

Jupiter

July 16, 1994

After  
Impact Site  
Enlarged and Enhanced



Hubble Space Telescope

1  
00:00:24,380 --> 00:00:19,300

I

2  
00:00:26,900 --> 00:00:24,390

affairs officer space science welcome

3  
00:00:29,089 --> 00:00:26,910

today to the beginning of day two of the

4  
00:00:31,550 --> 00:00:29,099

world's watching the comet impacting

5  
00:00:33,740 --> 00:00:31,560

Jupiter following a very successful

6  
00:00:35,240 --> 00:00:33,750

first night of observing we're here at

7  
00:00:37,549 --> 00:00:35,250

the Goddard Space Flight Center and

8  
00:00:40,100 --> 00:00:37,559

Maryland today and with us we will have

9  
00:00:41,660 --> 00:00:40,110

some panelists discuss the results of

10  
00:00:43,940 --> 00:00:41,670

last night's observing from around the

11  
00:00:47,810 --> 00:00:43,950

world and from the Hubble telescope I'd

12  
00:00:50,419 --> 00:00:47,820

like to introduce first of all Jean

13  
00:00:52,250 --> 00:00:50,429

shoemaker who was a astronomer with

14

00:00:55,430 --> 00:00:52,260

Lowell Observatory and a professor with

15

00:00:57,529 --> 00:00:55,440

the US Geological Survey to his left his

16

00:01:02,720 --> 00:00:57,539

wife Carolyn shoemaker also an

17

00:01:06,200 --> 00:01:02,730

astronomer with the US Geological Survey

18

00:01:09,020 --> 00:01:06,210

and the Lowell Observatory to my

19

00:01:11,120 --> 00:01:09,030

immediate left David Levy amateur

20

00:01:14,030 --> 00:01:11,130

astronomer and author and co-discoverer

21

00:01:16,760 --> 00:01:14,040

with the shoemaker's of this connor and

22

00:01:18,460 --> 00:01:16,770

to his left we have Heidi Hammel from

23

00:01:21,440 --> 00:01:18,470

massachusetts institute of technology

24

00:01:24,709 --> 00:01:21,450

with the Space Telescope Science

25

00:01:28,840 --> 00:01:24,719

Institute imaging team and I'd like to

26  
00:01:31,819 --> 00:01:28,850  
start off with Jean shoemaker thanks Don

27  
00:01:35,740 --> 00:01:31,829  
well many of you know we had an

28  
00:01:38,719 --> 00:01:35,750  
absolutely incredible night last night

29  
00:01:40,520 --> 00:01:38,729  
when we knew for the first time they

30  
00:01:43,850 --> 00:01:40,530  
were we were really going to see some

31  
00:01:48,410 --> 00:01:43,860  
exciting results the first tense came in

32  
00:01:52,099 --> 00:01:48,420  
from Colorado Spain and from la SIA and

33  
00:01:54,709 --> 00:01:52,109  
Chile and just about the time we were

34  
00:01:56,929 --> 00:01:54,719  
giving our first announcement I'm not

35  
00:01:59,510 --> 00:01:56,939  
Heidi came up from the bowels of the

36  
00:02:01,999 --> 00:01:59,520  
Space Telescope Science Institute waving

37  
00:02:05,929 --> 00:02:02,009  
a picture and showing that indeed Hubble

38  
00:02:07,429 --> 00:02:05,939

was producing fantastic images so how

39

00:02:10,609 --> 00:02:07,439

he's going to tell you into some detail

40

00:02:14,810 --> 00:02:10,619

now about that a little bit later to

41

00:02:18,350 --> 00:02:14,820

bring you up to date fragments ABC and D

42

00:02:20,960 --> 00:02:18,360

have now all hit the planet there are

43

00:02:23,360 --> 00:02:20,970

observations on the first three of these

44

00:02:25,910 --> 00:02:23,370

that will be able to report on D has

45

00:02:27,700 --> 00:02:25,920

just come down this morning and we're

46

00:02:31,180 --> 00:02:27,710

not quite ready to give you any up

47

00:02:33,640 --> 00:02:31,190

on that we're going to have observations

48

00:02:36,340 --> 00:02:33,650

on we'll show you an observation from

49

00:02:39,220 --> 00:02:36,350

Sarah to low low in Chile the

50

00:02:41,650 --> 00:02:39,230

inter-american Observatory in Chile and

51  
00:02:43,660 --> 00:02:41,660  
we have reports that are coming up then

52  
00:02:45,970 --> 00:02:43,670  
from the NASA infrared telescope

53  
00:02:50,380 --> 00:02:45,980  
facility and from the Keck Observatory

54  
00:02:52,630 --> 00:02:50,390  
on Mauna Kea in Hawaii but first Heidi

55  
00:02:53,770 --> 00:02:52,640  
will tell you about all the excitement

56  
00:02:55,480 --> 00:02:53,780  
that was happening at the Space

57  
00:02:58,590 --> 00:02:55,490  
Telescope Science Institute last night

58  
00:03:01,060 --> 00:02:58,600  
Heidi Thank You gene it was indeed very

59  
00:03:03,550 --> 00:03:01,070  
exciting I think we were all incredibly

60  
00:03:05,290 --> 00:03:03,560  
astonished at what we saw last night and

61  
00:03:06,750 --> 00:03:05,300  
I'm not going to waste any time i'm

62  
00:03:10,570 --> 00:03:06,760  
going to show you that first image again

63  
00:03:13,240 --> 00:03:10,580

this is a 4 10 nanometers that's four

64  
00:03:17,380 --> 00:03:13,250  
thousand angstroms blue wavelengths you

65  
00:03:19,600 --> 00:03:17,390  
can see jupiter on the right and what

66  
00:03:22,870 --> 00:03:19,610  
you see on the left is a blow-up of the

67  
00:03:25,690 --> 00:03:22,880  
impact site from fragment a this is the

68  
00:03:27,370 --> 00:03:25,700  
first feature that went into the plant

69  
00:03:30,760 --> 00:03:27,380  
the first large fragment that went into

70  
00:03:33,010 --> 00:03:30,770  
the planet you can see the blue

71  
00:03:36,910 --> 00:03:33,020  
wavelengths that it is very dark very

72  
00:03:38,710 --> 00:03:36,920  
dark indeed we're speculating at this

73  
00:03:40,570 --> 00:03:38,720  
point as to our that might be we think

74  
00:03:42,880 --> 00:03:40,580  
that possibly what we're mostly seeing

75  
00:03:45,480 --> 00:03:42,890  
is cometary material at this point

76

00:03:47,710 --> 00:03:45,490

because comets are very dark too I

77

00:03:49,720 --> 00:03:47,720

expected to see a bright future myself

78

00:03:54,160 --> 00:03:49,730

so I was a little bit surprised to see

79

00:03:56,230 --> 00:03:54,170

this lovely black splotch on Jupiter it

80

00:03:58,450 --> 00:03:56,240

looks somewhat like a streak there in

81

00:04:00,340 --> 00:03:58,460

the center we're beginning to think that

82

00:04:02,290 --> 00:04:00,350

perhaps that's just a projection effect

83

00:04:04,900 --> 00:04:02,300

we think when we do the measurements of

84

00:04:07,180 --> 00:04:04,910

that outer Oriole perhaps that's the

85

00:04:09,010 --> 00:04:07,190

wood we might use and measure the

86

00:04:13,030 --> 00:04:09,020

latitudes and longitudes very carefully

87

00:04:16,000 --> 00:04:13,040

it appears that that larger spreading is

88

00:04:18,820 --> 00:04:16,010

circular and then it only looks like

89

00:04:21,820 --> 00:04:18,830

like that your lips because it's down

90

00:04:23,680 --> 00:04:21,830

near the edge of the planet at same for

91

00:04:26,230 --> 00:04:23,690

that central streak we're not sure

92

00:04:29,740 --> 00:04:26,240

exactly what the size of that is to give

93

00:04:34,930 --> 00:04:29,750

you a scale that box the blow-up box is

94

00:04:37,510 --> 00:04:34,940

to earth diameters so that feature is a

95

00:04:39,610 --> 00:04:37,520

good good fraction of the size of the

96

00:04:41,140 --> 00:04:39,620

earth we can be very good

97

00:04:44,290 --> 00:04:41,150

add that this comment was heading for

98

00:04:46,210 --> 00:04:44,300

Jupiter not the earth now the next way

99

00:04:48,040 --> 00:04:46,220

image that I'll show you is that a very

100

00:04:50,890 --> 00:04:48,050

different wavelength this is it's a red

101  
00:04:53,830 --> 00:04:50,900  
wavelengths which showed the next image

102  
00:04:56,939 --> 00:04:53,840  
m ec inverts this is a very strong

103  
00:04:59,469 --> 00:04:56,949  
methane band nine thousand angstroms

104  
00:05:03,430 --> 00:04:59,479  
methane is a molecule that absorbs

105  
00:05:06,100 --> 00:05:03,440  
photons very efficiently and so Jupiter

106  
00:05:08,320 --> 00:05:06,110  
is very dark the only place that jupiter

107  
00:05:11,860 --> 00:05:08,330  
is bright at this wavelength is where

108  
00:05:13,990 --> 00:05:11,870  
you have particles at high altitudes you

109  
00:05:16,420 --> 00:05:14,000  
can see the Great Red Spot very clearly

110  
00:05:19,240 --> 00:05:16,430  
it's a high altitude feature it's bright

111  
00:05:23,290 --> 00:05:19,250  
the poles are bright now look at the

112  
00:05:26,980 --> 00:05:23,300  
comet site it's right that was likely to

113  
00:05:29,439 --> 00:05:26,990

mean it's a high altitude feature so

114

00:05:32,350 --> 00:05:29,449

that was very interesting to see at all

115

00:05:36,100 --> 00:05:32,360

the other wavelengths that feature was

116

00:05:38,020 --> 00:05:36,110

dark that would clarify that at all the

117

00:05:41,710 --> 00:05:38,030

wavelengths that Hubble was observing

118

00:05:44,050 --> 00:05:41,720

the visual the ultraviolet and even nine

119

00:05:46,810 --> 00:05:44,060

thousand five hundred angstroms it was

120

00:05:48,250 --> 00:05:46,820

dark it's bright in the methane band and

121

00:05:51,430 --> 00:05:48,260

it's bright in the infrared observations

122

00:05:53,200 --> 00:05:51,440

that will hear about later now I would

123

00:05:55,440 --> 00:05:53,210

like to show you one of the most

124

00:05:58,270 --> 00:05:55,450

exciting things that we saw last night

125

00:06:01,629 --> 00:05:58,280

absolutely knocked our socks off and we

126  
00:06:03,310 --> 00:06:01,639  
saw this this is a plume sequence and

127  
00:06:05,110 --> 00:06:03,320  
you can see this is hot off the press

128  
00:06:07,659 --> 00:06:05,120  
and we're just taking a picture of a

129  
00:06:10,540 --> 00:06:07,669  
laser copy hold up it's a sequence from

130  
00:06:14,620 --> 00:06:10,550  
top to bottom in the first image the

131  
00:06:16,930 --> 00:06:14,630  
impact has not occurred at 2018 a has

132  
00:06:19,480 --> 00:06:16,940  
gone in and sent out a fireball that

133  
00:06:21,520 --> 00:06:19,490  
extends beyond the limb of the planet

134  
00:06:24,700 --> 00:06:21,530  
you can see a clear separation between

135  
00:06:27,640 --> 00:06:24,710  
that fireball and the Terminator of

136  
00:06:29,860 --> 00:06:27,650  
Jupiter and we think at this point that

137  
00:06:32,800 --> 00:06:29,870  
we're seeing the shadow of Jupiter on

138  
00:06:35,290 --> 00:06:32,810

the fireball and the third image you can

139

00:06:37,270 --> 00:06:35,300

see that this fireball is spreading the

140

00:06:39,310 --> 00:06:37,280

fourth image is spreading even more and

141

00:06:43,960 --> 00:06:39,320

in the bottom image it's a flat little

142

00:06:46,719 --> 00:06:43,970

pancake it's absolutely amazing I mean

143

00:06:48,040 --> 00:06:46,729

there were theories about this but we

144

00:06:51,250 --> 00:06:48,050

really didn't in our heart of hearts

145

00:06:52,800 --> 00:06:51,260

expect to see it in the first impact we

146

00:06:55,110 --> 00:06:52,810

are expected to see it at the

147

00:06:56,909 --> 00:06:55,120

when we are very close to the limb this

148

00:06:59,640 --> 00:06:56,919

is not particularly close to the limb

149

00:07:02,100 --> 00:06:59,650

this is a massive thing we're talking a

150

00:07:05,280 --> 00:07:02,110

thousand fifteen hundred kilometers

151  
00:07:06,720 --> 00:07:05,290  
above the limb of Jupiter so that's

152  
00:07:10,770 --> 00:07:06,730  
pretty astounding we are just

153  
00:07:13,770 --> 00:07:10,780  
flabbergasted so I also have a video of

154  
00:07:15,659 --> 00:07:13,780  
Hubble images that are taking pre impact

155  
00:07:17,460 --> 00:07:15,669  
and I'm showing you this so that you can

156  
00:07:20,730 --> 00:07:17,470  
see the kind of detail that's on Jupiter

157  
00:07:22,740 --> 00:07:20,740  
already and also to set you up because

158  
00:07:24,990 --> 00:07:22,750  
one week from now we're going to give

159  
00:07:27,719 --> 00:07:25,000  
you another movie showing what Jupiter

160  
00:07:30,330 --> 00:07:27,729  
looks like after the impacts and that

161  
00:07:33,120 --> 00:07:30,340  
will be a very interesting comparison so

162  
00:07:35,129 --> 00:07:33,130  
if we can run this video reminder this

163  
00:07:37,740 --> 00:07:35,139

is a pre impact video just to show you

164

00:07:39,659 --> 00:07:37,750

the amazing quality of the images from

165

00:07:41,640 --> 00:07:39,669

the Hubble Space Telescope after its

166

00:07:44,010 --> 00:07:41,650

refurbishment mission this is the wide

167

00:07:46,140 --> 00:07:44,020

field camera we will also be taking

168

00:07:48,840 --> 00:07:46,150

close-up views of the impact sites in

169

00:07:51,690 --> 00:07:48,850

the planetary camera which has a factor

170

00:07:54,379 --> 00:07:51,700

of 2 greater resolution and I am really

171

00:07:59,490 --> 00:07:54,389

looking forward to seeing those images

172

00:08:01,110 --> 00:07:59,500

thank you ok that's great hiding maybe

173

00:08:03,110 --> 00:08:01,120

Kelvin will tell us a little bit about

174

00:08:08,700 --> 00:08:03,120

the excitement we were having last night

175

00:08:11,430 --> 00:08:08,710

all right we have a reaction tape from

176

00:08:13,850 --> 00:08:11,440

the OSS that talks about celebration I

177

00:08:16,890 --> 00:08:13,860

think you know that we just all

178

00:08:20,130 --> 00:08:16,900

literally hit the ceiling when we heard

179

00:08:24,510 --> 00:08:20,140

the results it was too exciting to to

180

00:08:26,820 --> 00:08:24,520

believe and it's something that will

181

00:08:29,460 --> 00:08:26,830

always remember the reactions i think

182

00:08:34,020 --> 00:08:29,470

from all over the world show that

183

00:08:36,120 --> 00:08:34,030

excitement can we have that b roll so

184

00:08:38,130 --> 00:08:36,130

it's you can usually see people looking

185

00:08:42,159 --> 00:08:38,140

eagerly to

186

00:08:48,220 --> 00:08:42,169

you're tidy examining the image to

187

00:08:50,410 --> 00:08:48,230

select earnestly we all did every single

188

00:08:55,810 --> 00:08:50,420

one of them just have us breathtaking

189

00:08:59,079 --> 00:08:55,820

and you there's how we were hard all of

190

00:09:01,360 --> 00:08:59,089

the tune universe' there does you can

191

00:09:05,560 --> 00:09:01,370

see these people have worked extremely

192

00:09:14,230 --> 00:09:05,570

hard get the results and they were all

193

00:09:17,260 --> 00:09:14,240

filled and we all closes baby hiding is

194

00:09:20,769 --> 00:09:17,270

still excited don't worry I didn't know

195

00:09:26,829 --> 00:09:20,779

right there what a great time oh great

196

00:09:34,930 --> 00:09:26,839

Alyssa Vita hasn't moved she's still

197

00:09:41,079 --> 00:09:34,940

looking puzzled the infamous bottle of

198

00:09:44,020 --> 00:09:41,089

champagne Lewis was martyred everyone

199

00:09:49,270 --> 00:09:44,030

was ready to celebrate ok that's

200

00:09:50,770 --> 00:09:49,280

wonderful killed well David let's let's

201  
00:09:53,320 --> 00:09:50,780  
hear about some of the other early

202  
00:09:58,900 --> 00:09:53,330  
reports ok yeah Heidi we have to work on

203  
00:10:00,490 --> 00:09:58,910  
getting a little more enthusiastic well

204  
00:10:01,870 --> 00:10:00,500  
I thought we would have to make stuff up

205  
00:10:04,210 --> 00:10:01,880  
and i don't know if i'm going to say

206  
00:10:07,060 --> 00:10:04,220  
everything that I need to say we started

207  
00:10:09,730 --> 00:10:07,070  
observing getting observations from

208  
00:10:12,460 --> 00:10:09,740  
Keller alto and Spain impact a was

209  
00:10:16,120 --> 00:10:12,470  
observed with the 3.5 liter telescope

210  
00:10:19,690 --> 00:10:16,130  
there the plume appeared now the the

211  
00:10:22,210 --> 00:10:19,700  
