1
00:01:41,910 --> 00:01:40,149
good morning

2
00:01:44,149 --> 00:01:41,920
welcome to goddard space flight center

3
00:01:45,190 --> 00:01:44,159
and next edition of our comet update for

4
00:01:47,590 --> 00:01:45,200
thursday

5
00:01:49,109 --> 00:01:47,600
uh this morning we would uh have opened

6
00:01:51,270 --> 00:01:49,119
up as you saw with

7
00:01:53,109 --> 00:01:51,280
the first real color image from the

8
00:01:53,910 --> 00:01:53,119
hubble space telescope of the impacts

9
00:01:56,069 --> 00:01:53,920
and that was the g

10
00:01:57,109 --> 00:01:56,079
fragment impact site we'll roll that

11
00:01:59,109 --> 00:01:57,119
again later

12
00:02:01,030 --> 00:01:59,119
uh today we will tell you more about

13
00:02:02,310 --> 00:02:01,040

that as well as give you a look at comet

14
00:02:04,789 --> 00:02:02,320
fragments q1

15
00:02:05,749 --> 00:02:04,799
and 2 and that's 10 hours before impact

16
00:02:07,830 --> 00:02:05,759
and just after

17
00:02:09,430 --> 00:02:07,840
impact and we'll bring you some news

18
00:02:09,910 --> 00:02:09,440
from comet observers from around the

19
00:02:12,229 --> 00:02:09,920
world

20
00:02:14,470 --> 00:02:12,239
including a looks at fragment r and a

21
00:02:16,790 --> 00:02:14,480
surprising report on fragment

22
00:02:18,630 --> 00:02:16,800
uh m impact of fragment m which had

23
00:02:19,990 --> 00:02:18,640
totally disappeared from vue a couple of

24
00:02:21,910 --> 00:02:20,000
months ago

25
00:02:23,750 --> 00:02:21,920
and we'll have more information on on

26
00:02:26,869 --> 00:02:23,760
that and and what's coming up later

27
00:02:28,630 --> 00:02:26,879
in the next few days uh following uh

28
00:02:30,550 --> 00:02:28,640
the presentations let me introduce a

29
00:02:32,790 --> 00:02:30,560
panel now to my left

30
00:02:34,710 --> 00:02:32,800
dr hal weaver a scientist at the space

31
00:02:36,710 --> 00:02:34,720
telescope science institute

32
00:02:38,790 --> 00:02:36,720
and a leader of the team using hubble's

33
00:02:40,869 --> 00:02:38,800
wide field planetary camera 2

34
00:02:43,350 --> 00:02:40,879
and faint object spectrograph to observe

35
00:02:47,270 --> 00:02:43,360
the structure and breakup of the comet

36
00:02:48,949 --> 00:02:47,280
to his left dr rita bibi a planetologist

37
00:02:49,750 --> 00:02:48,959
of long standing at new mexico state

38
00:02:51,509 --> 00:02:49,760

university

39
00:02:52,949 --> 00:02:51,519
and a member of the whitefield planetary

40
00:02:56,229 --> 00:02:52,959
camera 2 team observing

41
00:02:57,589 --> 00:02:56,239
jupiter's atmosphere and back with us

42
00:02:59,750 --> 00:02:57,599
again today

43
00:03:01,350 --> 00:02:59,760
dr eugene shoemaker coming back for

44
00:03:03,110 --> 00:03:01,360
another day a long time comment watcher

45
00:03:05,190 --> 00:03:03,120
and co-discoverer of the comet shoemaker

46
00:03:07,270 --> 00:03:05,200
levy 9 with the lowell observatory in

47
00:03:10,390 --> 00:03:07,280
the u.s geological survey

48
00:03:11,589 --> 00:03:10,400
to his left dr lucy mcfadden also back

49
00:03:12,869 --> 00:03:11,599
with us again today

50
00:03:14,869 --> 00:03:12,879
from the university of maryland

51
00:03:16,309 --> 00:03:14,879
university of california

52
00:03:18,550 --> 00:03:16,319
and she's the coordinator of the

53
00:03:19,910 --> 00:03:18,560
worldwide comment observing campaign

54
00:03:21,750 --> 00:03:19,920
and a visiting professor at the

55
00:03:25,110 --> 00:03:21,760
university of maryland

56
00:03:27,509 --> 00:03:25,120
and to her left david levy as

57
00:03:28,869 --> 00:03:27,519
co-discoverer of the comet and he is

58
00:03:31,670 --> 00:03:28,879
author of some

59
00:03:31,990 --> 00:03:31,680
recently published books and uh at this

60
00:03:34,949 --> 00:03:32,000
point

61
00:03:36,070 --> 00:03:34,959
i'd like to uh turn this over to gene

62
00:03:38,869 --> 00:03:36,080
shoemaker

63
00:03:39,750 --> 00:03:38,879

thanks don uh we'll give just a little

64
00:03:43,589 --> 00:03:39,760
bit of

65
00:03:45,670 --> 00:03:43,599
an update on the status of the fragments

66
00:03:46,710 --> 00:03:45,680
uh one that's a particular interest to

67
00:03:49,430 --> 00:03:46,720
me is that

68
00:03:50,149 --> 00:03:49,440
keck reported seeing the impact of

69
00:03:52,949 --> 00:03:50,159
fragment

70
00:03:54,550 --> 00:03:52,959
m which had actually disappeared from

71
00:03:56,470 --> 00:03:54,560
view for a while

72
00:03:58,149 --> 00:03:56,480
and there's been great debate as to what

73
00:04:00,630 --> 00:03:58,159
do these things actually

74
00:04:01,990 --> 00:04:00,640
dissipate or is there really something

75
00:04:03,830 --> 00:04:02,000
is there really a piece there that

76
00:04:06,550 --> 00:04:03,840
simply stop being active

77
00:04:07,030 --> 00:04:06,560
uh and i think both both hal and i have

78
00:04:08,470 --> 00:04:07,040
had the

79
00:04:09,990 --> 00:04:08,480
have been on the side that yes there's

80
00:04:11,110 --> 00:04:10,000
really something there it's just sort of

81
00:04:13,910 --> 00:04:11,120
turned off

82
00:04:15,910 --> 00:04:13,920
and so both of us are very pleased with