observation of a plume is absolutely

212  
00:10:24,970 --> 00:10:22,220  
amazing it was as Heidi said it was not

213  
00:10:27,280 --> 00:10:24,980

expected for this fragment this the

214

00:10:29,380 --> 00:10:27,290

later ones especially w at the end is

215

00:10:31,480 --> 00:10:29,390

going to be really quite close to the

216

00:10:34,000 --> 00:10:31,490

limb and to get so much from this first

217

00:10:36,070 --> 00:10:34,010

little impact I'm wondering if we could

218

00:10:39,550 --> 00:10:36,080

take a look at that picture of the comet

219

00:10:41,710 --> 00:10:39,560

behind us with a over there look look

220

00:10:44,500 --> 00:10:41,720

how small rod is compared to what's

221

00:10:48,250 --> 00:10:44,510

coming later on I mean look at G over

222

00:10:50,940 --> 00:10:48,260

here I mean where this is just the the

223

00:10:53,800 --> 00:10:50,950

Orchestra warming up

224

00:10:57,820 --> 00:10:53,810

so from La Palma with the two point

225

00:11:01,480 --> 00:10:57,830

meter telescope there were they the

226

00:11:03,250 --> 00:11:01,490

impact site was visible sorry Mel the

227

00:11:04,900 --> 00:11:03,260

impact site was visible in images

228

00:11:09,820 --> 00:11:04,910

obtained with the one meter capoten

229

00:11:12,810 --> 00:11:09,830

telescope from La Palma there is a

230

00:11:15,970 --> 00:11:12,820

report that if concern confirmed is

231

00:11:19,810 --> 00:11:15,980

really interesting of a visual sighting

232

00:11:23,460 --> 00:11:19,820

of the meteors from the wise Observatory

233

00:11:25,660 --> 00:11:23,470

that's as the flashes as the comet

234

00:11:27,940 --> 00:11:25,670

started to go into Jupiter's upper

235

00:11:30,400 --> 00:11:27,950

atmosphere and behaved as abnormal

236

00:11:32,700 --> 00:11:30,410

meteor would on earth but the meteors on

237

00:11:35,829 --> 00:11:32,710

earth that we see in the night sky are

238

00:11:39,910 --> 00:11:35,839

objects the size of a pea or a grain of

239

00:11:41,410 --> 00:11:39,920

sand this is the impact of something

240

00:11:44,079 --> 00:11:41,420

that's at least one kilometer in

241

00:11:45,970 --> 00:11:44,089

diameter coming into Jupiter possibly

242

00:11:49,329 --> 00:11:45,980

seen the two independent observations

243

00:11:51,220 --> 00:11:49,339

were made with small telescopes they

244

00:11:54,880 --> 00:11:51,230

would pour in a possible sighting of a

245

00:11:57,430 --> 00:11:54,890

brief sharp flash by brief we mean less

246

00:12:00,490 --> 00:11:57,440

than one second duration near the limb

247

00:12:03,519 --> 00:12:00,500

near the edge of Jupiter and it was at

248

00:12:06,160 --> 00:12:03,529

the approximately correct location Jim

249

00:12:08,380 --> 00:12:06,170

Scotti who was at the wise observatory

250

00:12:11,380 --> 00:12:08,390

at the time has asked me to be really

251  
00:12:13,180 --> 00:12:11,390  
careful with this report I don't want to

252  
00:12:15,670 --> 00:12:13,190  
it needs to be mentioned because it's

253  
00:12:17,290 --> 00:12:15,680  
out on all the electronic mail but I

254  
00:12:21,100 --> 00:12:17,300  
don't want to put a whole lot of

255  
00:12:23,890 --> 00:12:21,110  
credence into it just yet until if we

256  
00:12:26,680 --> 00:12:23,900  
get other observations of other flashes

257  
00:12:29,800 --> 00:12:26,690  
but because there are these two reports

258  
00:12:32,680 --> 00:12:29,810  
it means that other flashes could be

259  
00:12:35,079 --> 00:12:32,690  
visible with people using small

260  
00:12:37,210 --> 00:12:35,089  
telescopes if this is true and I don't

261  
00:12:39,160 --> 00:12:37,220  
know that it is I'd like to be be

262  
00:12:41,650 --> 00:12:39,170  
conservative and say it probably isn't

263  
00:12:43,329 --> 00:12:41,660

but it means that people with small

264

00:12:46,329 --> 00:12:43,339

telescopes who know exactly where to

265

00:12:49,240 --> 00:12:46,339

look on the limb of Jupiter at the right

266

00:12:52,780 --> 00:12:49,250

time do have a chance of seeing future

267

00:12:54,940 --> 00:12:52,790

flashes amateur astronomers should

268

00:12:57,940 --> 00:12:54,950

really this is a red alert for amateur

269

00:13:00,250 --> 00:12:57,950

astronomers with small telescopes there

270

00:13:02,740 --> 00:13:00,260

was an observation from the point four

271

00:13:04,630 --> 00:13:02,750

meter that's a 16 inch telescope in

272

00:13:07,380 --> 00:13:04,640

western Massachusetts

273

00:13:10,560 --> 00:13:07,390

they saw a bright spot at the impact on

274

00:13:13,960 --> 00:13:10,570

this is the impact site for fragment a

275

00:13:16,930 --> 00:13:13,970

the South Pole infrared Explorer 60

276  
00:13:19,300 --> 00:13:16,940  
centimeter telescope has detected the

277  
00:13:23,170 --> 00:13:19,310  
plume from frag grenades being detected

278  
00:13:27,040 --> 00:13:23,180  
all over the place fragmin be was also

279  
00:13:29,200 --> 00:13:27,050  
detected from the Keck telescope and not

280  
00:13:30,820 --> 00:13:29,210  
detected from a number of other sites

281  
00:13:32,800 --> 00:13:30,830  
that would have expected to detect

282  
00:13:35,770 --> 00:13:32,810  
fragment be if you look back at that

283  
00:13:37,510 --> 00:13:35,780  
picture though take notice that fragment

284  
00:13:43,090 --> 00:13:37,520  
B which is the second one there is not

285  
00:13:46,630 --> 00:13:43,100  
exactly on the line of a vintage on the

286  
00:13:49,900 --> 00:13:46,640  
line of comets there that's a good one B

287  
00:13:51,760 --> 00:13:49,910  
is a little bit above it and we

288  
00:13:53,770 --> 00:13:51,770

interpret that as being that that

289

00:13:56,530 --> 00:13:53,780

fragment split off from the main comment

290

00:14:00,070 --> 00:13:56,540

after july seventh nineteen ninety-two

291

00:14:02,800 --> 00:14:00,080

when the main comet split apart and if

292

00:14:05,140 --> 00:14:02,810

this and and the fact that fragment see

293

00:14:08,110 --> 00:14:05,150

which is right on the line was also

294

00:14:11,470 --> 00:14:08,120

detected and detected so strongly I

295

00:14:14,980 --> 00:14:11,480

think we can doing a little bit of arm

296

00:14:16,840 --> 00:14:14,990

waving here suggests that the fragment

297

00:14:19,750 --> 00:14:16,850

be and all of the other fragments that

298

00:14:21,820 --> 00:14:19,760

are off the line might be weaker they

299

00:14:24,790 --> 00:14:21,830

might be more loosely held together more

300

00:14:26,560 --> 00:14:24,800

more of a rubble pile than a and the

301

00:14:28,870 --> 00:14:26,570

other fragments that split up right at

302

00:14:35,710 --> 00:14:28,880

the time of closest approach back in

303

00:14:38,490 --> 00:14:35,720

1992 we have a lot of other observations

304

00:14:41,350 --> 00:14:38,500

d just came down about an hour ago and

305

00:14:44,020 --> 00:14:41,360

we don't have any any observations of

306

00:14:45,550 --> 00:14:44,030

that yet they will be coming in very

307

00:14:50,170 --> 00:14:45,560

soon I think I'll give a thank you note

308

00:14:51,700 --> 00:14:50,180

G ok thanks well early this morning we

309

00:14:53,680 --> 00:14:51,710

heard from James Graham at the

310

00:14:55,300 --> 00:14:53,690

University of California reporting on

311

00:14:59,050 --> 00:14:55,310

fragments a and C from the Keck

312

00:15:01,720 --> 00:14:59,060

Observatory on Mauna Kea and I think

313

00:15:04,300 --> 00:15:01,730

week if we can roll now those

314

00:15:07,150 --> 00:15:04,310

observations and we should have a direct

315

00:15:10,990 --> 00:15:07,160

audio before can't front lace

316

00:15:12,790 --> 00:15:11,000

when the second impact was jus and we

317

00:15:18,910 --> 00:15:12,800

thought distinct signature of the plume

318

00:15:22,210 --> 00:15:18,920

of one of the only impacts and topical

319

00:15:27,119 --> 00:15:22,220

images show very bright features on the

320

00:15:30,550 --> 00:15:27,129

surface of Jupiter at the impact site

321

00:15:33,369 --> 00:15:30,560

incredibly bright very clear very

322

00:15:36,129 --> 00:15:33,379

spectacular event one of the things that

323

00:15:38,530 --> 00:15:36,139

that surprises just how bright these

324

00:15:40,509 --> 00:15:38,540

events are and so the thing that the

325

00:15:42,850 --> 00:15:40,519

check the advantage the church has is

326

00:15:45,100 --> 00:15:42,860

that can see much fainter things going

327

00:15:47,829 --> 00:15:45,110

on in particular what I experiments that

328

00:15:49,769 --> 00:15:47,839

we did this evening that will take some

329

00:15:53,470 --> 00:15:49,779

more time to analyze was looking at

330

00:15:55,629 --> 00:15:53,480

jupiters ring and that has the advantage

331

00:15:58,210 --> 00:15:55,639

is that by looking at reflected light

332

00:16:00,369 --> 00:15:58,220

off the rain we can sense view the

333

00:16:03,189 --> 00:16:00,379

impact fight directly so hopefully when

334

00:16:05,829 --> 00:16:03,199

we look at that data carefully we will

335

00:16:13,840 --> 00:16:05,839

see the initial flash when the comet

336

00:16:19,710 --> 00:16:13,850

fragment hit Jupiter let's go on then we

337

00:16:23,400 --> 00:16:19,720

have an image now from fragment a impact

338

00:16:26,290 --> 00:16:23,410

from Sarah to low low in la serena chile

339

00:16:28,509 --> 00:16:26,300

this is this is an image now coming up

340

00:16:33,309 --> 00:16:28,519

from John Spencer of Lowell Observatory

341

00:16:35,139 --> 00:16:33,319

who's down at serif to low low and Louis

342

00:16:38,139 --> 00:16:35,149

it doesn't look great they grant

343

00:16:41,410 --> 00:16:38,149

imagenext for the gram images next we

344

00:16:45,910 --> 00:16:41,420

just had Grail there it is oh here's his

345

00:16:48,639 --> 00:16:45,920

image ok image that directly is a

346

00:16:50,769 --> 00:16:48,649

picture from the Keck telescope did an

347

00:16:53,620 --> 00:16:50,779

infrared picture at the wavelength of

348

00:16:57,100 --> 00:16:53,630

3.3 microns which is but six times the

349

00:16:59,350 --> 00:16:57,110

wavelength of visible light the features

350

00:17:02,740 --> 00:16:59,360

that you see are the bright polar caps

351  
00:17:03,769 --> 00:17:02,750  
which are always present and just the

352  
00:17:07,419 --> 00:17:03,779  
equator is

353  
00:17:10,720 --> 00:17:07,429  
the storm system of the red spot but

354  
00:17:12,980 --> 00:17:10,730  
Pfeifer's about the minus 40 degrees

355  
00:17:15,110 --> 00:17:12,990  
must roll out features which are the

356  
00:17:17,960 --> 00:17:15,120  
aftermath of the comet impacts of the

357  
00:17:21,079 --> 00:17:17,970  
curious evening the brightest part of

358  
00:17:28,270 --> 00:17:21,089  
the very first impact the one the S on

359  
00:17:35,270 --> 00:17:33,289  
and test a fantastic I'm like I might

360  
00:17:37,850 --> 00:17:35,280  
make just insert the comment there that

361  
00:17:39,830 --> 00:17:37,860  
it's very clear that these impact sites

362  
00:17:41,690 --> 00:17:39,840  
are going to remain visible we've seen

363  
00:17:44,600 --> 00:17:41,700

one now go through a complete rotation

364

00:17:46,909 --> 00:17:44,610

we may see a whole string of these now

365

00:17:48,980 --> 00:17:46,919

by the end of the week lighting up that

366

00:17:51,620 --> 00:17:48,990

latitude band on Jupiter string of

367

00:17:54,590 --> 00:17:51,630

pearls that's another string of four

368

00:17:58,399 --> 00:17:54,600

Carolyn okay now I think we should have

369

00:18:04,279 --> 00:17:58,409

the coming up next on the screen John

370

00:18:08,480 --> 00:18:04,289

Spencer's image from Sarah to Lola and

371

00:18:11,029 --> 00:18:08,490

there it is again a John is going to

372

00:18:14,270 --> 00:18:11,039

give us a report tomorrow so we'll have

373

00:18:16,070 --> 00:18:14,280

him an audio at that time but I think

374

00:18:19,159 --> 00:18:16,080

you can see that we're getting good

375

00:18:21,440 --> 00:18:19,169

images now from many telescopes around

376

00:18:25,130 --> 00:18:21,450

the world that's that's the impact site

377

00:18:26,990 --> 00:18:25,140

for a we also heard from Glenn Orton at

378

00:18:30,500 --> 00:18:27,000

the at nasa's infrared telescope

379

00:18:33,470 --> 00:18:30,510

facility at mauna kea who filed the

380

00:18:40,639 --> 00:18:33,480

report now that we're going to see again

381

00:18:43,279 --> 00:18:40,649

on fragment a very clearly had

382

00:18:47,539 --> 00:18:43,289

introduced the new cloud which was quite

383

00:18:50,299 --> 00:18:47,549

long oh when we observed the plume from

384

00:18:52,610 --> 00:18:50,309

C was clearly at the same latitude but

385

00:18:56,820 --> 00:18:52,620

at first very difficult to distinguish

386

00:18:59,880 --> 00:18:56,830

from the holiday that is the final

387

00:19:02,759 --> 00:18:59,890

and time passed the plume from sea

388

00:19:05,490 --> 00:19:02,769

became very much brighter several times

389

00:19:06,899 --> 00:19:05,500

brighter than that cloud the cloud from

390

00:19:10,350 --> 00:19:06,909

the a fragment that turned out to be

391

00:19:15,360 --> 00:19:10,360

about the same brightness as the north

392

00:19:17,299 --> 00:19:15,370

and south polar caps I'm very ecstatic

393

00:19:20,159 --> 00:19:17,309

about any of this witnessing this is

394

00:19:22,710 --> 00:19:20,169

kind of amazing and what what's amazing

395

00:19:25,490 --> 00:19:22,720

about both of these is the fact that

396

00:19:27,930 --> 00:19:25,500

being see are both rather faint objects

397

00:19:31,560 --> 00:19:27,940

certainly in the thermal improv in the

398

00:19:34,080 --> 00:19:31,570

near infrared so fmg are known to be

399

00:19:36,000 --> 00:19:34,090

much bigger I'm much brighter in there

400

00:19:38,460 --> 00:19:36,010

for a specially mirror they're both much

401  
00:19:42,990 --> 00:19:38,470  
baby spiders biggest objects than a and

402  
00:19:45,180 --> 00:19:43,000  
so this is going to be a real show okay

403  
00:19:47,580 --> 00:19:45,190  
I guess we're going to see Glen's actual

404  
00:19:54,930 --> 00:19:47,590  
images tomorrow so we'll have an update

405  
00:19:57,120 --> 00:19:54,940  
their from from glenarden I guess at

406  
00:19:59,549 --> 00:19:57,130  
this point we turn it back to you don

407  
00:20:02,430 --> 00:19:59,559  
okay yeah well then we'll turn it over

408  
00:20:04,620 --> 00:20:02,440  
to reporters here at the Goddard Space

409  
00:20:06,600 --> 00:20:04,630  
Flight Center for Q&A and then we'll

410  
00:20:08,820 --> 00:20:06,610  
check with our other centers to see if

411  
00:20:11,460 --> 00:20:08,830  
we have questions there let's start here

412  
00:20:12,659 --> 00:20:11,470  
in the front and please wait for the

413  
00:20:16,500 --> 00:20:12,669

microphone is state your name and

414

00:20:18,149 --> 00:20:16,510

affiliation I've cooked news day and you

415

00:20:20,070 --> 00:20:18,159

had a chance to think about why it might

416

00:20:22,980 --> 00:20:20,080

be dark in terms of chemical terms or

417

00:20:25,289 --> 00:20:22,990

something like that I think we're going

418

00:20:28,200 --> 00:20:25,299

to wait to answer that question until we

419

00:20:30,049 --> 00:20:28,210

get some spectroscopy we actually have

420

00:20:33,060 --> 00:20:30,059

been getting some reports a very

421

00:20:35,759 --> 00:20:33,070

interesting chemistry going on some of

422

00:20:38,549 --> 00:20:35,769

the telescopes in Hawaii have reported I