83
00:04:21,030 --> 00:04:15,920
that report

84
00:04:24,390 --> 00:04:21,040
and then hal is going to give our

85
00:04:27,670 --> 00:04:24,400
last look at the two pieces of fragment

86
00:04:29,430 --> 00:04:27,680
q1 and q2 what was happening to them

87
00:04:31,110 --> 00:04:29,440
as we were watching the comet going in

88
00:04:32,710 --> 00:04:31,120

hell

89
00:04:35,510 --> 00:04:32,720
that's right we might call this show

90
00:04:37,749 --> 00:04:35,520
right now watch this comet die

91
00:04:38,790 --> 00:04:37,759
because the hubble most of this week has

92
00:04:40,390 --> 00:04:38,800
spent its time

93
00:04:42,310 --> 00:04:40,400
focused on jupiter watching the

94
00:04:44,469 --> 00:04:42,320
spectacular display that you've

95
00:04:48,469 --> 00:04:44,479
talked about all this week but we can't

96
00:04:51,670 --> 00:04:50,310
of course that's the source of all the

97
00:04:53,270 --> 00:04:51,680
activity we're seeing and we really

98
00:04:54,150 --> 00:04:53,280
can't understand what's happening on

99
00:04:56,629 --> 00:04:54,160
jupiter

100
00:04:58,790 --> 00:04:56,639
until we understand what it is that went

101
00:05:02,070 --> 00:04:58,800
plowing into jupiter

102
00:05:03,990 --> 00:05:02,080
and as don was saying earlier

103
00:05:05,110 --> 00:05:04,000
the hubble actually swung off of jupiter

104
00:05:06,950 --> 00:05:05,120
and observed

105
00:05:08,390 --> 00:05:06,960
the very interesting q region in the

106
00:05:09,670 --> 00:05:08,400
comet this is one of the brighter

107
00:05:12,950 --> 00:05:09,680
regions

108
00:05:14,390 --> 00:05:12,960
only 10 hours prior prior to its plunge

109
00:05:16,230 --> 00:05:14,400
into jupiter

110
00:05:17,590 --> 00:05:16,240
now i thought before i showed you the

111
00:05:21,670 --> 00:05:17,600
pictures of

112
00:05:24,469 --> 00:05:21,680
step back and just

113
00:05:25,909 --> 00:05:24,479

give you a status report on the comet

114
00:05:29,430 --> 00:05:25,919
gives you sort of a road map

115
00:05:31,029 --> 00:05:29,440
if we can show the first picture

116
00:05:32,629 --> 00:05:31,039
i think most of you recognize now we've

117
00:05:35,749 --> 00:05:32,639
been lettering these

118
00:05:39,029 --> 00:05:35,759
commentary nuclei from a through w

119
00:05:42,150 --> 00:05:39,039
they're 21 pieces and

120
00:05:46,629 --> 00:05:42,160
a was the first one to go in on saturday

121
00:05:50,070 --> 00:05:46,639
and we're now up to just in front of the

122
00:05:51,430 --> 00:05:50,080
s impact and s is going to be going in

123
00:05:55,270 --> 00:05:51,440
about three hours from now

124
00:05:57,830 --> 00:05:55,280
about about 11 am and you see

125
00:05:59,189 --> 00:05:57,840
a couple couple of pieces before s you

126
00:06:01,110 --> 00:05:59,199
see the q region

127
00:06:02,629 --> 00:06:01,120
that was a has always been recognized as

128
00:06:05,590 --> 00:06:02,639
a very interesting region

129
00:06:07,430 --> 00:06:05,600
but if we go to the next graphic you'll

130
00:06:09,110 --> 00:06:07,440
see

131
00:06:14,230 --> 00:06:09,120
what is left if we can dissolve to the

132
00:06:19,830 --> 00:06:17,029
okay we 16 of the pieces have gone and

133
00:06:22,870 --> 00:06:19,840
we got five left to go

134
00:06:24,150 --> 00:06:22,880
and q as i said has always been

135
00:06:25,110 --> 00:06:24,160
recognized as one of the more

136
00:06:27,189 --> 00:06:25,120
interesting

137
00:06:29,830 --> 00:06:27,199
pieces of the comment and if we can go

138
00:06:34,070 --> 00:06:29,840

to to the next graphic showing

139
00:06:38,629 --> 00:06:34,080
the q region as we saw it in late march

140
00:06:38,639 --> 00:06:46,550
i think having it

141
00:06:46,560 --> 00:06:50,230
could you roll the next graphic please

142
00:06:53,830 --> 00:06:53,029
um you can kind of make out here why q

143
00:06:56,230 --> 00:06:53,840
is special

144
00:06:58,150 --> 00:06:56,240
it's obviously not okay this is showing

145
00:06:59,909 --> 00:06:58,160
what's left most of the comment is gone

146
00:07:01,270 --> 00:06:59,919
most of it has died away and

147
00:07:02,550 --> 00:07:01,280
unfortunately we only have these few

148
00:07:03,189 --> 00:07:02,560
pieces left for those of us who like

149
00:07:06,150 --> 00:07:03,199
comments

150
00:07:08,710 --> 00:07:06,160
now if you can go on to the next the

151
00:07:12,070 --> 00:07:08,720
next picture

152
00:07:13,990 --> 00:07:12,080
and this is how q appeared to the left

153
00:07:16,950 --> 00:07:14,000
this is how q appeared

154
00:07:18,550 --> 00:07:16,960
in late march there was actually four

155
00:07:22,309 --> 00:07:18,560
pieces in the field at that point

156
00:07:25,909 --> 00:07:22,319
q1 q2 and then

157
00:07:29,029 --> 00:07:25,919
down below those are the so-called p

158
00:07:31,830 --> 00:07:29,039
region and

159
00:07:34,070 --> 00:07:31,840
q you can see is a double object and

160
00:07:36,150 --> 00:07:34,080
that's what made it so interesting

161
00:07:37,110 --> 00:07:36,160
most of the fragments in the comet had

162
00:07:39,110 --> 00:07:37,120
remained stable

163
00:07:40,390 --> 00:07:39,120