423

00:20:40,350 --> 00:20:38,559

don't I don't know how much detail I can

424

00:20:41,850 --> 00:20:40,360

go into at this point but I think I'll

425

00:20:50,659 --> 00:20:41,860

leave it at saying that the the

426  
00:20:54,960 --> 00:20:52,980  
Miles O'Brien with CNN let's talk what

427  
00:20:55,940 --> 00:20:54,970  
about the significance of seeing those

428  
00:20:58,840 --> 00:20:55,950  
plumes

429  
00:21:01,039 --> 00:20:58,850  
or fragment a not something you expected

430  
00:21:02,779 --> 00:21:01,049  
just the significance of being able to

431  
00:21:04,759 --> 00:21:02,789  
see that first of all and then what you

432  
00:21:08,180 --> 00:21:04,769  
might think we might see on some of

433  
00:21:12,049 --> 00:21:08,190  
these potentially larger fragments well

434  
00:21:15,139 --> 00:21:12,059  
miles I showed a theoretical prediction

435  
00:21:18,409 --> 00:21:15,149  
last night for the plumes as I look at

436  
00:21:20,990 --> 00:21:18,419  
the plumes that Heidi showed us now in

437  
00:21:24,110 --> 00:21:21,000  
that sequence it looks to me as though

438  
00:21:26,840 --> 00:21:24,120

the prediction is bang-on you in terms

439

00:21:29,779 --> 00:21:26,850

of the timing you get a plume growing up

440

00:21:33,019 --> 00:21:29,789

to a tall column it cools at the top and

441

00:21:35,210 --> 00:21:33,029

then it collapses and flattens and flows

442

00:21:36,350 --> 00:21:35,220

out and spreads out at the base and I

443

00:21:38,870 --> 00:21:36,360

think you can see that whole sequence

444

00:21:40,789 --> 00:21:38,880

and if I remember the times correctly

445

00:21:42,470 --> 00:21:40,799

that I saw in Heidi's images we're

446

00:21:46,519 --> 00:21:42,480

looking at a time interval of about

447

00:21:49,460 --> 00:21:46,529

eight or nine minutes isn't it 18 27

448

00:21:51,950 --> 00:21:49,470

minus 18 yeah nine minutes 9 minutes I'm

449

00:21:53,750 --> 00:21:51,960

talked about and so we really expected

450

00:21:56,269 --> 00:21:53,760

the plume to start to collapse after

451  
00:21:58,340 --> 00:21:56,279  
about five minutes and flow out and

452  
00:21:59,990 --> 00:21:58,350  
spread and I think that's exactly what

453  
00:22:02,060 --> 00:22:00,000  
you're seeing it's a and I think that's

454  
00:22:04,820 --> 00:22:02,070  
a beautiful testimony to the prediction

455  
00:22:06,919 --> 00:22:04,830  
that was made by Paul haddock of Titan

456  
00:22:09,860 --> 00:22:06,929  
research corporation who did that model

457  
00:22:12,919 --> 00:22:09,870  
on and what it also is saying is to get

458  
00:22:15,259 --> 00:22:12,929  
that size plume we are in fact dealing

459  
00:22:17,000 --> 00:22:15,269  
with an object that had the energy of at

460  
00:22:19,279 --> 00:22:17,010  
least a kilometer sized object maybe

461  
00:22:21,080 --> 00:22:19,289  
even a little bit bigger there so that

462  
00:22:23,539 --> 00:22:21,090  
means there's a lot of stuff even in

463  
00:22:25,700 --> 00:22:23,549

these smaller fragments the implication

464

00:22:28,850 --> 00:22:25,710

is that the later fragments will

465

00:22:35,090 --> 00:22:28,860

probably be even more extended and

466

00:22:37,320 --> 00:22:35,100

larger yep Cathy oh ok we'll do a

467

00:22:40,140 --> 00:22:37,330

follow-up

468

00:22:42,540 --> 00:22:40,150

you said earlier many times gene that

469

00:22:44,340 --> 00:22:42,550

all your career you'd hope to witness

470

00:22:48,270 --> 00:22:44,350

something like this you've studied

471

00:22:49,770 --> 00:22:48,280

craters the the residue of something

472

00:22:57,120 --> 00:22:49,780

like this now having seen one run of

473

00:22:59,250 --> 00:22:57,130

your thoughts love you sooo beyond the

474

00:23:01,590 --> 00:22:59,260

fact that we feel enormously relieved

475

00:23:04,590 --> 00:23:01,600

that they're really big objects there

476  
00:23:07,350 --> 00:23:04,600  
that are going to give us a show it

477  
00:23:08,520 --> 00:23:07,360  
gives me a very warm feeling that we can

478  
00:23:11,280 --> 00:23:08,530  
affect you some of the most

479  
00:23:13,140 --> 00:23:11,290  
sophisticated numerical models that have

480  
00:23:15,420 --> 00:23:13,150  
been developed with intensive effort

481  
00:23:17,550 --> 00:23:15,430  
over the last three decades and find

482  
00:23:20,250 --> 00:23:17,560  
that they really work on this enormous

483  
00:23:22,650 --> 00:23:20,260  
scale and that we really can gain a

484  
00:23:24,060 --> 00:23:22,660  
close theoretical understanding of what

485  
00:23:26,400 --> 00:23:24,070  
is happening with each one of these

486  
00:23:31,590 --> 00:23:26,410  
impacts I think I feel very good about

487  
00:23:35,670 --> 00:23:31,600  
that Kathy Kathy Sawyer the Washington

488  
00:23:38,430 --> 00:23:35,680

Post for gene can you tell me roughly

489

00:23:43,320 --> 00:23:38,440

what altitude you think the dark splotch

490

00:23:47,900 --> 00:23:43,330

is residing at currently if it's fixed

491

00:23:51,210 --> 00:23:47,910

in a place and what's there what what

492

00:23:52,950 --> 00:23:51,220

gases are at that level to the extent

493

00:23:56,060 --> 00:23:52,960

that you know or could this be material

494

00:23:58,980 --> 00:23:56,070

that's been exposed from the interior

495

00:24:01,620 --> 00:23:58,990

possibly the model calculations would

496

00:24:04,110 --> 00:24:01,630

indicate that the largest part of the

497

00:24:06,660 --> 00:24:04,120

material in that dark splotch actually

498

00:24:09,150 --> 00:24:06,670

consists of jovian atmosphere that's

499

00:24:12,180 --> 00:24:09,160

been dredged up from beneath the ammonia

500

00:24:15,030 --> 00:24:12,190

cloud tops but it will contain almost

501  
00:24:17,520 --> 00:24:15,040  
all of the cometary material as well so

502  
00:24:19,200 --> 00:24:17,530  
this is heidi said there's there's got

503  
00:24:21,300 --> 00:24:19,210  
to be some wonderful chemistry going on

504  
00:24:23,640 --> 00:24:21,310  
remember all of this stuff got very hot

505  
00:24:26,220 --> 00:24:23,650  
we're talking about the initial fireball

506  
00:24:28,530 --> 00:24:26,230  
temperatures in the range of 30,000

507  
00:24:31,440 --> 00:24:28,540  
degrees Kelvin and then it cools off

508  
00:24:33,240 --> 00:24:31,450  
from there and so there's some chemistry

509  
00:24:35,720 --> 00:24:33,250  
that I think we don't really know how to

510  
00:24:39,510 --> 00:24:35,730  
model just what those constituents are

511  
00:24:41,670 --> 00:24:39,520  
that make it dark and bright at the

512  
00:24:42,930 --> 00:24:41,680  
relative wavelengths is is something

513  
00:24:45,930 --> 00:24:42,940

that's still going to take a lot of work

514

00:24:48,630 --> 00:24:45,940

the the altitude at which you're seeing

515

00:24:49,550 --> 00:24:48,640

that reside later on I think you got a

516

00:24:51,920 --> 00:24:49,560

hit from that

517

00:24:54,680 --> 00:24:51,930

from the limb profile but it's probably

518

00:24:56,600 --> 00:24:54,690

of the order most of it will be of the

519

00:24:59,150 --> 00:24:56,610

order of a couple hundred kilometers I

520

00:25:00,710 --> 00:24:59,160

think above the ammonia cloud top so

521

00:25:02,570 --> 00:25:00,720

you'd like to comment on that honey I

522

00:25:05,510 --> 00:25:02,580

think that that's where we're heading

523

00:25:07,340 --> 00:25:05,520

right now to mostly based on the methane

524

00:25:10,760 --> 00:25:07,350

band image where we saw this material

525

00:25:12,890 --> 00:25:10,770

very bright similar brightness to the

526  
00:25:14,990 --> 00:25:12,900  
Great Red Spot for example if we could

527  
00:25:19,130 --> 00:25:15,000  
show the methane band image which is the

528  
00:25:20,540 --> 00:25:19,140  
the second graphic by seeing this thing

529  
00:25:22,700 --> 00:25:20,550  
fighting the methane bands and

530  
00:25:25,310 --> 00:25:22,710  
particularly in all the infrared images

531  
00:25:27,560 --> 00:25:25,320  
too we know that it's got to be

532  
00:25:29,750 --> 00:25:27,570  
relatively high I think we're going to

533  
00:25:32,090 --> 00:25:29,760  
have to wait for more detailed analysis

534  
00:25:37,940 --> 00:25:32,100  
before we can give us a firm number on

535  
00:25:40,160 --> 00:25:37,950  
that back here third round Debra's a

536  
00:25:42,710 --> 00:25:40,170  
prank oh I work for Reuters what can you

537  
00:25:44,960 --> 00:25:42,720  
tell us about what permanent effects

538  
00:25:47,330 --> 00:25:44,970

this might have on Jupiter these these

539

00:25:49,880 --> 00:25:47,340

impacts seem to be brighter bigger you

540

00:25:52,190 --> 00:25:49,890

know altogether more than them you were

541

00:25:53,600 --> 00:25:52,200

predicting and now that these look like

542

00:25:55,850 --> 00:25:53,610

they're gonna be lasting features of the

543

00:25:59,510 --> 00:25:55,860

planet how's it going to change is there

544

00:26:01,600 --> 00:25:59,520

anything you know at this point you

545

00:26:04,280 --> 00:26:01,610

oughta try it yeah I'll give it a whirl

546

00:26:07,160 --> 00:26:04,290

well we we don't we won't know for a few

547

00:26:10,180 --> 00:26:07,170

days I think how long did these features

548

00:26:13,220 --> 00:26:10,190

are it could be a very tenuous

549

00:26:15,530 --> 00:26:13,230

deposition of material that splotch and

550

00:26:17,690 --> 00:26:15,540

the zonal winds on Jupiter are pretty

551  
00:26:20,030 --> 00:26:17,700  
strong so they could cheer it out and

552  
00:26:22,340 --> 00:26:20,040  
spread it out based on what we've seen

553  
00:26:24,920 --> 00:26:22,350  
however just from the the few that we've

554  
00:26:28,250 --> 00:26:24,930  
seen it looks pretty clear that that

555  
00:26:33,010 --> 00:26:28,260  
whole band of latitude is going to be

556  
00:26:35,240 --> 00:26:33,020  
pockmarked with these impact sites and

557  
00:26:36,740 --> 00:26:35,250  
heaven only knows what I'm going to show

558  
00:26:39,320 --> 00:26:36,750  
you a week from now and I'll show you

559  
00:26:41,630 --> 00:26:39,330  
that movie yeah except that we're not at

560  
00:26:43,880 --> 00:26:41,640  
the moment expecting that these impact

561  
00:26:45,530 --> 00:26:43,890  
sites and whatever is forming are going

562  
00:26:47,510 --> 00:26:45,540  
to last permanently there they're very

563  
00:26:49,400 --> 00:26:47,520

brief we're expecting that they will

564

00:26:51,620 --> 00:26:49,410

disappear within a matter of days or

565

00:26:53,480 --> 00:26:51,630

weeks I don't think Bob West would agree

566

00:26:56,810 --> 00:26:53,490

with that one no you've got a

567

00:26:58,780 --> 00:26:56,820

program yeah absolutely we're dumping a

568

00:27:01,850 --> 00:26:58,790

lot of material in the stratosphere and

569

00:27:03,860 --> 00:27:01,860

you know as we see on in the earth when

570

00:27:05,419 --> 00:27:03,870

Pinatubo erupted and you through all

571

00:27:07,790 --> 00:27:05,429

that material in the stratosphere of the

572

00:27:09,560 --> 00:27:07,800

earth it hung around for a long time we

573

00:27:12,500 --> 00:27:09,570

were seeing beautiful sunsets for a very

574

00:27:13,910 --> 00:27:12,510

long time so you know this stuff could

575

00:27:16,130 --> 00:27:13,920

hang around in the stratosphere of

576  
00:27:17,840 --> 00:27:16,140  
Jupiter for a while and we have programs

577  
00:27:20,000 --> 00:27:17,850  
on the Hubble and many other

578  
00:27:23,480 --> 00:27:20,010  
ground-based telescopes to look for that

579  
00:27:26,030 --> 00:27:23,490  
for a week after a month after many

580  
00:27:27,320 --> 00:27:26,040  
months after and we will be able to tell

581  
00:27:29,720 --> 00:27:27,330  
you until we've done those observations

582  
00:27:31,549 --> 00:27:29,730  
how long it's going to hang around this

583  
00:27:33,230 --> 00:27:31,559  
may be one of the surprises we were

584  
00:27:37,460 --> 00:27:33,240  
looking for yeah I'm going to stop being

585  
00:27:40,520 --> 00:27:37,470  
conservative maybe what you were leading

586  
00:27:42,470 --> 00:27:40,530  
to Heidi is that you know as a higher

587  
00:27:44,450 --> 00:27:42,480  
altitude of stuff spreads out there

588  
00:27:46,430 --> 00:27:44,460

there's going to be a haze band very

589

00:27:49,100 --> 00:27:46,440

likely something that will be readily

590

00:27:50,480 --> 00:27:49,110

observable even with a small telescope

591

00:27:51,950 --> 00:27:50,490

on the ground that maybe have broad

592

00:27:53,600 --> 00:27:51,960

enough feature that will be seen for

593

00:27:55,340 --> 00:27:53,610

some time which i think is exciting for

594

00:27:59,060 --> 00:27:55,350

all everybody it'll be interesting to

595

00:28:03,650 --> 00:27:59,070

see if those features stay dark very

596

00:28:06,950 --> 00:28:03,660

interesting to see a senior sky of an

597

00:28:10,870 --> 00:28:06,960

educator who do to us a size of fragment

598

00:28:13,820 --> 00:28:10,880

b c d e and what happened to those

599

00:28:16,310 --> 00:28:13,830

fragment i heard that the Hubble Space

600

00:28:19,460 --> 00:28:16,320

Telescope is taking a picture just 10

601  
00:28:21,860 --> 00:28:19,470  
hour before the Corazon itself so what

602  
00:28:24,410 --> 00:28:21,870  
happened to fragmented selex before the

603  
00:28:28,460 --> 00:28:24,420  
collision is broke down are you still

604  
00:28:32,510 --> 00:28:28,470  
keep this shape or something alright I

605  
00:28:34,780 --> 00:28:32,520  
can try um I it looked as though in the

606  
00:28:37,790 --> 00:28:34,790  
days preceding the impact of fragment a

607  
00:28:42,320 --> 00:28:37,800  
there was a report that that the that

608  
00:28:44,960 --> 00:28:42,330  
the fragment was becoming much more oval

609  
00:28:46,700 --> 00:28:44,970  
and one report said that the nucleus it

610  
00:28:49,850 --> 00:28:46,710  
meant the nucleus was splitting up but

611  
00:28:51,919 --> 00:28:49,860  
how Weaver definitely wanted to stop

612  
00:28:54,650 --> 00:28:51,929  
that idea saying that it was just the

613  
00:28:58,160 --> 00:28:54,660

dust coma around the nucleus that was

614

00:28:59,750 --> 00:28:58,170

starting to be pulled on by Jupiter's

615

00:29:02,419 --> 00:28:59,760

gravity so that it would start getting

616

00:29:05,419 --> 00:29:02,429

more elliptical all the evidence we have

617

00:29:06,320 --> 00:29:05,429

right now indicates that fragment a must

618

00:29:09,470 --> 00:29:06,330

have impact

619

00:29:11,570 --> 00:29:09,480

pretty well intact and that elongation

620

00:29:15,560 --> 00:29:11,580

we were seeing in the days before was

621

00:29:17,570 --> 00:29:15,570

simply the coma of the that particular

622

00:29:20,389 --> 00:29:17,580

comet that was starting to get pulled in

623

00:29:22,009 --> 00:29:20,399

towards Jupiter but I think in partial

624

00:29:24,919 --> 00:29:22,019

answer the quite the thing that you were

625

00:29:28,549 --> 00:29:24,929

suggesting earlier David was that the

626

00:29:32,090 --> 00:29:28,559

nuclei that are off the line may in fact

627

00:29:35,180 --> 00:29:32,100

be essentially swarms of objects so a

628

00:29:37,639 --> 00:29:35,190

maybe mostly a single object be maybe a

629

00:29:39,740 --> 00:29:37,649

swarm see is again mostly a single

630

00:29:41,509 --> 00:29:39,750

object and we come back and he sort of

631

00:29:43,310 --> 00:29:41,519

sort of pick out the candidates for just

632

00:29:45,649 --> 00:29:43,320

swarms and those are the things that