for about two years not showing any

164
00:07:42,710 --> 00:07:40,400
evidence of breakup

165
00:07:43,670 --> 00:07:42,720
but q from the time that we started

166
00:07:45,189 --> 00:07:43,680
observing it

167
00:07:46,469 --> 00:07:45,199
they had these two bodies close to each

168
00:07:47,430 --> 00:07:46,479
other indicating that there was a

169
00:07:52,309 --> 00:07:47,440
subsequent

170
00:07:55,589 --> 00:07:52,319
the the breakup of the original body

171
00:07:57,350 --> 00:07:55,599
and based on that

172
00:07:59,029 --> 00:07:57,360
some of us thought that maybe q was a

173
00:08:00,390 --> 00:07:59,039
good candidate for breaking up further

174
00:08:01,909 --> 00:08:00,400
as it came into jupiter

175
00:08:03,589 --> 00:08:01,919
that's why we wanted to take the last

176
00:08:04,950 --> 00:08:03,599
look because the amount of

177
00:08:06,869 --> 00:08:04,960
energy that's impact you know that goes

178
00:08:08,469 --> 00:08:06,879
into jupiter's atmosphere and causes

179
00:08:09,589 --> 00:08:08,479
these explosions depends on how much

180
00:08:11,430 --> 00:08:09,599
mass and if this thing is going to be

181
00:08:13,990 --> 00:08:11,440
breaking up into small pieces before it

182
00:08:17,029 --> 00:08:14,000
goes into jupiter you get much less bang

183
00:08:17,990 --> 00:08:17,039
so yesterday morning we took the picture

184
00:08:20,070 --> 00:08:18,000
to the right

185
00:08:21,110 --> 00:08:20,080
which shows how dramatically stretched

186
00:08:23,189 --> 00:08:21,120
out

187
00:08:24,950 --> 00:08:23,199
the comet is getting just before going

188
00:08:27,670 --> 00:08:24,960

into jupiter it stretches out

189
00:08:29,670 --> 00:08:27,680
along the direction along the path of

190
00:08:33,670 --> 00:08:29,680
its motion into jupiter

191
00:08:35,430 --> 00:08:33,680
and you see that uh q1 and q2 the comey

192
00:08:36,550 --> 00:08:35,440
which is the dust around the comet is

193
00:08:37,670 --> 00:08:36,560
getting stretched out along the

194
00:08:39,430 --> 00:08:37,680
direction of motion

195
00:08:42,070 --> 00:08:39,440
but but the fragments are hanging in

196
00:08:43,589 --> 00:08:42,080
there just 10 hours prior to the impact

197
00:08:45,110 --> 00:08:43,599
they're still hanging in there

198
00:08:49,110 --> 00:08:45,120
indicating that there should be a

199
00:08:53,110 --> 00:08:51,509
now at that point uh i think we're ready

200
00:08:55,350 --> 00:08:53,120
to turn it over to rita and find out

201
00:08:59,350 --> 00:08:55,360
exactly what happened as the q impacts

202
00:09:04,470 --> 00:09:01,350
i know you're all waiting for the triple

203
00:09:08,389 --> 00:09:06,470
actually from what he's just told you

204
00:09:11,430 --> 00:09:08,399
it's a quadruple miami

205
00:09:15,269 --> 00:09:11,440
because we have q1 q2 and then we have

206
00:09:16,550 --> 00:09:15,279
rns going in the planet rotates once

207
00:09:19,590 --> 00:09:16,560
every 10 hours

208
00:09:21,269 --> 00:09:19,600
q2 and q1 were

209
00:09:24,389 --> 00:09:21,279
scheduled to arrive so that they should

210
00:09:27,509 --> 00:09:24,399
have impacted about 12 degrees apart

211
00:09:29,990 --> 00:09:27,519
and then almost 10 hours later

212
00:09:31,509 --> 00:09:30,000
r comes in and almost 10 hours later s

213
00:09:34,550 --> 00:09:31,519

comes in

214
00:09:36,710 --> 00:09:34,560
so that the this impact site will have

215
00:09:38,949 --> 00:09:36,720
only 10 hours to recover

216
00:09:43,430 --> 00:09:38,959
from site to site the site could i have

217
00:09:55,829 --> 00:09:49,190
could i have the next one please

218
00:10:04,389 --> 00:10:03,670
next graphic please next graphic please

219
00:10:06,470 --> 00:10:04,399
okay

220
00:10:07,670 --> 00:10:06,480
uh we'll start with the one that was

221
00:10:11,190 --> 00:10:07,680
displayed at uh

222
00:10:14,870 --> 00:10:11,200
when we first came in uh that one showed

223
00:10:15,990 --> 00:10:14,880
the g impact site about an hour and 45

224
00:10:19,750 --> 00:10:16,000
minutes

225
00:10:22,470 --> 00:10:19,760
after that the g had impacted

226
00:10:24,470 --> 00:10:22,480
d had impacted considerably early but d

227
00:10:26,790 --> 00:10:24,480
was quite a small one it's just a small

228
00:10:28,790 --> 00:10:26,800
spot sitting off to the side

229
00:10:31,430 --> 00:10:28,800
now could i have the previous graphic

230
00:10:34,710 --> 00:10:31,440
and we'll see the same region

231
00:10:35,750 --> 00:10:34,720
61 hours later could we go back to the

232
00:10:40,069 --> 00:10:35,760
other color graphic

233
00:10:46,790 --> 00:10:43,190
so here you see the development site d

234
00:10:47,990 --> 00:10:46,800
is the impact site uh in the upper

235
00:10:51,829 --> 00:10:48,000
portion

236
00:10:54,550 --> 00:10:51,839
and l has arrived in the interim

237
00:10:55,190 --> 00:10:54,560
and it's below the white two white spots

238
00:10:57,829 --> 00:10:55,200

or off

239
00:10:59,990 --> 00:10:57,839
to to the left of the screen so here we

240
00:11:03,110 --> 00:11:00,000
see the the

241
00:11:06,310 --> 00:11:03,120
how these uh bodies have evolved

242
00:11:09,910 --> 00:11:06,320
over in the case of

243
00:11:13,670 --> 00:11:09,920
these 61 hours and in the case of

244
00:11:15,910 --> 00:11:13,680
39 hours off on the limb

245
00:11:17,030 --> 00:11:15,920
of the planet up at the top of the

246
00:11:20,470 --> 00:11:17,040
screen

247
00:11:22,550 --> 00:11:20,480
we see q the the impact q

248
00:11:24,069 --> 00:11:22,560
just coming around so that from this

249
00:11:28,389 --> 00:11:24,079
point of view you can see that

250
00:11:31,829 --> 00:11:28,399
q has landed now q2

251
00:11:35,110 --> 00:11:31,839
was scheduled to arrive

252
00:11:35,670 --> 00:11:35,120
so that it would have impacted 12

253
00:11:39,509 --> 00:11:35,680
degrees

254
00:11:43,350 --> 00:11:42,790
if it arrived according to paul chodes

255
00:11:46,550 --> 00:11:43,360
last

256
00:11:47,670 --> 00:11:46,560
computed time arrival it should be the

257
00:11:51,350 --> 00:11:47,680
tiny little

258
00:11:54,629 --> 00:11:51,360
brown spot that you can scarcely see

259
00:11:57,829 --> 00:11:54,639
if you look across from

260
00:12:01,269 --> 00:11:57,839
the q impact site toward the g

261
00:12:05,269 --> 00:12:01,279
impact site there's a small brown comma

262
00:12:12,230 --> 00:12:05,279
in there which is almost invisible

263
00:12:20,870 --> 00:12:17,670

q broke up q2 is a younger fragment

264
00:12:23,509 --> 00:12:20,880
than q1 so it's quite possible that

265
00:12:26,150 --> 00:12:23,519
there are other fragments

266
00:12:27,670 --> 00:12:26,160
we have only one orbit of data and we

267
00:12:29,990 --> 00:12:27,680
got this down at two o'clock this

268
00:12:32,550 --> 00:12:30,000
morning so we have been busily

269
00:12:33,110 --> 00:12:32,560
setting this up for you and we haven't

270
00:12:36,150 --> 00:12:33,120
had

271
00:12:37,350 --> 00:12:36,160
any chance to check so one thing we can

272
00:12:39,990 --> 00:12:37,360
say about this feature

273
00:12:42,389 --> 00:12:40,000
is that this is the smallest impact site

274
00:12:46,790 --> 00:12:42,399
we have seen yet

275
00:12:52,470 --> 00:12:48,870
the fact that it is brown is interesting

276
00:12:53,910 --> 00:12:52,480
now can i have the other graphic please

277
00:12:56,069 --> 00:12:53,920
describe which one it is you're looking

278
00:12:59,110 --> 00:12:56,079
for okay this one

279
00:13:00,629 --> 00:12:59,120
okay now this one is that taken at about

280
00:13:03,750 --> 00:13:00,639
the same time

281
00:13:10,389 --> 00:13:03,760
in the methane filter

282
00:13:14,790 --> 00:13:12,949
is dark because the the sunlight is

283
00:13:16,710 --> 00:13:14,800
coming in and the methane gas is

284
00:13:20,069 --> 00:13:16,720
absorbing it before it can get back

285
00:13:23,269 --> 00:13:20,079
out now look for

286
00:13:26,790 --> 00:13:23,279
our little friend in that

287
00:13:27,750 --> 00:13:26,800
you see the q site on the on the edge of

288
00:13:31,750 --> 00:13:27,760

the planet there

289
00:13:34,949 --> 00:13:31,760
that may be a complex of q2 and q1

290
00:13:37,509 --> 00:13:34,959
or that may be q1 and then down

291
00:13:38,629 --> 00:13:37,519
along the track you see a tiny white

292
00:13:42,629 --> 00:13:38,639
spot

293
00:13:43,750 --> 00:13:42,639
now in the in the insert you you see a

294
00:13:47,030 --> 00:13:43,760
grossly

295
00:13:51,030 --> 00:13:47,040
filtered view and you see

296
00:13:54,069 --> 00:13:51,040
the pattern of the evolving

297
00:13:57,990 --> 00:13:54,079
g site and you see that the q

298
00:13:59,269 --> 00:13:58,000
site at the top and in between you see a

299
00:14:02,470 --> 00:13:59,279
little white

300
00:14:05,750 --> 00:14:02,480
spot now this is much

301
00:14:08,470 --> 00:14:05,760
much fainter than the d-spot was

302
00:14:10,550 --> 00:14:08,480
when it was young it was quite easy to

303
00:14:13,590 --> 00:14:10,560
see it in methane light

304
00:14:15,750 --> 00:14:13,600
so this definitely is our baby

305
00:14:17,910 --> 00:14:15,760
of the whole family and what's

306
00:14:20,150 --> 00:14:17,920
interesting is that

307
00:14:22,069 --> 00:14:20,160
in the images that i put together to

308
00:14:25,189 --> 00:14:22,079
make the color view for you

309
00:14:26,629 --> 00:14:25,199
it had the same color dependence as any

310
00:14:29,670 --> 00:14:26,639
of the big spots

311
00:14:31,670 --> 00:14:29,680
it too is dark in all of those colors so

312
00:14:33,590 --> 00:14:31,680
whether it's q2 or not

313
00:14:35,590 --> 00:14:33,600

is really not that significant what's

314
00:14:39,750 --> 00:14:35,600
really significant

315
00:14:42,310 --> 00:14:39,760
is that this tiny little one went in

316
00:14:42,790 --> 00:14:42,320
and it's behaving in the same it has the

317
00:14:46,310 --> 00:14:42,800
same

318
00:14:48,629 --> 00:14:46,320
color behavior enough material came

319
00:14:50,629 --> 00:14:48,639
up to get high enough above the clouds

320
00:14:54,550 --> 00:14:50,639
to reflect and be white

321
00:14:58,710 --> 00:14:54,560
and still in all the other colors

322
00:15:00,629 --> 00:14:58,720
it's dark so that may we now are

323
00:15:02,629 --> 00:15:00,639
sort of getting a lever on this and this

324
00:15:04,550 --> 00:15:02,639