633

00:29:47,870 --> 00:29:45,659

have less mass and less energy and will

634

00:29:52,310 --> 00:29:47,880

produce less than of an effect when they

635

00:29:54,289 --> 00:29:52,320

hit Jupiter front glenda chu San Jose

636

00:29:56,419 --> 00:29:54,299

Mercury News I have two questions one

637

00:29:59,330 --> 00:29:56,429

for David Lee V the the two reports that

638

00:30:00,769 --> 00:29:59,340

you got of flashes possibly being seen

639

00:30:02,750 --> 00:30:00,779

from small telescopes at rise

640

00:30:04,879 --> 00:30:02,760

observatory could you tell us where that

641

00:30:07,519 --> 00:30:04,889

Observatory is and that were those

642

00:30:09,440 --> 00:30:07,529

observatory and Hezbollah and where were

643

00:30:10,820 --> 00:30:09,450

those Observatory telescopes how big

644

00:30:12,680 --> 00:30:10,830

were they or were they amateur

645

00:30:15,350 --> 00:30:12,690

telescopes nearby and I have one other

646

00:30:18,620 --> 00:30:15,360

question yeah thnkx the the wiser betray

647

00:30:21,830 --> 00:30:18,630

is in southern Israel it's us south of

648

00:30:24,580 --> 00:30:21,840

Beersheba and it's in it's in the Negev

649

00:30:27,710 --> 00:30:24,590

desert beautiful beautiful conditions

650

00:30:29,539 --> 00:30:27,720

although I understand from Jim Scotti at

651  
00:30:32,539 --> 00:30:29,549  
the from the University of Arizona who's

652  
00:30:34,220 --> 00:30:32,549  
actually observing their that they have

653  
00:30:36,169 --> 00:30:34,230  
been having a lot of clouds and were

654  
00:30:38,710 --> 00:30:36,179  
really lucky that it cleared up at

655  
00:30:41,539 --> 00:30:38,720  
impact time were there abouts

656  
00:30:44,509 --> 00:30:41,549  
surrounding the observatory the gym

657  
00:30:47,810 --> 00:30:44,519  
Scotty was observing him were a lot of

658  
00:30:50,899 --> 00:30:47,820  
the whole crowd of either amateur

659  
00:30:53,899 --> 00:30:50,909  
advanced amateurs or professionals with

660  
00:30:56,570 --> 00:30:53,909  
just small telescopes trying to see if

661  
00:30:59,570 --> 00:30:56,580  
they could see the flashes to people

662  
00:31:03,950 --> 00:30:59,580  
with I believe a four-inch diameter and

663  
00:31:05,779 --> 00:31:03,960

a 10 inch diameter telescope detected

664

00:31:09,409 --> 00:31:05,789

seeing the impact flashes these are

665

00:31:12,710 --> 00:31:09,419

small telescopes that you can just go

666

00:31:15,110 --> 00:31:12,720

out and get in a store somewhere and so

667

00:31:17,480 --> 00:31:15,120

I want to be very cautious about this

668

00:31:19,600 --> 00:31:17,490

because they were not can no one else

669

00:31:23,260 --> 00:31:19,610

has seen this no one else has reported

670

00:31:25,470 --> 00:31:23,270

impact flashes however it does mean that

671

00:31:28,030 --> 00:31:25,480

people with telescopes of that size

672

00:31:30,370 --> 00:31:28,040

knowing exactly where to look at the

673

00:31:33,970 --> 00:31:30,380

limb on the limb of Jupiter the edge of

674

00:31:36,070 --> 00:31:33,980

Jupiter should be able to to at least

675

00:31:39,970 --> 00:31:36,080

try to see if some of the later impacts

676  
00:31:44,470 --> 00:31:39,980  
will display meteor flashes as the

677  
00:31:46,090 --> 00:31:44,480  
initial media comes in I had I I'm kind

678  
00:31:48,940 --> 00:31:46,100  
of confused about the term fireball to

679  
00:31:50,560 --> 00:31:48,950  
keep people keep using as I understood

680  
00:31:52,120 --> 00:31:50,570  
it there's no oxygen on Jupiter they

681  
00:31:53,620 --> 00:31:52,130  
can't be any fire and people keep

682  
00:31:57,730 --> 00:31:53,630  
talking about a fireball and a plume

683  
00:32:00,010 --> 00:31:57,740  
what exactly is this thing burning or is

684  
00:32:02,020 --> 00:32:00,020  
it simply very hot what what is it is it

685  
00:32:04,240 --> 00:32:02,030  
just an expanding bubble of hot gas or

686  
00:32:05,799 --> 00:32:04,250  
can you describe it yeah there are

687  
00:32:08,440 --> 00:32:05,809  
number of different events the first we

688  
00:32:11,590 --> 00:32:08,450

call the meteor phase this is this

689

00:32:14,770 --> 00:32:11,600

happens when the fragment is coming into

690

00:32:17,740 --> 00:32:14,780

Jupiter it enters Jupiter

691

00:32:19,659 --> 00:32:17,750

stratosphere it starts to interact with

692

00:32:21,520 --> 00:32:19,669

the atmosphere just like a meteor on

693

00:32:23,650 --> 00:32:21,530

earth that we see any night of any night

694

00:32:25,630 --> 00:32:23,660

of the year and next month on August

695

00:32:26,970 --> 00:32:25,640

eleventh with the perseid shower that we

696

00:32:30,700 --> 00:32:26,980

should be seeing a lot of them but

697

00:32:32,409 --> 00:32:30,710

instead of a grain of sand producing the

698

00:32:34,720 --> 00:32:32,419

bright meteor this is an object one

699

00:32:39,340 --> 00:32:34,730

kilometer that's more than well more

700

00:32:41,950 --> 00:32:39,350

than half a mile wide producing a very

701  
00:32:45,280 --> 00:32:41,960  
very bright meteor lasting like the

702  
00:32:47,950 --> 00:32:45,290  
meteors on earth a second or so then it

703  
00:32:51,039 --> 00:32:47,960  
disappears it goes down into into

704  
00:32:53,919 --> 00:32:51,049  
Jupiter's clouds explode somewhere well

705  
00:32:56,740 --> 00:32:53,929  
below the clouds and then a huge

706  
00:33:00,400 --> 00:32:56,750  
fireball cloud comes up we've all heard

707  
00:33:02,950 --> 00:33:00,410  
of the sad but accurate term the nuclear

708  
00:33:07,390 --> 00:33:02,960  
fireball after an atomic explosion where

709  
00:33:10,750 --> 00:33:07,400  
a big huge cloud rumbles up and creates

710  
00:33:14,530 --> 00:33:10,760  
a plume that lasts for several minutes

711  
00:33:18,340 --> 00:33:14,540  
that we call the fireball and the plume

712  
00:33:20,049 --> 00:33:18,350  
as a the plume of from that fireball has

713  
00:33:22,210 --> 00:33:20,059

apparently lasted a while and then it

714

00:33:25,090 --> 00:33:22,220

collapsed just as jeans model its

715

00:33:28,000 --> 00:33:25,100

cheded it would yes absolutely it's

716

00:33:30,850 --> 00:33:28,010

just a terminology that comes from

717

00:33:34,140 --> 00:33:30,860

nuclear experiments where you simply

718

00:33:37,840 --> 00:33:34,150

created tremendously hot

719

00:33:40,090 --> 00:33:37,850

at atmospheric a mass that's shot the

720

00:33:42,730 --> 00:33:40,100

the heating is actually due to the shock

721

00:33:44,289 --> 00:33:42,740

and the temperatures go up to

722

00:33:46,060 --> 00:33:44,299

temperatures that are way beyond

723

00:33:48,580 --> 00:33:46,070

anything in our normal experience on the

724

00:33:51,430 --> 00:33:48,590

earth the temperatures rise to tens of

725

00:33:53,200 --> 00:33:51,440

thousands of degrees Kelvin and that's

726

00:33:55,060 --> 00:33:53,210

what we mean by the fireball it doesn't

727

00:33:58,210 --> 00:33:55,070

mean that something is burning it's just

728

00:34:00,520 --> 00:33:58,220

extraordinarily hot by the heat is

729

00:34:03,820 --> 00:34:00,530

coming from the shock wave not from

730

00:34:07,090 --> 00:34:03,830

combustion it's it's incandescent

731

00:34:08,740 --> 00:34:07,100

because it's so hot bubble of hot gas is

732

00:34:13,750 --> 00:34:08,750

exactly the right way to think about it

733

00:34:16,359 --> 00:34:13,760

very very hot gas Jim Jim slave ABC news

734

00:34:20,760 --> 00:34:16,369

what do you have in radio emissions at

735

00:34:25,720 --> 00:34:23,040

don't think that we've heard any reports

736

00:34:27,190 --> 00:34:25,730

radio emissions at the present time I'm

737

00:34:29,020 --> 00:34:27,200

certainly from the impacts there was

738

00:34:31,540 --> 00:34:29,030

that earlier one we heard we heard a

739

00:34:34,480 --> 00:34:31,550

report from Japan this came over the

740

00:34:36,609 --> 00:34:34,490

wire services yesterday that that

741

00:34:38,349 --> 00:34:36,619

predates the impacts and we need to

742

00:34:40,990 --> 00:34:38,359

learn more about that but in terms of

743

00:34:43,000 --> 00:34:41,000

radio emission of time of impact I'm not

744

00:34:46,300 --> 00:34:43,010

aware that we received any reports in at

745

00:34:48,369 --> 00:34:46,310

the present time the second question was

746

00:34:50,770 --> 00:34:48,379

prospect sighs me well you saw the

747

00:34:55,930 --> 00:34:50,780

seismic wave there it is we're right

748

00:34:57,970 --> 00:34:55,940

down there on your spot we were

749

00:35:00,370 --> 00:34:57,980

primarily expecting to see the seismic

750

00:35:03,280 --> 00:35:00,380

waves and the atmospheric waves in the

751  
00:35:04,840 --> 00:35:03,290  
infrared data more so than in the

752  
00:35:07,270 --> 00:35:04,850  
visible wavelength data that's where you

753  
00:35:09,400 --> 00:35:07,280  
would directly detect the seismic waves

754  
00:35:11,740 --> 00:35:09,410  
and in this visible wavelength data

755  
00:35:13,960 --> 00:35:11,750  
you're seeing a secondary effect or the

756  
00:35:16,480 --> 00:35:13,970  
temperature causes some kind of cloud to

757  
00:35:19,150 --> 00:35:16,490  
condense in the atmosphere from what I

758  
00:35:21,910 --> 00:35:19,160  
have heard and seen so far we have seen

759  
00:35:24,099 --> 00:35:21,920  
the impact sites in the infrared but I

760  
00:35:27,400 --> 00:35:24,109  
have not yet heard a report of seeing

761  
00:35:30,490 --> 00:35:27,410  
wave phenomena in the infrared okay now

762  
00:35:33,660 --> 00:35:30,500  
Heidi yes what's that ring around the

763  
00:35:36,580 --> 00:35:33,670

dark spot well that's a good question I

764

00:35:38,740 --> 00:35:36,590

claim I claim that's just about the

765

00:35:41,260 --> 00:35:38,750

distance at which this acoustic wave

766

00:35:43,630 --> 00:35:41,270

should have around we all know when we

767

00:35:45,910 --> 00:35:43,640

have another sequence of images where we

768

00:35:46,329 --> 00:35:45,920

can see that expand outwards if we don't

769

00:35:48,430 --> 00:35:46,339

see

770

00:35:50,499 --> 00:35:48,440

moving outwards gene then it's not

771

00:35:52,329 --> 00:35:50,509

likely to be an atmospheric wait this

772

00:35:55,209 --> 00:35:52,339

isn't the best one we didn't expect to

773

00:35:57,400 --> 00:35:55,219

see anything even we didn't plan a

774

00:35:59,709 --> 00:35:57,410

sequence we do have images later on

775

00:36:02,170 --> 00:35:59,719

where we're planning to take sequences

776

00:36:04,930 --> 00:36:02,180

over several orbits so we can see this

777

00:36:07,120 --> 00:36:04,940

wave move out and certainly as i said in

778

00:36:09,190 --> 00:36:07,130

the infrared that's where we really

779

00:36:11,650 --> 00:36:09,200

expect to see these seismic waves if you

780

00:36:14,140 --> 00:36:11,660

see them here you should see them in the

781

00:36:16,329 --> 00:36:14,150

infrared ok so we're going to have to

782

00:36:18,400 --> 00:36:16,339

wait and see when we really look closely

783

00:36:20,380 --> 00:36:18,410

at the end for that data you're going to

784

00:36:23,739 --> 00:36:20,390

believe anything you want but you have

785

00:36:25,539 --> 00:36:23,749

yet you have to explain why that is out

786

00:36:27,579 --> 00:36:25,549

as far as it is and I think that's just

787

00:36:29,799 --> 00:36:27,589

about the distance at which needs to

788

00:36:32,529 --> 00:36:29,809

call you well ok I'll go out on the limb

789

00:36:34,450 --> 00:36:32,539

here I thought that that was debris that

790

00:36:37,329 --> 00:36:34,460

had fallen down I mean when we looked at

791

00:36:40,329 --> 00:36:37,339

that plume image it's very extended and

792

00:36:44,049 --> 00:36:40,339

I thought that that circular pattern was

793

00:36:45,700 --> 00:36:44,059

the fallout from that plume ok we'll see

794

00:36:47,079 --> 00:36:45,710

I'm betting it's the size of a Quaker

795

00:36:49,180 --> 00:36:47,089

see you're seeing an effect in the

796

00:36:54,519 --> 00:36:49,190

atmosphere member bhikkhus take way

797

00:36:56,950 --> 00:36:54,529

we'll see ok this is marker o of the

798

00:37:00,009 --> 00:36:56,960

Houston Chronicle could you go over the

799

00:37:02,109 --> 00:37:00,019

witch of the fragments you think are the

800

00:37:04,809 --> 00:37:02,119

largest and some estimate of what size

801  
00:37:08,469 --> 00:37:04,819  
you think they might be and as a related

802  
00:37:10,450 --> 00:37:08,479  
question the impact information you're

803  
00:37:12,160 --> 00:37:10,460  
getting now what is it telling you about

804  
00:37:18,569 --> 00:37:12,170  
what these fragments are actually made

805  
00:37:20,650 --> 00:37:18,579  
of what let's look at let's look at the

806  
00:37:23,049 --> 00:37:20,660  
panel in the back this is a wonderful

807  
00:37:24,789 --> 00:37:23,059  
book there is the graphics coming up

808  
00:37:30,039 --> 00:37:24,799  
again only they've got those horrible

809  
00:37:34,989 --> 00:37:30,049  
numbers i think an ABC fe dollar all

810  
00:37:40,660 --> 00:37:34,999  
numbers except for eggs except array all

811  
00:37:44,079 --> 00:37:40,670  
right number 24 on there which is G that

812  
00:37:46,599 --> 00:37:44,089  
big guy behind that's tomorrow G and H

813  
00:37:51,160 --> 00:37:46,609

are the biggies let's see what else is

814

00:37:53,440 --> 00:37:51,170

in here that's re go Nadine fabulous

815

00:37:55,859 --> 00:37:53,450

there we go all right all right now

816

00:37:57,749 --> 00:37:55,869

we've got it H&K are

817

00:38:01,650 --> 00:37:57,759

all goodies that was a little bit

818

00:38:04,890 --> 00:38:01,660

smaller q1 is another biggie those are

819

00:38:07,589 --> 00:38:04,900

the real big ones and if we engage now

820

00:38:09,870 --> 00:38:07,599

from nucleus a and the effects we got

821

00:38:12,599 --> 00:38:09,880

from that then I would say how Weaver's

822

00:38:14,609 --> 00:38:12,609

estimates of the sizes that came out now

823

00:38:17,039 --> 00:38:14,619

and were published in January are

824

00:38:18,509 --> 00:38:17,049

probably very good and so we're talking

825

00:38:23,130 --> 00:38:18,519

about three probably three

826

00:38:30,029 --> 00:38:23,140

kilometer-sized objects for GH k and q q

827

00:38:36,230 --> 00:38:30,039

one dick Kerr science magazine out in

828

00:38:42,329 --> 00:38:36,240

the the Graham images we saw two spots

829

00:38:44,039 --> 00:38:42,339

those were a and C was the B failed to

830

00:38:46,920 --> 00:38:44,049

create one of those spots are with it

831

00:38:52,380 --> 00:38:46,930

just not in that view and what would

832

00:38:54,660 --> 00:38:52,390

that imply about mass or nature of that

833

00:38:56,940 --> 00:38:54,670

object he would have been on the other

834

00:39:00,170 --> 00:38:56,950

side and be would be would have been up

835

00:39:07,769 --> 00:39:00,180

a few to i think but but be was detected

836

00:39:09,299 --> 00:39:07,779

at kick attacked one more question here

837

00:39:11,849 --> 00:39:09,309

and then we'll go to Kennedy Space

838

00:39:13,979 --> 00:39:11,859

Center and come back after that baba

839

00:39:15,569 --> 00:39:13,989

hagar with NBC did the new observations

840

00:39:18,720 --> 00:39:15,579

tell you any more about the amount of

841

00:39:21,930 --> 00:39:18,730

energy released during this event with a

842

00:39:26,880 --> 00:39:21,940

and the amounts that you could expect

843

00:39:32,529 --> 00:39:30,130

well what we can say is that from what

844

00:39:35,049 --> 00:39:32,539

we saw on a it was much more energetic

845

00:39:38,259 --> 00:39:35,059

than we expected and so the kind of

846

00:39:40,690 --> 00:39:38,269

energetics we were expecting were ten to

847

00:39:44,079 --> 00:39:40,700

the twenty nine hundred million megatons

848

00:39:47,589 --> 00:39:44,089

4G so it seems like we're seeing that

849

00:39:53,559 --> 00:39:47,599

kind of energy for a it seems to be more

850

00:39:56,589 --> 00:39:53,569

powerful than we expected well I'd say

851

00:39:58,989 --> 00:39:56,599

about you know think we're off by a

852

00:40:04,150 --> 00:39:58,999

factor of 10 all right yeah 10 million

853

00:40:05,710 --> 00:40:04,160

megatons all right I'd like to go to

854

00:40:07,479 --> 00:40:05,720

Kennedy Space Center we have some

855

00:40:09,970 --> 00:40:07,489

questions there we will check the other

856

00:40:13,660 --> 00:40:09,980

centers and come back here go ahead

857

00:40:16,210 --> 00:40:13,670

Kennedy still along the Miami Herald to

858

00:40:17,890 --> 00:40:16,220

questions but a non-technical and they

859

00:40:19,779 --> 00:40:17,900

sort of come from what Heidi said about

860

00:40:22,509 --> 00:40:19,789

the possibility or the good thing that

861

00:40:24,160 --> 00:40:22,519

it's going to Jupiter a lot of people

862

00:40:26,650 --> 00:40:24,170

are wondering today kind of a what if

863

00:40:28,450 --> 00:40:26,660

question so what effect would it have

864

00:40:30,640 --> 00:40:28,460

had if this would command anywhere

865

00:40:33,549 --> 00:40:30,650

around North America and the second

866

00:40:35,979 --> 00:40:33,559

question is a lot of people don't

867

00:40:43,410 --> 00:40:35,989

understand an object of this relatively

868

00:40:50,680 --> 00:40:47,950

well if a had hit North America it's

869

00:40:54,279 --> 00:40:50,690

likely first of all it would have made a

870

00:40:59,589 --> 00:40:54,289

crater about 20 kilometers in diameter

871

00:41:01,420 --> 00:40:59,599

of course if that happened over the

872

00:41:04,809 --> 00:41:01,430

baltimore-washington area it would have

873

00:41:06,160 --> 00:41:04,819

taken us all out we wouldn't be here so

874

00:41:09,670 --> 00:41:06,170

the local damage would have been just

875

00:41:11,470 --> 00:41:09,680

enormous you not only take out what's in

876

00:41:12,999 --> 00:41:11,480

the crater but you take out everything

877

00:41:15,249 --> 00:41:13,009

that's in the ejecta blanket of the

878

00:41:16,809 --> 00:41:15,259

crater and you knocked down things for

879

00:41:19,329 --> 00:41:16,819

hundreds of kilometres a hundreds of

880

00:41:22,979 --> 00:41:19,339

miles beyond that but also then you a

881

00:41:25,720 --> 00:41:22,989

tremendous amount of polarized material

882

00:41:28,299 --> 00:41:25,730

would have been carried up into the high

883

00:41:29,829 --> 00:41:28,309

atmosphere and ultimately would spread

884

00:41:32,710 --> 00:41:29,839

over all of the northern hemisphere

885

00:41:35,769 --> 00:41:32,720

you'd probably get a very significant

886

00:41:38,890 --> 00:41:35,779

global climatic effect from that single

887

00:41:42,220 --> 00:41:38,900

fragment so it would

888

00:41:44,230 --> 00:41:42,230

be a major disaster be probably the

889

00:41:49,510 --> 00:41:44,240

worst natural disaster ever witnessed by

890

00:41:51,970 --> 00:41:49,520

man and that's just for a single for a

891

00:41:56,559 --> 00:41:51,980

single one i see first fragment that we

892

00:41:58,210 --> 00:41:56,569

didn't expect anything from and the

893

00:42:00,220 --> 00:41:58,220

second part of the question how does a

894

00:42:03,549 --> 00:42:00,230

such a relatively small object cause

895

00:42:07,470 --> 00:42:03,559

that much disturbance okay the thing to

896

00:42:10,000 --> 00:42:07,480

remember is that any mass of material

897

00:42:14,140 --> 00:42:10,010

doesn't matter it matter whether it's

898

00:42:17,289 --> 00:42:14,150

lead or custard pie if you take one gram

899

00:42:19,750 --> 00:42:17,299

of that material and move it at the

900

00:42:22,329 --> 00:42:19,760

speed of three kilometers per second

901  
00:42:25,000 --> 00:42:22,339  
that's getting pretty fast that's faster

902  
00:42:28,660 --> 00:42:25,010  
than a very high-powered rifle bullet

903  
00:42:31,480 --> 00:42:28,670  
its kinetic energy is equivalent to the

904  
00:42:34,720 --> 00:42:31,490  
same man to the combustion of the same

905  
00:42:37,569 --> 00:42:34,730  
mass of high explosive like TNT now the

906  
00:42:41,140 --> 00:42:37,579  
energy goes up as the square of the

907  
00:42:43,480 --> 00:42:41,150  
velocity so for each gram of that comet

908  
00:42:45,730 --> 00:42:43,490  
coming in will have not just the

909  
00:42:50,589 --> 00:42:45,740  
equivalent mass of combustion of a gram

910  
00:42:52,299 --> 00:42:50,599  
of TNT it will have 20 squared times as

911  
00:42:54,970 --> 00:42:52,309  
much in other words four hundred times

912  
00:42:57,339 --> 00:42:54,980  
as much energy packed into each gram as

913  
00:43:02,079 --> 00:42:57,349

the energy of combustion of TNT that's

914

00:43:04,569 --> 00:43:02,089

why it's so damaging now this is taha

915

00:43:07,329 --> 00:43:04,579

personal 40 today we've heard y'all

916

00:43:08,980 --> 00:43:07,339

talking about fragment a I'm wondering

917

00:43:12,880 --> 00:43:08,990

whether or not at this time you can

918

00:43:15,789 --> 00:43:12,890

describe what was seen with fragments B

919

00:43:18,010 --> 00:43:15,799

and C and I realized II was just

920

00:43:21,609 --> 00:43:18,020

happening Vegas right before he came on

921

00:43:24,460 --> 00:43:21,619

the air here C was observed as strongly

922

00:43:27,190 --> 00:43:24,470

as a was and more recently we don't have

923

00:43:31,779 --> 00:43:27,200

as much analysis from see as we did from

924

00:43:34,630 --> 00:43:31,789

from a B was seemed to be a lot weaker

925

00:43:38,019 --> 00:43:34,640

and so far we're interpreting that as

926  
00:43:41,620 --> 00:43:38,029  
being the B is probably composed of more

927  
00:43:45,450 --> 00:43:41,630  
of a rubble pile by the rubble pile it

928  
00:43:48,250 --> 00:43:45,460  
was just a loosely congealed group of

929  
00:43:50,859 --> 00:43:48,260  
very tiny fragments and as it got closer

930  
00:43:51,970 --> 00:43:50,869  
to Jupiter just before impact they just

931  
00:43:54,190 --> 00:43:51,980  
kind of fell apart

932  
00:43:57,420 --> 00:43:54,200  
and what probably happened is it most of

933  
00:44:00,520 --> 00:43:57,430  
be exploded much higher up in Jupiter's

934  
00:44:03,790 --> 00:44:00,530  
stratosphere probably little of it or

935  
00:44:06,490 --> 00:44:03,800  
not as much as we thought got down into

936  
00:44:08,620 --> 00:44:06,500  
the atmosphere however the Keck

937  
00:44:10,990 --> 00:44:08,630  
telescope which is now the world's

938  
00:44:14,859 --> 00:44:11,000

largest ground-based telescope did

939

00:44:16,240 --> 00:44:14,869

observe an explosive plume from B this

940

00:44:19,180 --> 00:44:16,250

is something that we thought would be

941

00:44:22,060 --> 00:44:19,190

lucky to get on any you know remember

942

00:44:23,710 --> 00:44:22,070

when we were upset earlier that these

943

00:44:24,849 --> 00:44:23,720

fries impacts are going to be on the

944

00:44:27,370 --> 00:44:24,859

night side we're not going to see

945

00:44:29,590 --> 00:44:27,380

anything from Earth even with weekly put

946

00:44:32,770 --> 00:44:29,600

together fragment be we're still free

947

00:44:35,650 --> 00:44:32,780

seeing the explosive plume from Earth

948

00:44:38,410 --> 00:44:35,660

with ground-based telescopes see on the

949

00:44:40,300 --> 00:44:38,420

other hand appears to have been more of

950

00:44:44,740 --> 00:44:40,310

a solid fragment came right down like a

951  
00:44:47,920 --> 00:44:44,750  
did and made a much larger explosion

952  
00:44:50,859 --> 00:44:47,930  
this is just our tentative idea but most

953  
00:44:52,720 --> 00:44:50,869  
of us seem to agree with that at this

954  
00:44:54,130 --> 00:44:52,730  
time just quick power at this time can

955  
00:45:00,400 --> 00:44:54,140  
you give us an idea of how high above

956  
00:45:02,500 --> 00:45:00,410  
the limb the DMC plumes traveled we can

957  
00:45:04,120 --> 00:45:02,510  
only speculate that for a at this point

958  
00:45:07,690 --> 00:45:04,130  
because that's the one we have the

959  
00:45:11,010 --> 00:45:07,700  
highest resolution imaging and we seem

960  
00:45:13,450 --> 00:45:11,020  
to believe that that the bright detached

961  
00:45:15,970 --> 00:45:13,460  
portion of that plume was about a

962  
00:45:20,410 --> 00:45:15,980  
thousand kilometers above the limb of

963  
00:45:24,160 --> 00:45:20,420

Jupiter and I'm wondering if you could

964

00:45:27,400 --> 00:45:24,170

just review quickly for me the impacts

965

00:45:32,260 --> 00:45:27,410

that you anticipate the rest of today

966

00:45:38,940 --> 00:45:32,270

and tomorrow okay can give you a rundown

967

00:45:45,390 --> 00:45:38,950

on that in eastern daylight time

968

00:45:51,400 --> 00:45:45,400

fragment II is is coming down at 11 05

969

00:45:58,359 --> 00:45:51,410

so not very far away fragment F will be

970

00:46:02,349 --> 00:45:58,369

at 20-27 Zulu time of course that's 827

971

00:46:05,080 --> 00:46:02,359

this evening and then fragment G will

972

00:46:08,700 --> 00:46:05,090

come down tomorrow morning

973

00:46:11,590 --> 00:46:08,710

329 okay so a 27 this evening Eastern

974

00:46:14,170 --> 00:46:11,600

that June day like that I miss turned a

975

00:46:17,410 --> 00:46:14,180

lifetime so observers with small

976  
00:46:20,020 --> 00:46:17,420  
telescopes should be trying to watch at

977  
00:46:22,840 --> 00:46:20,030  
the right spot on the limb for brief

978  
00:46:25,600 --> 00:46:22,850  
flashes be really careful though I'm not

979  
00:46:28,510 --> 00:46:25,610  
saying the Jupiter is going to get

980  
00:46:29,890 --> 00:46:28,520  
millions of times brighter this is this

981  
00:46:32,170 --> 00:46:29,900  
is going to be something that if you

982  
00:46:34,150 --> 00:46:32,180  
really know what you're looking for you

983  
00:46:36,340 --> 00:46:34,160  
there is a chance that you might detect

984  
00:46:38,620 --> 00:46:36,350  
the flash I want to add I want to

985  
00:46:40,540 --> 00:46:38,630  
qualify that to say that there have been

986  
00:46:44,230 --> 00:46:40,550  
no reports from any professional

987  
00:46:48,400 --> 00:46:44,240  
observatories detecting those flashes

988  
00:46:50,530 --> 00:46:48,410

and they've been looking so I would add

989

00:46:53,770 --> 00:46:50,540

to that that we went to the US Naval

990

00:46:56,710 --> 00:46:53,780

Observatory last night to put our eye to

991

00:46:59,170 --> 00:46:56,720

the telescope in hopes of seeing a flash

992

00:47:03,850 --> 00:46:59,180

and when you really want to see a flash

993

00:47:05,650 --> 00:47:03,860

you can almost imagine that you do so we

994

00:47:08,920 --> 00:47:05,660

all have to be careful that we aren't

995

00:47:11,290 --> 00:47:08,930

imagining something that isn't quite out

996

00:47:13,240 --> 00:47:11,300

there yeah very true we've always tried

997

00:47:15,340 --> 00:47:13,250

to explain those those too tentative

998

00:47:17,170 --> 00:47:15,350

reports they have to be mentioned

999

00:47:20,230 --> 00:47:17,180

because they were reported by more than

1000

00:47:22,720 --> 00:47:20,240

one observer but it is something that

1001  
00:47:25,270 --> 00:47:22,730  
has not I don't consider that it's been

1002  
00:47:27,430 --> 00:47:25,280  
confirmed the only way to confirm

1003  
00:47:29,610 --> 00:47:27,440  
something like that is to increase the

1004  
00:47:32,110 --> 00:47:29,620  
number of people trying to observe them

1005  
00:47:34,000 --> 00:47:32,120  
timing would be all important the one

1006  
00:47:35,500 --> 00:47:34,010  
thing to remember however is a visual

1007  
00:47:38,350 --> 00:47:35,510  
Observer has the advantage of being

1008  
00:47:40,570 --> 00:47:38,360  
there watching all the time and you may

1009  
00:47:42,580 --> 00:47:40,580  
not capture that very brief event which

1010  
00:47:44,770 --> 00:47:42,590  
will last only two or most at the most

1011  
00:47:46,750 --> 00:47:44,780  
three seconds if you're not taking the

1012  
00:47:48,370 --> 00:47:46,760  
image at the right time so so there are

1013  
00:47:51,220 --> 00:47:48,380

some advantages the visual Observer has

1014

00:47:55,120 --> 00:47:51,230

the disadvantage is it's hard to prove

1015

00:47:57,310 --> 00:47:55,130

that you saw more questions from Kennedy

1016

00:47:59,920 --> 00:47:57,320

yeah what another quick power for me

1017

00:48:03,120 --> 00:47:59,930

there are other anticipated impacts

1018

00:48:07,540 --> 00:48:03,130

tomorrow besides G earn addition to G oh

1019

00:48:09,790 --> 00:48:07,550

sure let me let me say that what we have

1020

00:48:12,160 --> 00:48:09,800

that information available and that

1021

00:48:14,260 --> 00:48:12,170

should be at the newsroom at Kennedy and

1022

00:48:16,500 --> 00:48:14,270

if it's not there we will fax a full

1023

00:48:18,840 --> 00:48:16,510

list of all the

1024

00:48:22,290 --> 00:48:18,850

times and locations where those can be

1025

00:48:24,240 --> 00:48:22,300

viewed from and the observatories that

1026  
00:48:26,160 --> 00:48:24,250  
are likely to have an opportunity to

1027  
00:48:28,290 --> 00:48:26,170  
observe those as well as a Hubble

1028  
00:48:30,240 --> 00:48:28,300  
observing schedule so that should be in

1029  
00:48:32,670 --> 00:48:30,250  
the newsroom at the end of this briefing

1030  
00:48:35,430 --> 00:48:32,680  
if it's not already there any more

1031  
00:48:37,200 --> 00:48:35,440  
questions from Kennedy yes two more

1032  
00:48:39,030 --> 00:48:37,210  
reporters this sojourn earth news to

1033  
00:48:41,010 --> 00:48:39,040  
Heidi I'll make it easy on your video

1034  
00:48:43,290 --> 00:48:41,020  
person to tell them that I need you to

1035  
00:48:45,570 --> 00:48:43,300  
display the graphic showing your little

1036  
00:48:47,790 --> 00:48:45,580  
movie in the travel coming in disgusting

1037  
00:48:50,010 --> 00:48:47,800  
vertical skills one of time and one of

1038  
00:48:52,140 --> 00:48:50,020

the wavelength what happens when you

1039

00:48:54,810 --> 00:48:52,150

stay at one wavelength says do you still

1040

00:48:56,490 --> 00:48:54,820

see the same expanding or ultimately

1041

00:48:57,720 --> 00:48:56,500

what happens did you say at one time how

1042

00:49:00,480 --> 00:48:57,730

different does it look in the different

1043

00:49:03,450 --> 00:49:00,490

wavelengths well the data you saw are

1044

00:49:06,180 --> 00:49:03,460

the data we have we only took that data

1045

00:49:08,100 --> 00:49:06,190

because we were sampling various

1046

00:49:11,790 --> 00:49:08,110

wavelengths so I can't answer that

1047

00:49:14,100 --> 00:49:11,800

question not yet I think that if these

1048

00:49:16,050 --> 00:49:14,110

things are visible at this level and

1049

00:49:17,970 --> 00:49:16,060

particularly for the brighter fragments

1050

00:49:19,980 --> 00:49:17,980

that some of the other ground-based

1051

00:49:22,230 --> 00:49:19,990

observatories will be able to do that

1052

00:49:24,720 --> 00:49:22,240

experiment we're not really particularly

1053

00:49:26,370 --> 00:49:24,730