this may help us to argue whether this

325
00:15:05,910 --> 00:15:04,560
material is really coming from a comet

326
00:15:09,670 --> 00:15:05,920
or not

327
00:15:11,990 --> 00:15:09,680
now we have a problem uh about the the

328
00:15:14,310 --> 00:15:12,000
17th of may hal took an image that

329
00:15:15,350 --> 00:15:14,320
he had and he assumed that the

330
00:15:18,710 --> 00:15:15,360
brightness

331
00:15:21,189 --> 00:15:18,720
of the comet was equivalent to the mass

332
00:15:22,470 --> 00:15:21,199
and from that he computed the energies

333
00:15:25,269 --> 00:15:22,480
of impact

334
00:15:25,990 --> 00:15:25,279
and if you set the impact energy of a

335
00:15:29,030 --> 00:15:26,000
equal to

336
00:15:32,710 --> 00:15:29,040
one the impact energy

337
00:15:33,749 --> 00:15:32,720
of d was equal to one and the impact

338
00:15:37,430 --> 00:15:33,759

energy of g

339
00:15:38,470 --> 00:15:37,440
was equal to twenty four now he had

340
00:15:42,310 --> 00:15:38,480
predicted that the

341
00:15:45,189 --> 00:15:42,320
impact energy of q would be 25

342
00:15:47,350 --> 00:15:45,199
and the impact of q1 would be 25 and the

343
00:15:50,870 --> 00:15:47,360
impact of q2

344
00:15:53,829 --> 00:15:50,880
would be 10. l was 15 so

345
00:15:54,230 --> 00:15:53,839
l is in line but if this is q2 it's

346
00:15:58,310 --> 00:15:54,240
really

347
00:15:59,910 --> 00:15:58,320
out of line but i was astounded when i

348
00:16:02,389 --> 00:15:59,920
saw the impact of a

349
00:16:03,829 --> 00:16:02,399
because i was waiting for g which was

350
00:16:07,030 --> 00:16:03,839
going to give me a reasonable

351
00:16:09,509 --> 00:16:07,040
impact so here we're finding out that

352
00:16:10,230 --> 00:16:09,519
the assumption he made is proving not to

353
00:16:11,829 --> 00:16:10,240
be true

354
00:16:14,470 --> 00:16:11,839
now it was the only one he could make at

355
00:16:16,150 --> 00:16:14,480
that time to get some sort of a handle

356
00:16:17,269 --> 00:16:16,160
on it we did a lot of our scheduling

357
00:16:20,310 --> 00:16:17,279
around it but

358
00:16:21,509 --> 00:16:20,320
at that time hal warned us that there

359
00:16:24,710 --> 00:16:21,519
might be a different

360
00:16:26,230 --> 00:16:24,720
problem involved here as well it turns

361
00:16:29,269 --> 00:16:26,240
out that a

362
00:16:32,389 --> 00:16:29,279
f and q 2

363
00:16:33,110 --> 00:16:32,399

are not on the same line as all of the

364
00:16:36,629 --> 00:16:33,120
other

365
00:16:41,910 --> 00:16:36,639
comet hits so the result is that

366
00:16:48,069 --> 00:16:45,110
i'm sorry it's d f and q

367
00:16:49,749 --> 00:16:48,079
two they have been ejected in the

368
00:16:50,949 --> 00:16:49,759
breakup and howell warned us that they

369
00:16:55,430 --> 00:16:50,959
might

370
00:16:59,430 --> 00:16:55,440
of

371
00:17:01,749 --> 00:16:59,440
ejected and so far hal

372
00:17:02,790 --> 00:17:01,759
has got a smile on his face because all

373
00:17:06,789 --> 00:17:02,800
of the ones that were

374
00:17:09,429 --> 00:17:06,799
out of line are if this is q2

375
00:17:09,909 --> 00:17:09,439
he's he's got a you know straight run

376
00:17:12,949 --> 00:17:09,919
here

377
00:17:15,990 --> 00:17:12,959
batting 400 on his small particles that

378
00:17:20,789 --> 00:17:17,669
i'd say he's batting a thousand wouldn't

379
00:17:23,909 --> 00:17:22,710
we haven't we haven't gotten them all

380
00:17:26,230 --> 00:17:23,919
yet

381
00:17:28,230 --> 00:17:26,240
but that really i just just to

382
00:17:31,350 --> 00:17:28,240
encapsulate what you said

383
00:17:33,510 --> 00:17:31,360
uh what that's really supporting is that

384
00:17:35,669 --> 00:17:33,520
the guys that are in line which seemed

385
00:17:36,470 --> 00:17:35,679
to be initial fragments from the breakup

386
00:17:39,110 --> 00:17:36,480
of the comet

387
00:17:39,909 --> 00:17:39,120
when it got closest to jupiter uh are

388
00:17:43,029 --> 00:17:39,919

more or less

389
00:17:45,270 --> 00:17:43,039
compact objects and are behaving like we

390
00:17:48,230 --> 00:17:45,280
would expect from the photometry

391
00:17:50,070 --> 00:17:48,240
whereas these guys that are off the line

392
00:17:52,549 --> 00:17:50,080
are more likely swarms

393
00:17:53,830 --> 00:17:52,559
and and so we get greatly fooled by the

394
00:17:55,830 --> 00:17:53,840
brightness then

395
00:17:57,990 --> 00:17:55,840
as to what's really there but this also

396
00:18:01,350 --> 00:17:58,000
means that we have two kinds of probes

397
00:18:08,630 --> 00:18:04,390
that's great okay uh

398
00:18:11,190 --> 00:18:08,640
let's go on here now to uh to david levy

399
00:18:12,310 --> 00:18:11,200
uh for an update on what the amateurs

400
00:18:15,430 --> 00:18:12,320
are seeing

401
00:18:18,789 --> 00:18:15,440
yeah there's quite a bit to say um

402
00:18:21,909 --> 00:18:18,799
there is there are a lot of

403
00:18:24,630 --> 00:18:21,919
continuing reports of of

404
00:18:26,630 --> 00:18:24,640
very large dark spots visible at the

405
00:18:30,070 --> 00:18:26,640
impact sites particularly k

406
00:18:32,230 --> 00:18:30,080
l and g parading across the disc