designed to do this kind of an

1054

00:49:29,700 --> 00:49:26,380

experiment with experiment with the

1055

00:49:32,010 --> 00:49:29,710

Hubble Space Telescope but I buy this

1056

00:49:35,910 --> 00:49:32,020

kind of experiment I mean something that

1057

00:49:38,760 --> 00:49:35,920

has very rapid time sequence that really

1058

00:49:40,890 --> 00:49:38,770

wasn't the point of this this was purely

1059

00:49:43,380 --> 00:49:40,900

certain diffidence that we did see it in

1060

00:49:45,000 --> 00:49:43,390

a time sequence like that so I think

1061

00:49:46,650 --> 00:49:45,010

you'll have to wait and hear from the

1062

00:49:48,680 --> 00:49:46,660

ground-based telescopes that are

1063

00:49:52,500 --> 00:49:48,690

designed to do that kind of an

1064

00:49:54,570 --> 00:49:52,510

experiment another side of the spectrum

1065

00:49:57,570 --> 00:49:54,580

and infrared have you heard any reports

1066

00:49:59,160 --> 00:49:57,580

McDonald Observatory or from the kuiper

1067

00:50:01,980 --> 00:49:59,170

airborne observatory which i believe is

1068

00:50:04,320 --> 00:50:01,990

flying out of Australia we haven't

1069

00:50:07,350 --> 00:50:04,330

gotten a report yet from the kuiper

1070

00:50:08,850 --> 00:50:07,360

airborne observatory observations were

1071

00:50:10,860 --> 00:50:08,860

scheduled so I hope maybe we'll be able

1072

00:50:12,720 --> 00:50:10,870

to report on that tomorrow we're

1073

00:50:15,030 --> 00:50:12,730

attempting to contact them throughout

1074

00:50:17,940 --> 00:50:15,040

the morning to get what we can and post

1075

00:50:19,860 --> 00:50:17,950

that as soon as we could okay Angie and

1076

00:50:21,600 --> 00:50:19,870

a really big picture question couple of

1077

00:50:23,550 --> 00:50:21,610

the year and on a panel were in

1078

00:50:25,029 --> 00:50:23,560

elementary school at the time but would

1079

00:50:27,370 --> 00:50:25,039

you where you bought started 20

1080

00:50:31,919 --> 00:50:27,380

years ago Praetorians Apollo 11 then you

1081

00:50:38,499 --> 00:50:34,329

that's kind of hard to compare their

1082

00:50:41,469 --> 00:50:38,509

different events I think that we all had

1083

00:50:44,949 --> 00:50:41,479

a lot of confidence in Apollo 11 that it

1084

00:50:47,409 --> 00:50:44,959

was going to be a successful landing so

1085

00:50:50,079 --> 00:50:47,419

when it happened we said all right that

1086

00:50:53,499 --> 00:50:50,089

happened and we were all delighted and

1087

00:50:55,749 --> 00:50:53,509

grateful for that achievement what's

1088

00:50:57,309 --> 00:50:55,759

different with this situation is we

1089

00:51:00,849 --> 00:50:57,319

didn't know how nature was going to

1090

00:51:04,239 --> 00:51:00,859

perform and we're just elated that

1091

00:51:06,729 --> 00:51:04,249

nature has outdone herself has to give

1092

00:51:10,390 --> 00:51:06,739

us this spectacular experiment that

1093

00:51:12,909 --> 00:51:10,400

we're looking now at now still long

1094

00:51:16,329 --> 00:51:12,919

Miami Herald again just one more quick

1095

00:51:18,069 --> 00:51:16,339

question about the spots themselves to

1096

00:51:20,979 --> 00:51:18,079

the layperson there might be some

1097

00:51:23,380 --> 00:51:20,989

confusion it's described as a dark spot

1098

00:51:25,630 --> 00:51:23,390

or a light spot that maybe just simply

1099

00:51:28,029 --> 00:51:25,640

the technology that observes it but to

1100

00:51:30,099 --> 00:51:28,039

someone who is going say to the local

1101  
00:51:31,659 --> 00:51:30,109  
community college observatory what

1102  
00:51:33,339 --> 00:51:31,669  
should they look for what could they

1103  
00:51:35,799 --> 00:51:33,349  
expect to see and could you explain a

1104  
00:51:40,120 --> 00:51:35,809  
little bit ly one it appears light 21

1105  
00:51:44,829 --> 00:51:40,130  
and dark to the other yeah I still doubt

1106  
00:51:46,120 --> 00:51:44,839  
that people with small telescopes are

1107  
00:51:49,779 --> 00:51:46,130  
going to be able to detect these

1108  
00:51:52,149 --> 00:51:49,789  
features at all I debt very very much

1109  
00:51:54,459 --> 00:51:52,159  
they looking awfully nice that remember

1110  
00:51:56,289 --> 00:51:54,469  
these pictures are with our with very

1111  
00:51:59,380 --> 00:51:56,299  
large ground-based telescopes or with

1112  
00:52:01,620 --> 00:51:59,390  
the Hubble Space Telescope I strongly

1113  
00:52:04,269 --> 00:52:01,630

suggest that people go to their local

1114

00:52:06,399 --> 00:52:04,279

observatories planet area and look at

1115

00:52:09,999 --> 00:52:06,409

you bitter and I still think that you

1116

00:52:12,729 --> 00:52:10,009

will probably see no changes on Jupiter

1117

00:52:16,479 --> 00:52:12,739

I will be thrilled and delighted if I'm

1118

00:52:18,640 --> 00:52:16,489

wrong on that but go to go out with your

1119

00:52:20,349 --> 00:52:18,650

telescope look at you bitter don't

1120

00:52:22,779 --> 00:52:20,359

expect to see more than the beautiful

1121

00:52:25,630 --> 00:52:22,789

Jupiter it always is and then keep our

1122

00:52:27,249 --> 00:52:25,640

keep posted to HST and the other

1123

00:52:29,769 --> 00:52:27,259

ground-based telescopes to see the real

1124

00:52:31,539 --> 00:52:29,779

changes that we are seeing and if I'm

1125

00:52:33,459 --> 00:52:31,549

wrong on that then I'll be just as

1126  
00:52:36,309 --> 00:52:33,469  
thrilled as anybody else to answer the

1127  
00:52:38,380 --> 00:52:36,319  
question more directly at visible

1128  
00:52:41,410 --> 00:52:38,390  
wavelengths if you were looking

1129  
00:52:44,559 --> 00:52:41,420  
your eyes if you were out at Jupiter you

1130  
00:52:47,140 --> 00:52:44,569  
would see dark spots invisible these

1131  
00:52:49,900 --> 00:52:47,150  
features right now are dark when they're

1132  
00:52:51,519 --> 00:52:49,910  
fresh they're dark the only time that

1133  
00:52:54,549 --> 00:52:51,529  
they're bright is when we're looking in

1134  
00:52:57,370 --> 00:52:54,559  
the infrared and that's because these

1135  
00:52:59,799 --> 00:52:57,380  
features are hot when they're hot

1136  
00:53:01,960 --> 00:52:59,809  
they're bright in the infrared so we

1137  
00:53:04,630 --> 00:53:01,970  
have something that's visually dark and

1138  
00:53:07,569 --> 00:53:04,640

hot so it's dark in the visible and

1139

00:53:10,809 --> 00:53:07,579

bright in the infrared and the methane

1140

00:53:12,940 --> 00:53:10,819

band is bright because the methane

1141

00:53:15,099 --> 00:53:12,950

molecule is absorbing all the other

1142

00:53:18,849 --> 00:53:15,109

photons except the ones that are getting

1143

00:53:22,990 --> 00:53:18,859

reflected off of these particles does

1144

00:53:26,259 --> 00:53:23,000

that help clarify alright we'll go to

1145

00:53:31,089 --> 00:53:26,269

JPL now for a question and we'll be back

1146

00:53:32,529 --> 00:53:31,099

here for follow-ups go ahead JPL this is

1147

00:53:36,130 --> 00:53:32,539

robert lee host with the los angeles

1148

00:53:38,769 --> 00:53:36,140

times just a simple fact question if

1149

00:53:41,049 --> 00:53:38,779

fragment a you best guess is that it's

1150

00:53:43,900 --> 00:53:41,059

about a half-mile wide then what's your

1151

00:53:51,759 --> 00:53:43,910

best guess on the literal size of b c

1152

00:53:54,009 --> 00:53:51,769

and d i'd say a fragment c is very

1153

00:53:55,450 --> 00:53:54,019

comparable to fragment a they're very

1154

00:53:57,999 --> 00:53:55,460

very close so we're talking about

1155

00:53:59,589 --> 00:53:58,009

something of order of a kilometer six

1156

00:54:01,650 --> 00:53:59,599

tenths of a mile something like that

1157

00:54:07,690 --> 00:54:01,660

these are rough numbers please remember

1158

00:54:10,180 --> 00:54:07,700

as far as be it's much harder to say it

1159

00:54:12,849 --> 00:54:10,190

clearly produced much less effect so the

1160

00:54:14,769 --> 00:54:12,859

total mass is less and it may have been

1161

00:54:17,589 --> 00:54:14,779

a loose swarm by the time it hit the

1162

00:54:19,930 --> 00:54:17,599

atmosphere not a single object so it's a

1163

00:54:23,319 --> 00:54:19,940

little bit hard to put size on that if

1164

00:54:26,410 --> 00:54:23,329

you wanted it all up together perhaps it

1165

00:54:29,769 --> 00:54:26,420

was something that was of the order of a

1166

00:54:31,029 --> 00:54:29,779

few hundred meters across I guess we

1167

00:54:33,069 --> 00:54:31,039

want to want to take a shot at that

1168

00:54:35,319 --> 00:54:33,079

Heidi do you have it no I think we did a

1169

00:54:38,079 --> 00:54:35,329

great job okay we got the letters on

1170

00:54:42,069 --> 00:54:38,089

this fragments now oh good now we got

1171

00:54:43,930 --> 00:54:42,079

wonderful okay well come back here to

1172

00:54:47,380 --> 00:54:43,940

Goddard and take some questions have one

1173

00:54:51,800 --> 00:54:49,880

with gallant Galileo on the way out

1174

00:54:53,510 --> 00:54:51,810

there carrying a probe to drop into this

1175

00:54:55,340 --> 00:54:53,520

very same atmosphere how do you think

1176  
00:54:59,170 --> 00:54:55,350  
these results are going to inform what

1177  
00:55:03,710 --> 00:55:01,880  
you won't try it I can try we're going

1178  
00:55:07,520 --> 00:55:03,720  
to be thinking very very carefully about

1179  
00:55:10,310 --> 00:55:07,530  
what we see and Galileo is actually

1180  
00:55:12,380 --> 00:55:10,320  
taking pictures of these events so that

1181  
00:55:14,450 --> 00:55:12,390  
will be fascinating to see what the

1182  
00:55:17,180 --> 00:55:14,460  
Galileo spacecraft sends back because

1183  
00:55:20,720 --> 00:55:17,190  
they had direct views of these impact

1184  
00:55:23,930 --> 00:55:20,730  
sites certainly the changes in the

1185  
00:55:27,560 --> 00:55:23,940  
Jovian atmosphere are going to be very

1186  
00:55:30,290 --> 00:55:27,570  
interesting and I think it's great

1187  
00:55:32,630 --> 00:55:30,300  
timing that we the NASA has a spacecraft

1188  
00:55:34,310 --> 00:55:32,640

on its way to Jupiter right now and

1189

00:55:36,410 --> 00:55:34,320

we'll get there and see these things up

1190

00:55:39,200 --> 00:55:36,420

close the other thing is that the

1191

00:55:42,290 --> 00:55:39,210

Galileo probe the the probe part of it

1192

00:55:44,810 --> 00:55:42,300

was very carefully designed to go down

1193

00:55:48,410 --> 00:55:44,820

into a certain depth below Jupiter's

1194

00:55:52,550 --> 00:55:48,420

cloud tops one probe an active probe

1195

00:55:54,530 --> 00:55:52,560

with instruments we now have 21 small

1196

00:55:56,650 --> 00:55:54,540

positive probes going down all the

1197

00:56:01,070 --> 00:55:56,660

different layers of Jupiter's atmosphere

1198

00:56:03,620 --> 00:56:01,080

and revealing whatever they can reveal

1199

00:56:05,930 --> 00:56:03,630

each one of these comet impacts is a

1200

00:56:08,090 --> 00:56:05,940

little bit like a probe going down very

1201

00:56:11,030 --> 00:56:08,100

much like a pro going down and below the

1202

00:56:13,460 --> 00:56:11,040

cloud tops siming up stuff from the

1203

00:56:16,700 --> 00:56:13,470

interior telling us an enormous amount

1204

00:56:19,250 --> 00:56:16,710

of what to piter's made of and what it's

1205

00:56:22,250 --> 00:56:19,260

like we need to look at these things as

1206

00:56:25,700 --> 00:56:22,260

being almost like probes next question

1207

00:56:26,960 --> 00:56:25,710

Mike Nickerson NHK on yesterday we

1208

00:56:29,060 --> 00:56:26,970

learned that there was a 13-minute

1209

00:56:31,820 --> 00:56:29,070

deviation from the predictive time of

1210

00:56:34,130 --> 00:56:31,830

the impact of a and do we have specific

1211

00:56:37,400 --> 00:56:34,140

impact times and same sort of the

1212

00:56:43,190 --> 00:56:37,410

deviations regarding b c and i guess d

1213

00:56:44,960 --> 00:56:43,200

now Heidi you've got the the first

1214

00:56:48,980 --> 00:56:44,970

timing that shows the plume coming up

1215

00:56:54,110 --> 00:56:48,990

and it was a 20-18 which was exactly the

1216

00:56:58,440 --> 00:56:54,120

time given by the people at Keller Alto

1217

00:57:01,650 --> 00:56:58,450

and Spain so the impact probably

1218

00:57:05,930 --> 00:57:01,660

there's a little bit before that by as

1219

00:57:09,060 --> 00:57:05,940

much as perhaps three to five minutes I

1220

00:57:11,880 --> 00:57:09,070

would just that that's the offset no i

1221

00:57:14,910 --> 00:57:11,890

don't i haven't heard any reports of

1222

00:57:16,410 --> 00:57:14,920

accurate timing of the other ones yet so

1223

00:57:18,540 --> 00:57:16,420

i don't think we know the answer to that

1224

00:57:21,900 --> 00:57:18,550

question as to whether the whole chain

1225

00:57:24,089 --> 00:57:21,910

is offset by that amount will be working

1226

00:57:26,010 --> 00:57:24,099

on that throughout the day today to find

1227

00:57:28,800 --> 00:57:26,020

out information out if we can get

1228

00:57:31,500 --> 00:57:28,810

reports of the direct radio signals for

1229

00:57:33,510 --> 00:57:31,510

example from ulysses that would probably

1230

00:57:35,910 --> 00:57:33,520

give us that might give us the most

1231

00:57:37,829 --> 00:57:35,920

precise timing because that Ulysses can

1232

00:57:40,530 --> 00:57:37,839

look directly at the impact site at

1233

00:57:42,390 --> 00:57:40,540

Short radio radio wavelengths and we

1234

00:57:44,849 --> 00:57:42,400

might see that that plume should produce

1235

00:57:46,920 --> 00:57:44,859

a or even the meteor may produce a radio

1236

00:57:49,109 --> 00:57:46,930

signal that would give us the exact

1237

00:57:51,030 --> 00:57:49,119

impact Hank I also want to ask you about

1238

00:57:55,260 --> 00:57:51,040

some the other phenomena that had been

1239

00:57:56,819 --> 00:57:55,270

predicted such as a Nora effect and or

1240

00:57:58,910 --> 00:57:56,829

reflections off of this some of the

1241

00:58:02,069 --> 00:57:58,920

Jovian satellites have any of those been

1242

00:58:04,890 --> 00:58:02,079

served no observations are that we've

1243

00:58:08,160 --> 00:58:04,900

gotten yet of reflections off the

1244

00:58:09,900 --> 00:58:08,170

satellites that's that's interesting

1245

00:58:11,520 --> 00:58:09,910

that we haven't gotten that and yet

1246

00:58:13,530 --> 00:58:11,530

we've gotten so many positive things in

1247

00:58:15,540 --> 00:58:13,540

other ever those are hard to get hard to

1248

00:58:19,230 --> 00:58:15,550

observe when the satellites are in

1249

00:58:21,660 --> 00:58:19,240

sunlight wait for fragment k the

1250

00:58:23,880 --> 00:58:21,670

fragment k is going pregnant k is going

1251  
00:58:26,010 --> 00:58:23,890  
to impact europa will be in the shadow

1252  
00:58:28,650 --> 00:58:26,020  
of jupiter and that will be a very

1253  
00:58:31,020 --> 00:58:28,660  
sensitive test then and and the initial

1254  
00:58:33,270 --> 00:58:31,030  
we should see the flash of the initial

1255  
00:58:35,670 --> 00:58:33,280  
entry meteor there we may be able to get

1256  
00:58:38,220 --> 00:58:35,680  
that directly from observations of

1257  
00:58:40,380 --> 00:58:38,230  
europa at that time and i believe we're

1258  
00:58:42,930 --> 00:58:40,390  
getting some ultraviolet images with the

1259  
00:58:44,670 --> 00:58:42,940  
Hubble today and those will be very

1260  
00:58:47,190 --> 00:58:44,680  
interesting for studying the Aurora

1261  
00:58:49,349 --> 00:58:47,200  
hopefully John Clark will be able to