407
00:18:34,310 --> 00:18:32,240
a report from england saying that they

408
00:18:37,430 --> 00:18:34,320
are more spectacular than ever

409
00:18:39,270 --> 00:18:37,440
very large and dark and reports from

410
00:18:42,150 --> 00:18:39,280
everywhere indicating that they are

411
00:18:45,350 --> 00:18:42,160
about as big as the great red spot uh

412
00:18:47,350 --> 00:18:45,360
they are as dense as a satellite shadow

413
00:18:48,870 --> 00:18:47,360

and for those of us who have looked who

414
00:18:50,549 --> 00:18:48,880
have a lot of have some experience

415
00:18:54,150 --> 00:18:50,559
looking at jupiter

416
00:18:57,190 --> 00:18:54,160
uh this as a satellite

417
00:18:59,909 --> 00:18:57,200
parades across jupiter's disk it

418
00:19:01,669 --> 00:18:59,919
uh it transits the disk and you can see

419
00:19:05,110 --> 00:19:01,679
a very dark shadow

420
00:19:07,270 --> 00:19:05,120
across jupiter and this takes

421
00:19:08,950 --> 00:19:07,280
a couple of hours as especially the uh

422
00:19:12,310 --> 00:19:08,960
the moon io

423
00:19:14,230 --> 00:19:12,320
transits and there these are benchmarks

424
00:19:16,150 --> 00:19:14,240
when when you see a satellite shadow it

425
00:19:19,190 --> 00:19:16,160
usually is the easiest thing to see

426
00:19:21,190 --> 00:19:19,200
on the planet and here we have dark

427
00:19:22,310 --> 00:19:21,200
spots that are not satellite shadows

428
00:19:26,470 --> 00:19:22,320
they are every bit

429
00:19:28,789 --> 00:19:26,480
as easy to see as the satellite shadows

430
00:19:30,950 --> 00:19:28,799
but they appear to be as large as the

431
00:19:32,230 --> 00:19:30,960
great red spot at least the large impact

432
00:19:34,870 --> 00:19:32,240
sites

433
00:19:35,350 --> 00:19:34,880
are as large as the great red spot this

434
00:19:39,350 --> 00:19:35,360
means

435
00:19:41,909 --> 00:19:39,360
that these are the most obvious features

436
00:19:44,150 --> 00:19:41,919
ever seen on the planet jupiter

437
00:19:45,669 --> 00:19:44,160
this also means that just about anybody

438
00:19:49,029 --> 00:19:45,679

can go out and look at these

439
00:19:49,750 --> 00:19:49,039
and as i mentioned yesterday i recommend

440
00:19:51,830 --> 00:19:49,760
that people

441
00:19:53,909 --> 00:19:51,840
in people that don't have a lot of

442
00:19:55,430 --> 00:19:53,919
experience looking at jupiter

443
00:19:57,350 --> 00:19:55,440
should still not pass up this

444
00:19:58,549 --> 00:19:57,360
opportunity to get acquainted with this

445
00:20:00,390 --> 00:19:58,559
beautiful planet

446
00:20:02,470 --> 00:20:00,400
uh go to your planetarium if they're

447
00:20:03,270 --> 00:20:02,480
having a star party or amateur astronomy

448
00:20:06,070 --> 00:20:03,280
club

449
00:20:08,230 --> 00:20:06,080
and get someone to show you this

450
00:20:11,430 --> 00:20:08,240
beautiful beautiful sight

451
00:20:13,110 --> 00:20:11,440
and if if i can stop

452
00:20:14,870 --> 00:20:13,120
going to these dinners and stuff that

453
00:20:17,909 --> 00:20:14,880
we're having i'd love to see this

454
00:20:19,510 --> 00:20:17,919
myself but whenever it clears up in

455
00:20:20,470 --> 00:20:19,520
washington i'm told that i have to eat

456
00:20:22,149 --> 00:20:20,480
something

457
00:20:23,669 --> 00:20:22,159
but wait until you get to tucson the

458
00:20:27,029 --> 00:20:23,679
weather the seeing is much better in

459
00:20:29,270 --> 00:20:27,039
tuesday i know i can't wait to do that

460
00:20:30,149 --> 00:20:29,280
there is there is some interesting news

461
00:20:32,950 --> 00:20:30,159
though

462
00:20:35,270 --> 00:20:32,960
for what's in the future tonight the

463
00:20:36,950 --> 00:20:35,280

final two fragments which is really is

464
00:20:38,950 --> 00:20:36,960
kind of sad to say but the final two

465
00:20:43,110 --> 00:20:38,960
fragments are going in

466
00:20:44,149 --> 00:20:43,120
and v and w uh v comes in around 12 15

467
00:20:47,270 --> 00:20:44,159
or so

468
00:20:51,110 --> 00:20:47,280
eastern daylight time which means that

469
00:20:52,789 --> 00:20:51,120
for us uh v is jupiter is going to be

470
00:20:55,270 --> 00:20:52,799
set and we won't be able to see anything

471
00:20:56,789 --> 00:20:55,280
on the east coast of the united states

472
00:20:58,870 --> 00:20:56,799
for people on the west coast though

473
00:21:02,070 --> 00:20:58,880
jupiter will be just dandy just

474
00:21:04,950 --> 00:21:02,080
sitting there beautiful evening sky

475
00:21:06,710 --> 00:21:04,960
there is and and i want to caution that

476
00:21:09,350 --> 00:21:06,720
this is very unlikely

477
00:21:10,789 --> 00:21:09,360
but if there is any chance for visual

478
00:21:14,070 --> 00:21:10,799
observers experienced

479
00:21:17,110 --> 00:21:14,080
visual observers to see the in

480
00:21:18,070 --> 00:21:17,120
the flashes of the impacts either the

481
00:21:21,590 --> 00:21:18,080
incoming

482
00:21:24,789 --> 00:21:21,600
meteor as the uh as the fragment

483
00:21:27,110 --> 00:21:24,799
starts going in to the stratosphere or

484
00:21:29,190 --> 00:21:27,120
the explosive plume that we call the

485