1262  
00:58:54,450 --> 00:58:49,359  
talk about that tomorrow or perhaps the

1263  
00:58:56,309 --> 00:58:54,460

next day is it that the comet fragment

1264

00:58:58,130 --> 00:58:56,319

encounters from the time it enters the

1265

00:58:59,870 --> 00:58:58,140

atmosphere down to the

1266

00:59:04,400 --> 00:58:59,880

point where it explodes and what is it

1267

00:59:06,710 --> 00:59:04,410

that causes it to explode okay the comet

1268

00:59:09,859 --> 00:59:06,720

is entering a very tenuous uppermost

1269

00:59:12,680 --> 00:59:09,869

part of the Jovian atmosphere initially

1270

00:59:15,079 --> 00:59:12,690

and it simply increases a denser and

1271

00:59:16,940 --> 00:59:15,089

depths or atmosphere as it goes down by

1272

00:59:19,430 --> 00:59:16,950

the time it hits the ammonia cloud tops

1273

00:59:20,870 --> 00:59:19,440

it's reached the half bar level another

1274

00:59:23,809 --> 00:59:20,880

is a pressure about equal to half the

1275

00:59:26,240 --> 00:59:23,819

pressure in this room but it continues

1276

00:59:28,039 --> 00:59:26,250

for these larger fragments theory

1277

00:59:30,289 --> 00:59:28,049

predicted if there are single fragments

1278

00:59:33,440 --> 00:59:30,299

it will punch right on down and go to

1279

00:59:35,990 --> 00:59:33,450

the depths of order about ten or several

1280

00:59:39,200 --> 00:59:36,000

tens of kilometers below the ammonia

1281

00:59:42,500 --> 00:59:39,210

cloud tops at some point for a given

1282

00:59:45,259 --> 00:59:42,510

size fragment what will happen is the

1283

00:59:47,809 --> 00:59:45,269

comet is being decelerated by the

1284

00:59:50,630 --> 00:59:47,819

intense shock the bow shock ahead of it

1285

00:59:53,180 --> 00:59:50,640

and it simply becomes crushed by its own

1286

00:59:55,880 --> 00:59:53,190

inertia but it's because of that

1287

00:59:57,769 --> 00:59:55,890

deceleration in by the shockwave and

1288

01:00:00,380 --> 00:59:57,779

when they because when it crushes it

1289

01:00:02,809 --> 01:00:00,390

just falls apart it just spreads out and

1290

01:00:06,559 --> 01:00:02,819

falls apart and that then presents a

1291

01:00:08,059 --> 01:00:06,569

very broad area which which again now is

1292

01:00:10,039 --> 01:00:08,069

going to stop it very quickly in other

1293

01:00:13,190 --> 01:00:10,049

words it meets much more atmospheric

1294

01:00:15,859 --> 01:00:13,200

resistance and a stop very suddenly so

1295

01:00:17,809 --> 01:00:15,869

that essentially all of the kinetic

1296

01:00:20,089 --> 01:00:17,819

energy that was in the comet fragment to

1297

01:00:22,549 --> 01:00:20,099

begin with is delivered to that

1298

01:00:24,410 --> 01:00:22,559

shockwave and a little bit of a course

1299

01:00:26,480 --> 01:00:24,420

remains in the comet which itself gets

1300

01:00:28,970 --> 01:00:26,490

heated to tens of thousands of degrees

1301

01:00:31,039 --> 01:00:28,980

Kelvin as well so it's but it's

1302

01:00:34,220 --> 01:00:31,049

basically just transferring that initial

1303

01:00:37,670 --> 01:00:34,230

kinetic energy into a shockwave and most

1304

01:00:39,559 --> 01:00:37,680

of it but not all ends up at the lower

1305

01:00:45,109 --> 01:00:39,569

part where the comet sensually just

1306

01:00:48,279 --> 01:00:45,119

comes apart rather suddenly it's below

1307

01:00:51,190 --> 01:00:48,289

them hope we think it's below them well

1308

01:00:53,720 --> 01:00:51,200

remember it's still mostly hydrogen

1309

01:00:55,609 --> 01:00:53,730

ammonia clouds are just a portion of the

1310

01:01:01,839 --> 01:00:55,619

atmosphere but the atmosphere is mainly

1311

01:01:07,579 --> 01:01:04,819

howdy are we are we have to see HST

1312

01:01:09,620 --> 01:01:07,589

images of the impact of E today I know

1313

01:01:11,269 --> 01:01:09,630

there's nothing officially scheduled but

1314

01:01:12,829 --> 01:01:11,279

yesterday there was sort of an early

1315

01:01:14,449 --> 01:01:12,839

release and I'm wondering if there's

1316

01:01:18,650 --> 01:01:14,459

some excitement about what you see they

1317

01:01:20,420 --> 01:01:18,660

might be released sooner than expected I

1318

01:01:21,979 --> 01:01:20,430

don't really know the answer to that I

1319

01:01:23,469 --> 01:01:21,989

think we're not getting our images

1320

01:01:25,459 --> 01:01:23,479

downloaded until later in the afternoon

1321

01:01:28,160 --> 01:01:25,469

they're not coming down from the

1322

01:01:33,140 --> 01:01:28,170

spacecraft and so we may just have to

1323

01:01:35,420 --> 01:01:33,150

wait till tomorrow tomorrow morning mark

1324

01:01:38,059 --> 01:01:35,430

this marker of the Houston Chronicle

1325

01:01:40,459 --> 01:01:38,069

could you I know the questions other

1326

01:01:42,499 --> 01:01:40,469

basic but I'm still not sure I

1327

01:01:45,949 --> 01:01:42,509

understand what you've learned about

1328

01:01:49,189 --> 01:01:45,959

what the fragments are made of and in a

1329

01:01:51,559 --> 01:01:49,199

general sense kind of how they're if

1330

01:01:53,449 --> 01:01:51,569

there if there are multiple pieces how

1331

01:01:55,670 --> 01:01:53,459

they're grouped together and interacting

1332

01:02:01,120 --> 01:01:55,680

with each other has anything that you've

1333

01:02:07,189 --> 01:02:05,359

well only the one thing is that when you

1334

01:02:10,989 --> 01:02:07,199

have pieces that appear to be the same

1335

01:02:15,499 --> 01:02:10,999

size in our Hubble Space Telescope

1336

01:02:18,890 --> 01:02:15,509

January photograph photograph and a and

1337

01:02:21,859 --> 01:02:18,900

C come down really really strong and

1338

01:02:25,569 --> 01:02:21,869

then B is really weak the implication is

1339

01:02:31,009 --> 01:02:29,150

what is it that the comet fragment

1340

01:02:33,199 --> 01:02:31,019

encounters from the time it enters the

1341

01:02:35,329 --> 01:02:33,209

atmosphere down to the point where it

1342

01:02:39,499 --> 01:02:35,339

explodes and what is it that causes it

1343

01:02:42,140 --> 01:02:39,509

to explode okay the comet is entering

1344

01:02:45,349 --> 01:02:42,150

the very tenuous uppermost part of the

1345

01:02:47,569 --> 01:02:45,359

Jovian atmosphere initially and it

1346

01:02:49,849 --> 01:02:47,579

simply increases a denser and denser

1347

01:02:52,339 --> 01:02:49,859

their atmosphere as it goes down by the

1348

01:02:54,079 --> 01:02:52,349

time it hits the ammonia cloud tops it's

1349

01:02:55,400 --> 01:02:54,089

reached the half bar level and oh

1350

01:02:57,919 --> 01:02:55,410

there's a pressure about equal to half

1351

01:02:59,919 --> 01:02:57,929

the pressure in this room I but it

1352

01:03:02,239 --> 01:02:59,929

continues for these larger fragments

1353

01:03:03,949 --> 01:03:02,249

theory predicted if there are single

1354

01:03:07,009 --> 01:03:03,959

fragments it will punch right on down

1355

01:03:10,309 --> 01:03:07,019

and go to the depths of order about ten

1356

01:03:13,460 --> 01:03:10,319

or several tens of kilometers below the

1357

01:03:15,920 --> 01:03:13,470

ammonia cloud tops at some point

1358

01:03:19,280 --> 01:03:15,930

for a given size fragment what will

1359

01:03:22,250 --> 01:03:19,290

happen is the comet is being decelerated

1360

01:03:24,950 --> 01:03:22,260

by the intense shock the bow shock ahead

1361

01:03:27,890 --> 01:03:24,960

of it and it simply becomes crushed by

1362

01:03:30,859 --> 01:03:27,900

its own inertia but it's because of that

1363

01:03:32,660 --> 01:03:30,869

deceleration in by the shockwave and

1364

01:03:35,060 --> 01:03:32,670

when it because when it crushes it just

1365

01:03:37,520 --> 01:03:35,070

falls apart it just spreads out and

1366

01:03:41,270 --> 01:03:37,530

falls apart and that then presents a

1367

01:03:42,740 --> 01:03:41,280

very broad area which which again now is

1368

01:03:44,720 --> 01:03:42,750

going to stop it very quickly in other

1369

01:03:47,870 --> 01:03:44,730

words it meets much more atmospheric

1370

01:03:50,540 --> 01:03:47,880

resistance and to stop very suddenly so

1371

01:03:52,490 --> 01:03:50,550

that essentially all of the kinetic

1372

01:03:54,770 --> 01:03:52,500

energy that was in the comet fragment to

1373

01:03:57,230 --> 01:03:54,780

begin with is delivered to that

1374

01:03:59,120 --> 01:03:57,240

shockwave and a little bit of a course

1375

01:04:01,160 --> 01:03:59,130

remains in the comet which itself gets

1376

01:04:03,650 --> 01:04:01,170

heated to tens of thousands of degrees

1377

01:04:05,750 --> 01:04:03,660

Kelvin as well so it's but it's

1378

01:04:08,900 --> 01:04:05,760

basically just transferring that initial

1379

01:04:12,349 --> 01:04:08,910

kinetic energy into a shockwave and most

1380

01:04:14,240 --> 01:04:12,359

of it but not all ends up at the lower

1381

01:04:19,790 --> 01:04:14,250

part where the comet centrally just

1382

01:04:22,820 --> 01:04:19,800

comes apart rather suddenly it's below

1383

01:04:24,859 --> 01:04:22,830

them hope we think it's below them well

1384

01:04:27,710 --> 01:04:24,869

well remember it's it's still mostly

1385

01:04:29,270 --> 01:04:27,720

hydrogen ammonia clouds are just a

1386

01:04:31,160 --> 01:04:29,280

portion of the atmosphere but the

1387

01:04:36,859 --> 01:04:31,170

atmosphere is mainly hydrogen all the

1388

01:04:42,259 --> 01:04:39,499

howdy are we are we have to see HST

1389

01:04:44,299 --> 01:04:42,269

images of the impact of E today I know

1390

01:04:45,950 --> 01:04:44,309

there's nothing officially scheduled but

1391

01:04:47,509 --> 01:04:45,960

yesterday there was sort of an early

1392

01:04:49,160 --> 01:04:47,519

release and I'm wondering if there's

1393

01:04:52,989 --> 01:04:49,170

some excitement about what you see they

1394

01:04:55,099 --> 01:04:52,999

might be released sooner than expected I

1395

01:04:56,660 --> 01:04:55,109

don't really know the answer to that I

1396

01:04:58,150 --> 01:04:56,670

think we're not getting our images

1397

01:05:00,140 --> 01:04:58,160

downloaded until later in the afternoon

1398

01:05:02,839 --> 01:05:00,150

they're not coming down from the

1399

01:05:08,839 --> 01:05:02,849

spacecraft and so we may just have to

1400

01:05:11,779 --> 01:05:08,849

wait till tomorrow tomorrow morning this

1401  
01:05:13,789 --> 01:05:11,789  
marker of Houston Chronicle could you I

1402  
01:05:16,640 --> 01:05:13,799  
know the questions other basic but I'm

1403  
01:05:18,499 --> 01:05:16,650  
still not sure I understand what you've

1404  
01:05:22,460 --> 01:05:18,509  
learned about what the fragments are

1405  
01:05:24,890 --> 01:05:22,470  
made of and in a general sense kind of

1406  
01:05:26,870 --> 01:05:24,900  
how they're if there if there are

1407  
01:05:28,640 --> 01:05:26,880  
multiple pieces how they're grouped

1408  
01:05:31,220 --> 01:05:28,650  
together and interacting with each other

1409  
01:05:38,299 --> 01:05:31,230  
has anything that you've seen from the

1410  
01:05:40,970 --> 01:05:38,309  
impacts help clarify that well only one

1411  
01:05:44,539 --> 01:05:40,980  
thing is that when you have pieces that

1412  
01:05:48,019 --> 01:05:44,549  
appear to be the same size in our Hubble

1413  
01:05:52,190 --> 01:05:48,029

## Space Telescope January photo photograph

1414

01:05:55,700 --> 01:05:52,200

and a and C come down really really

1415

01:05:57,739 --> 01:05:55,710

strong and then B is really weak the

1416

01:06:00,079 --> 01:05:57,749

implication is that B is really loosely

1417

01:06:01,880 --> 01:06:00,089

held together and wants to just come

1418

01:06:03,970 --> 01:06:01,890

apart as soon as it starts getting and

1419

01:06:08,140 --> 01:06:03,980

interacting with Jupiter's atmosphere

1420

01:06:10,910 --> 01:06:08,150

other than that spectroscopy

1421

01:06:13,460 --> 01:06:10,920

spectroscopy does it oh wait until we

1422

01:06:14,930 --> 01:06:13,470

get some spectroscopic results from some

1423

01:06:17,269 --> 01:06:14,940

of the ground-based telescopes and the

1424

01:06:20,210 --> 01:06:17,279

Hubble Space Telescope and that will

1425

01:06:22,420 --> 01:06:20,220

give us information about composition of

1426

01:06:25,339 --> 01:06:22,430

the material that we're seeing and

1427

01:06:28,339 --> 01:06:25,349

whether it's Jovian dredged up from

1428

01:06:30,799 --> 01:06:28,349

below whether it's commentary spilled in

1429

01:06:32,599 --> 01:06:30,809

or whether it's some incredible mixture

1430

01:06:34,940 --> 01:06:32,609

of the two is going to take a while to

1431

01:06:36,259 --> 01:06:34,950

sort out but that's one place where we

1432

01:06:39,130 --> 01:06:36,269

will get some interesting information

1433

01:06:42,200 --> 01:06:39,140

about the comet the Comets composition

1434

01:06:46,039 --> 01:06:42,210

so you'll be doing a chemical analysis I

1435

01:06:48,260 --> 01:06:46,049

gather but is is this dust ice rocks is

1436

01:06:51,200 --> 01:06:48,270

that still what you think's

1437

01:06:54,470 --> 01:06:51,210

there I mean that's what I'm not clear

1438

01:06:57,470 --> 01:06:54,480

on yeah prevailing party line on comets

1439

01:07:00,740 --> 01:06:57,480

is it's a mixture of ice and and

1440

01:07:04,330 --> 01:07:00,750

silicate rocky particles and now we know

1441

01:07:06,950 --> 01:07:04,340

from the observations of halley's comet

1442

01:07:09,050 --> 01:07:06,960

that there's a fair amount a very

1443

01:07:11,510 --> 01:07:09,060

complex organic material that are called

1444

01:07:13,610 --> 01:07:11,520

Sean grains they're composed of carbon

1445

01:07:16,040 --> 01:07:13,620

hydrogen oxygen and nitrogen to some

1446

01:07:18,590 --> 01:07:16,050

kind of it's kind of a tari gunk if you

1447

01:07:21,170 --> 01:07:18,600

want to think of it that way that was a

1448

01:07:22,760 --> 01:07:21,180

substantial fraction of the dust that

1449

01:07:26,240 --> 01:07:22,770

was coming off of halle all of thats

1450

01:07:27,740 --> 01:07:26,250

mixed together in some kind of a mud

1451

01:07:30,650 --> 01:07:27,750

ball if you want to think of it that way

1452

01:07:32,990 --> 01:07:30,660

an icy mud ball whether it's solid or

1453

01:07:36,410 --> 01:07:33,000

whether it's porous and fluffy those are

1454

01:07:39,170 --> 01:07:36,420

all \$64 questions there's a wide variety

1455

01:07:41,060 --> 01:07:39,180

of opinion about that and I don't think

1456

01:07:43,460 --> 01:07:41,070

that we can really say yet from what

1457

01:07:45,770 --> 01:07:43,470

we're seeing with these impacts we can't

1458

01:07:48,470 --> 01:07:45,780

shed much light on it I have my I have a

1459

01:07:50,690 --> 01:07:48,480

personal prejudice that these things are

1460

01:07:52,910 --> 01:07:50,700

not all that porous that is to say the

1461

01:07:56,120 --> 01:07:52,920

pore space might be a few tens of

1462

01:07:58,400 --> 01:07:56,130

percent but the density of the object is

1463

01:08:02,330 --> 01:07:58,410

more or less like the density of a ball

1464

01:08:04,310 --> 01:08:02,340

of ice we have time for just a couple of

1465

01:08:06,020 --> 01:08:04,320

more questions before will lose the

1466

01:08:09,350 --> 01:08:06,030

satellite today and we would like to

1467

01:08:10,970 --> 01:08:09,360

replay all the images stills video and

1468

01:08:14,120 --> 01:08:10,980

animation that we had available today

1469

01:08:15,560 --> 01:08:14,130

while we still have the satellite so we

1470

01:08:17,150 --> 01:08:15,570

will go a couple more questions of

1471

01:08:19,039 --> 01:08:17,160

course the people here in the room will

1472

01:08:21,200 --> 01:08:19,049

still have an opportunity to ask a few

1473

01:08:25,220 --> 01:08:21,210

more following that but we'll take

1474

01:08:28,640 --> 01:08:25,230

another second row Matt grunts and the

1475

01:08:33,320 --> 01:08:28,650

Dallas Morning News g is 25 times more

1476

01:08:36,440 --> 01:08:33,330

massive than a and C do you expect that

1477

01:08:38,329 --> 01:08:36,450

that extra energy will bump you up into

1478

01:08:39,980 --> 01:08:38,339

a different kind of scenario from the

1479

01:08:43,990 --> 01:08:39,990

fireball one that you've been describing

1480

01:08:49,269 --> 01:08:46,150

I think we're getting it basically the

1481

01:08:53,019 --> 01:08:49,279

same phenomenon but a much bigger boom

1482

01:08:54,940 --> 01:08:53,029

now there is the possibility that some

1483

01:08:58,230 --> 01:08:54,950

of these much larger objects if they

1484

01:09:01,690 --> 01:08:58,240

remain intact can go very much deeper

1485

01:09:03,430 --> 01:09:01,700

into the Jovian atmosphere and so there

1486

01:09:05,710 --> 01:09:03,440

is a possibility that boom may be

1487

01:09:08,200 --> 01:09:05,720

muffled that not as good an eruptive

1488

01:09:09,610 --> 01:09:08,210

plume will come back out so well that

1489

01:09:11,079 --> 01:09:09,620

will be very interesting to watch and

1490

01:09:13,390 --> 01:09:11,089

see but we're certainly delivering that

1491

01:09:16,120 --> 01:09:13,400

much more energy to the planet a better

1492

01:09:17,800 --> 01:09:16,130

chance for some of these wave phenomena

1493

01:09:20,620 --> 01:09:17,810

whether it's an atmospheric waves of the

1494

01:09:24,340 --> 01:09:20,630

seismic waves that gene is sure he sees

1495

01:09:27,160 --> 01:09:24,350

already much more likely that for a

1496

01:09:31,260 --> 01:09:27,170

large body that those effects will be

1497

01:09:33,940 --> 01:09:31,270

visible question in the third row

1498

01:09:35,289 --> 01:09:33,950

Michael to take TV asahi this is a

1499

01:09:39,099 --> 01:09:35,299

question for Carolyn shoemaker and

1500

01:09:41,499 --> 01:09:39,109

rotated lady this shoemaker levy 9 was

1501  
01:09:43,420 --> 01:09:41,509  
discovering what is essentially very old

1502  
01:09:45,970 --> 01:09:43,430  
technology and now it's being observed

1503  
01:09:47,440 --> 01:09:45,980  
with the latest and most expensive of

1504  
01:09:49,900 --> 01:09:47,450  
technology if you I'd like to get your

1505  
01:09:54,400 --> 01:09:49,910  
comments about the way Sciences can be

1506  
01:09:57,790 --> 01:09:54,410  
done in the way it has been done here ok

1507  
01:10:01,630 --> 01:09:57,800  
I think that scientists tend to use

1508  
01:10:05,680 --> 01:10:01,640  
whatever is available for the funds that

1509  
01:10:10,990 --> 01:10:05,690  
they have I think very good technology

1510  
01:10:12,940 --> 01:10:11,000  
can come out of older methods the

1511  
01:10:16,690 --> 01:10:12,950  
telescope that we use at palomar

1512  
01:10:19,540 --> 01:10:16,700  
observatory's ideal for that purpose for

1513  
01:10:23,050 --> 01:10:19,550

the search of small bodies in the solar

1514

01:10:28,450 --> 01:10:23,060

system because we can cover such a wide

1515

01:10:31,600 --> 01:10:28,460

area of the sky you could not use a one

1516

01:10:34,720 --> 01:10:31,610

of the beautiful big new telescopes that

1517

01:10:40,090 --> 01:10:34,730

can look very deep and cover a lot of

1518

01:10:42,490 --> 01:10:40,100

sky but I think that we're very

1519

01:10:45,610 --> 01:10:42,500

fortunate today to have the advantage of

1520

01:10:47,620 --> 01:10:45,620

all the new technology because once you

1521

01:10:50,650 --> 01:10:47,630

find something then you want to look a

1522

01:10:52,750 --> 01:10:50,660

lot deeper if we didn't have the

1523

01:10:56,680 --> 01:10:52,760

wonderful telescopes that exist today

1524

01:10:57,669 --> 01:10:56,690

and and the new technology we wouldn't

1525

01:11:00,459 --> 01:10:57,679

begin to know

1526

01:11:04,810 --> 01:11:00,469

but this comet is really like and what

1527

01:11:08,919 --> 01:11:04,820

it's doing it's it's it's really

1528

01:11:11,529 --> 01:11:08,929

important and valuable to be continually

1529

01:11:13,029 --> 01:11:11,539

developing new technology one of the

1530

01:11:16,419 --> 01:11:13,039

things that we always love when we're in

1531

01:11:19,229 --> 01:11:16,429

palomar is to watch ourselves observing

1532

01:11:23,500 --> 01:11:19,239

with Paula Mars first telescope built in

1533

01:11:26,520 --> 01:11:23,510

1936 designed designed essentially by

1534

01:11:29,679 --> 01:11:26,530

amateur astronomer Russell Porter and

1535

01:11:31,719 --> 01:11:29,689

still in use a telescope that has made

1536

01:11:33,129 --> 01:11:31,729

more common and supernova discoveries

1537

01:11:37,239 --> 01:11:33,139

than any other telescope in the world

1538

01:11:39,729 --> 01:11:37,249

and it's important to have the new

1539

01:11:41,919 --> 01:11:39,739

technology that is necessary now without

1540

01:11:43,629 --> 01:11:41,929

all the new technology we wouldn't be

1541

01:11:46,209 --> 01:11:43,639

nearly as excited today we wouldn't be

1542

01:11:47,589 --> 01:11:46,219

excited all the days as we are but I

1543

01:11:50,199 --> 01:11:47,599

think it's also important not to toss

1544

01:11:52,540 --> 01:11:50,209

out the old technology too fast we're

1545

01:11:54,699 --> 01:11:52,550

seeing how valuable that was and at

1546

01:11:59,229 --> 01:11:54,709

least bringing this comet to everybody's

1547

01:12:00,759 --> 01:11:59,239

attention we have time for about one

1548

01:12:10,419 --> 01:12:00,769

more question before we lose to

1549

01:12:12,969 --> 01:12:10,429

satellite anyone glendon David you said

1550

01:12:14,979 --> 01:12:12,979

you're a little bit surprised by by the

1551

01:12:16,649 --> 01:12:14,989

idea that people would be able to see

1552

01:12:19,209 --> 01:12:16,659

some flashes especially from a big

1553

01:12:20,919 --> 01:12:19,219

object that these usually flashes would

1554

01:12:22,779 --> 01:12:20,929

come from smaller meteors but I wonder

1555

01:12:24,969 --> 01:12:22,789

if it's possible artista aren't these

1556

01:12:26,649 --> 01:12:24,979

comet fragments traveling along with a

1557

01:12:29,979 --> 01:12:26,659

lot of other little bitty things that we

1558

01:12:31,959 --> 01:12:29,989

can't really see and I wonder if it's

1559

01:12:33,879 --> 01:12:31,969

possible what if these people saw

1560

01:12:35,919 --> 01:12:33,889

something that they were actually much

1561

01:12:37,330 --> 01:12:35,929

smaller little bits traveling along with

1562

01:12:40,719 --> 01:12:37,340

the main fragments that might have

1563

01:12:43,000 --> 01:12:40,729

produced flashes that's a good treating

1564

01:12:45,669 --> 01:12:43,010

question i don't i don't think so i

1565

01:12:47,679 --> 01:12:45,679

think a small fragment the only the only

1566

01:12:51,640 --> 01:12:47,689

way that a small fragment could give a

1567

01:12:54,339 --> 01:12:51,650

brighter flash is if it exploded so much

1568

01:12:57,489 --> 01:12:54,349

higher in Jupiter stratosphere that it

1569

01:13:00,040 --> 01:12:57,499

was simply visible from the earth

1570

01:13:02,890 --> 01:13:00,050

because it was simply so much higher the

1571

01:13:04,330 --> 01:13:02,900

smaller the fragment is the higher up in

1572

01:13:07,509 --> 01:13:04,340

Jupiter's atmosphere is likely to

1573

01:13:09,160 --> 01:13:07,519

explode my guess is if these visual

1574

01:13:11,109 --> 01:13:09,170

observations are correct and that is a

1575

01:13:13,629 --> 01:13:11,119

huge if

1576

01:13:16,449 --> 01:13:13,639

if they're confirmed then my guess is

1577

01:13:21,159 --> 01:13:16,459

that they were the main impacting

1578

01:13:25,540 --> 01:13:21,169

fragment of a but can't be sure based on

1579

01:13:28,540 --> 01:13:25,550

that limited data set we're going to

1580

01:13:30,520 --> 01:13:28,550

hold other questions for now what we

1581

01:13:33,040 --> 01:13:30,530

would like to do is give the cameramen

1582

01:13:36,250 --> 01:13:33,050

and TV crews an opportunity to reset up

1583

01:13:38,799 --> 01:13:36,260

for a replay of the images and video

1584

01:13:40,719 --> 01:13:38,809

animation coming across and in just a

1585

01:13:44,350 --> 01:13:40,729

couple of minutes if you need that kind

1586

01:13:47,139 --> 01:13:44,360

of time to set up if you're ready to go

1587

01:13:49,359 --> 01:13:47,149

which is give a sign and we'll roll the

1588

01:13:51,129 --> 01:13:49,369

tape whenever you're ready and while

1589

01:13:54,129 --> 01:13:51,139

you're setting up on that just want to

1590

01:13:58,330 --> 01:13:54,139

make an announcement about our briefing

1591

01:14:00,879 --> 01:13:58,340

tomorrow to remind everyone the comet

1592

01:14:06,040 --> 01:14:00,889

update tomorrow well we hope have

1593

01:14:07,810 --> 01:14:06,050

information on e f and we may

1594

01:14:10,600 --> 01:14:07,820

conceivably have some sort of

1595

01:14:12,819 --> 01:14:10,610

information on G but I understand that's

1596

01:14:16,869 --> 01:14:12,829

that's pushing it for Hubble information

1597

01:14:18,489 --> 01:14:16,879

that's very close to the time that the

1598

01:14:21,279 --> 01:14:18,499

impact will have occurred so we may only

1599

01:14:22,989 --> 01:14:21,289

just know that it happened but whatever

1600

01:14:25,689 --> 01:14:22,999

we have at that time of course we will

1601  
01:14:29,709 --> 01:14:25,699  
make available as soon as we can other

1602  
01:14:31,540 --> 01:14:29,719  
observations from I RTF and from Kuiper

1603  
01:14:33,009 --> 01:14:31,550  
and other observatories of course we

1604  
01:14:34,810 --> 01:14:33,019  
will try to get that information and put

1605  
01:14:36,429 --> 01:14:34,820  
it out as soon as we can and have a

1606  
01:14:38,770 --> 01:14:36,439  
briefing on that tomorrow morning here

1607  
01:14:42,609 --> 01:14:38,780  
at Goddard at eight a.m. eastern time

1608  
01:14:44,379 --> 01:14:42,619  
and please stay tuned also to us for any

1609  
01:14:46,479 --> 01:14:44,389  
possible time changes or briefing

1610  
01:14:49,600 --> 01:14:46,489  
changes throughout the week if we have

1611  
01:14:51,250 --> 01:14:49,610  
an opportunity to include a report

1612  
01:14:55,359 --> 01:14:51,260  
that's more inclusive or has some better

1613  
01:14:57,369 --> 01:14:55,369

images we may in fact go to a later time

1614

01:15:00,549 --> 01:14:57,379

in the day if that's necessary we'll put

1615

01:15:03,689 --> 01:15:00,559

out the word and please check with us

1616

01:15:07,319 --> 01:15:03,699

and we will let everyone know and I

1617

01:15:09,429 --> 01:15:07,329

think we're ready to roll the video and

1618

01:15:11,679 --> 01:15:09,439

at that point i think would like to

1619

01:15:13,359 --> 01:15:11,689

thank everyone for coming today and we

1620

01:16:19,540 --> 01:15:13,369

will see you tomorrow morning and Thank

1621

01:16:19,550 --> 01:16:51,260

you

1622

01:16:57,240 --> 01:16:55,979

when the second impact was due and we

1623

01:17:01,050 --> 01:16:57,250

thought a distinct signature of the

1624

01:17:05,340 --> 01:17:01,060

plume of one of the other one the

1625

01:17:08,160 --> 01:17:05,350

impacts and then subsequent images show

1626

01:17:13,169 --> 01:17:08,170

very bright features on the surface of

1627

01:17:15,930 --> 01:17:13,179

Jupiter at the impact sites incredibly

1628

01:17:19,010 --> 01:17:15,940

bright very clear the very spectacular

1629

01:17:21,120 --> 01:17:19,020

event one of the things that that

1630

01:17:23,550 --> 01:17:21,130

surprises is just how bright these

1631

01:17:25,530 --> 01:17:23,560

events are and so the thing that the

1632

01:17:27,840 --> 01:17:25,540

take the advantage of the check has is

1633

01:17:29,850 --> 01:17:27,850

that can see much fainter things going

1634

01:17:32,640 --> 01:17:29,860

on and particular one of the experiments

1635

01:17:34,760 --> 01:17:32,650

that we did this evening that will take

1636

01:17:38,490 --> 01:17:34,770

some more time to analyze was looking at

1637

01:17:40,649 --> 01:17:38,500

jupiters ring and that has the advantage

1638

01:17:43,200 --> 01:17:40,659

is that by looking at reflected light

1639

01:17:45,390 --> 01:17:43,210

off the ring we can in a sense view the

1640

01:17:48,180 --> 01:17:45,400

impacts ice directly so hopefully when

1641

01:17:50,820 --> 01:17:48,190

we look at that data carefully we will

1642

01:18:01,930 --> 01:17:50,830

see the initial flash when the comet

1643

01:18:08,740 --> 01:18:05,920

the image that you're looking at is a

1644

01:18:10,840 --> 01:18:08,750

picture from the Keck telescope it's an

1645

01:18:13,720 --> 01:18:10,850

infrared picture at the wavelength of

1646

01:18:17,170 --> 01:18:13,730

3.3 microns which is about six times the

1647

01:18:19,420 --> 01:18:17,180

wavelength of visible light the features

1648

01:18:22,810 --> 01:18:19,430

that you see are the bright polar caps

1649

01:18:25,630 --> 01:18:22,820

which are always present and just as the

1650

01:18:30,910 --> 01:18:25,640

equator is the storm system in the red

1651

01:18:32,950 --> 01:18:30,920

spot but five thousand forty degrees is

1652

01:18:35,080 --> 01:18:32,960

our most prominent features which are

1653

01:18:37,240 --> 01:18:35,090

the aftermath of the comet impacts that

1654

01:18:38,860 --> 01:18:37,250

occur in early this evening the

1655

01:18:42,130 --> 01:18:38,870

brightest spot is the very first impact

1656

01:19:10,300 --> 01:18:42,140

the one at the end on the left-hand edge

1657

01:19:18,850 --> 01:19:14,470

how it very clearly had produced the new

1658

01:19:22,420 --> 01:19:18,860

cloud which was quite long when we

1659

01:19:24,940 --> 01:19:22,430

observed the plume from C was clearly at

1660

01:19:27,130 --> 01:19:24,950

the same latitude but at first very

1661

01:19:30,430 --> 01:19:27,140

difficult to distinguish from the the

1662

01:19:33,460 --> 01:19:30,440

cloud of a and as the planet rotated and

1663

01:19:35,890 --> 01:19:33,470

time passed the plume from sea became

1664

01:19:38,710 --> 01:19:35,900

very much brighter several times

1665

01:19:40,240 --> 01:19:38,720

brighter than that cloud the cloud from

1666

01:19:43,720 --> 01:19:40,250

the a fragment turned out to be about

1667

01:19:48,940 --> 01:19:43,730

the same brightness as the north and

1668

01:19:51,610 --> 01:19:48,950

south polar caps I'm very ecstatic about

1669

01:19:53,650 --> 01:19:51,620

any of this witnessing this is kind of

1670

01:19:56,800 --> 01:19:53,660

amazing and what what's amazing about

1671

01:19:58,710 --> 01:19:56,810

both of these is the fact that B and C

1672

01:20:00,970 --> 01:19:58,720

are both brothers faint objects

1673

01:20:04,780 --> 01:20:00,980

certainly in the turbulent drops in the

1674

01:20:07,480 --> 01:20:04,790

near infrared so f and g are known to be

1675

01:20:09,220 --> 01:20:07,490

much bigger much brighter and therefore

1676

01:20:11,290 --> 01:20:09,230

expect the mirror as they're both much

1677

01:20:50,959 --> 01:20:11,300

beta spriters biggest objects than a

1678

01:20:59,129 --> 01:20:55,469

so it's movie night we're looking for

1679

01:21:01,350 --> 01:20:59,139

something much i'm going to do that yeah