00:21:31,350 --> 00:21:29,200
fireball that comes afterwards and lasts

486
00:21:33,270 --> 00:21:31,360
quite a bit longer

487
00:21:34,549 --> 00:21:33,280
the best chances come tonight with

488
00:21:37,990 --> 00:21:34,559

fragments v

489
00:21:40,470 --> 00:21:38,000
and much later w w will be easiest to

490
00:21:43,270 --> 00:21:40,480
see for observers in

491
00:21:44,230 --> 00:21:43,280
california jupiter will be low there but

492
00:21:46,789 --> 00:21:44,240
hawaii

493
00:21:48,630 --> 00:21:46,799
the south pacific and observers in

494
00:21:50,789 --> 00:21:48,640
australia and new zealand

495
00:21:52,070 --> 00:21:50,799
should have a good chance w is a pretty

496
00:21:54,470 --> 00:21:52,080
good fragment

497
00:21:55,830 --> 00:21:54,480
it's it's pretty fair size it's a nice

498
00:21:59,350 --> 00:21:55,840
one to end our

499
00:22:02,310 --> 00:21:59,360
end our party with and also

500
00:22:02,870 --> 00:22:02,320
is the one that is hitting closest i

501
00:22:05,270 --> 00:22:02,880
think

502
00:22:06,390 --> 00:22:05,280
to the limb of jupiter to the edge of

503
00:22:09,430 --> 00:22:06,400
jupiter

504
00:22:11,029 --> 00:22:09,440
so what's happening tonight is we can go

505
00:22:13,270 --> 00:22:11,039
out and look at the dark spots

506
00:22:14,870 --> 00:22:13,280
and also if we're in the right position

507
00:22:17,350 --> 00:22:14,880
to try to see

508
00:22:20,070 --> 00:22:17,360
if we can see any flashes indicating the

509
00:22:24,390 --> 00:22:20,080
final impacts

510
00:22:26,630 --> 00:22:24,400
thanks david lucy can you

511
00:22:28,310 --> 00:22:26,640
bring us up to date on the on the latest

512
00:22:28,950 --> 00:22:28,320
impacts fragment are impacted about

513
00:22:31,350 --> 00:22:28,960

several

514
00:22:33,190 --> 00:22:31,360
hours ago and what where are we standing

515
00:22:34,870 --> 00:22:33,200
sure i'll try to there's a lot going on

516
00:22:36,070 --> 00:22:34,880
so it's a challenge to keep up with

517
00:22:38,870 --> 00:22:36,080
what's happening

518
00:22:40,070 --> 00:22:38,880
uh fragment r impacted several hours ago

519
00:22:41,990 --> 00:22:40,080
and we have this report

520
00:22:46,870 --> 00:22:42,000
from david schleicher at the lowell

521
00:22:50,470 --> 00:22:48,789
accompanying this i'll keep talking

522
00:22:53,830 --> 00:22:50,480
until we get the image up

523
00:22:55,990 --> 00:22:53,840
we have also confirmations from mcdonald

524
00:22:57,270 --> 00:22:56,000
observatory oh here let's listen to

525
00:22:59,669 --> 00:22:57,280
schleicher's report

526
00:23:00,950 --> 00:22:59,679
it appears that if we are detecting a

527
00:23:04,870 --> 00:23:00,960
plume from

528
00:23:05,430 --> 00:23:04,880
the impact of our this is using methane

529
00:23:09,430 --> 00:23:05,440
filter

530
00:23:09,909 --> 00:23:09,440
8900 angstroms we're somewhat surprised

531
00:23:11,430 --> 00:23:09,919
that

532
00:23:13,590 --> 00:23:11,440
being able to see it at all because

533
00:23:15,029 --> 00:23:13,600
there have i don't recall

534
00:23:18,310 --> 00:23:15,039
there being that many detections of

535
00:23:19,909 --> 00:23:18,320
plumes in the visible

536
00:23:22,789 --> 00:23:19,919
most of them have been in the infrared

537
00:23:24,070 --> 00:23:22,799
so far it may mean that it was a bigger

538
00:23:27,669 --> 00:23:24,080

piece than

539
00:23:31,750 --> 00:23:30,630
well um i think dave was uh suffering

540
00:23:34,870 --> 00:23:31,760
from a

541
00:23:37,270 --> 00:23:34,880
astronomer's fatigue um because other

542
00:23:39,350 --> 00:23:37,280
there have been a number of reports um

543
00:23:40,630 --> 00:23:39,360
mcdonald observatory was looking in in

544
00:23:43,990 --> 00:23:40,640
the same methane band

545
00:23:46,710 --> 00:23:44,000
and they did see a bright uh bright uh

546
00:23:48,630 --> 00:23:46,720
emission in that in that spectral region

547
00:23:51,430 --> 00:23:48,640
uh the keck observatory als

548
00:23:52,390 --> 00:23:51,440
also reported inca de peder from ucla

549
00:23:55,029 --> 00:23:52,400
and her team

550
00:23:56,630 --> 00:23:55,039
reported seeing a truly remarkable flash

551
00:23:58,950 --> 00:23:56,640
from the impact of r

552
00:24:01,110 --> 00:23:58,960
that lasted for about 20 seconds and

553
00:24:02,789 --> 00:24:01,120
then the plume the hot rising gases

554
00:24:03,510 --> 00:24:02,799
appeared eight minutes later over the

555
00:24:05,830 --> 00:24:03,520
limb

556
00:24:08,230 --> 00:24:05,840
and brightened and then faded over a

557
00:24:10,789 --> 00:24:08,240
period of about eight minutes

558
00:24:11,830 --> 00:24:10,799
now we have a report from the galileo

559
00:24:14,710 --> 00:24:11,840
spacecraft

560
00:24:15,830 --> 00:24:14,720
and as you recall this is really a

561
00:24:20,070 --> 00:24:15,840
significant

562
00:24:22,789 --> 00:24:20,080
looking directly down on the impact

563
00:24:24,470 --> 00:24:22,799

sites and they actually can see when the

564
00:24:27,510 --> 00:24:24,480
initial explosion

565
00:24:29,350 --> 00:24:27,520
occurs we have terry martin reporting

566
00:24:30,830 --> 00:24:29,360
today we were pleasantly surprised to

567
00:24:34,310 --> 00:24:30,840
pick up event

568
00:24:35,830 --> 00:24:34,320
l which was originally not expected to

569
00:24:37,830 --> 00:24:35,840
be captured because of the timing

570
00:24:38,549 --> 00:24:37,840
relative to the predictions of impact

571
00:24:40,630 --> 00:24:38,559
but

572
00:24:41,669 --> 00:24:40,640
the actual impact occurred later and we

573
00:24:44,390 --> 00:24:41,679
picked it up

574
00:24:44,950 --> 00:24:44,400
and this one is actually brighter than h

575
00:24:48,630 --> 00:24:44,960
by

576
00:24:51,269 --> 00:24:48,640
almost a factor of two it's more like uh

577
00:24:52,070 --> 00:24:51,279
five to six percent the brightness of

578
00:24:54,310 --> 00:24:52,080
jupiter

579
00:24:56,549 --> 00:24:54,320
and it takes 35 seconds or so for the

580
00:24:58,710 --> 00:24:56,559
light to die back down again

581
00:24:59,590 --> 00:24:58,720
so we see we think that we are seeing

582
00:25:07,830 --> 00:24:59,600
the

583
00:25:11,350 --> 00:25:07,840
very hot

584
00:25:14,710 --> 00:25:11,360
emission from that but over a very small

585
00:25:16,630 --> 00:25:14,720
streak of light across jupiter

586
00:25:17,830 --> 00:25:16,640
and this is a short duration and

587
00:25:20,070 --> 00:25:17,840
precedes

588
00:25:20,870 --> 00:25:20,080

the the plumes and the fireballs that

589
00:25:24,470 --> 00:25:20,880
are being seen

590
00:25:27,110 --> 00:25:25,990
let's hold that up if we can can we

591
00:25:29,029 --> 00:25:27,120
bring that back because i need to

592
00:25:31,029 --> 00:25:29,039
address the inset in there

593
00:25:32,549 --> 00:25:31,039
if possible what you are seeing is a

594
00:25:35,269 --> 00:25:32,559
tracing

595
00:25:37,190 --> 00:25:35,279
of intensity as a function of time and

596
00:25:39,669 --> 00:25:37,200
if you can recall the inset and we'll

597
00:25:42,870 --> 00:25:39,679
review it again later

598
00:25:45,909 --> 00:25:42,880
time goes proceeds along the bottom axis

599
00:25:47,110 --> 00:25:45,919
the horizontal axis and the flash is

600
00:25:49,269 --> 00:25:47,120
represented by a

601
00:25:50,549 --> 00:25:49,279
drastic a quick increase in intensity

602
00:25:54,070 --> 00:25:50,559
and then it decays

603
00:25:55,669 --> 00:25:54,080
as time goes on um then

604
00:25:57,909 --> 00:25:55,679
let's see we're sort of working

605
00:26:00,310 --> 00:25:57,919
backwards in the alphabet of impacts now

606
00:26:01,909 --> 00:26:00,320
um report with some reports that are

607
00:26:02,870 --> 00:26:01,919
coming in we have the european southern

608
00:26:05,830 --> 00:26:02,880
observatory

609
00:26:07,350 --> 00:26:05,840
um showing the k-impact fireball um and

610
00:26:10,310 --> 00:26:07,360
showing the plume and i think we'll just

611
00:26:13,830 --> 00:26:10,320
put that up briefly

612
00:26:15,830 --> 00:26:13,840
um okay yes we'll

613
00:26:17,110 --> 00:26:15,840

here we have the residual from the g

614
00:26:19,669 --> 00:26:17,120
impact and

615
00:26:20,390 --> 00:26:19,679
the quite prominent h impact now many

616
00:26:22,470 --> 00:26:20,400
most

617
00:26:24,310 --> 00:26:22,480
i i would say all observatories are

618
00:26:26,789 --> 00:26:24,320
reporting um that there's

619
00:26:28,950 --> 00:26:26,799
detectors that they're over exposing

620
00:26:30,950 --> 00:26:28,960
their images

621
00:26:33,110 --> 00:26:30,960
even when the first reports came in and

622
00:26:33,669 --> 00:26:33,120
reported over exposing or saturation of

623
00:26:35,750 --> 00:26:33,679
their ima

624
00:26:37,669 --> 00:26:35,760
of their detectors i'm sure everybody

625
00:26:40,950 --> 00:26:37,679
reduced their exposure times yet they're

626
00:26:42,710 --> 00:26:40,960
continuing to be over exposed so

627
00:26:44,070 --> 00:26:42,720
again we're we just continue to be

628
00:26:47,350 --> 00:26:44,080
surprised at how bright these

629
00:26:47,830 --> 00:26:47,360
these impacts are um we have a movie

630
00:26:55,110 --> 00:26:47,840
from

631
00:26:58,870 --> 00:26:57,590
and we will run that i haven't seen this

632
00:27:02,230 --> 00:26:58,880
this is of the g

633
00:27:05,269 --> 00:27:02,240
fragment impact and it's a time

634
00:27:10,070 --> 00:27:08,310
i'm sorry sacramento peak i i used the

635
00:27:12,710 --> 00:27:10,080
abbreviation it's the national solar

636
00:27:18,549 --> 00:27:12,720
observatory

637
00:27:23,110 --> 00:27:21,190
and the these data will be analyzed in

638
00:27:26,310 --> 00:27:23,120

terms of changes in the brightness and

639
00:27:27,990 --> 00:27:26,320
and any spatial variation which can be

640
00:27:30,230 --> 00:27:28,000
determined and we will of course

641
00:27:31,590 --> 00:27:30,240
correlate these results in the infrared

642
00:27:35,029 --> 00:27:31,600
with the um

643
00:27:36,389 --> 00:27:35,039
visible and ultraviolet images that are

644
00:27:37,909 --> 00:27:36,399
acquired from the other ground-based

645
00:27:39,110 --> 00:27:37,919
observatories and the hubble space

646
00:27:41,190 --> 00:27:39,120
telescope

647
00:27:42,389 --> 00:27:41,200
now we have our first report from

648
00:27:44,389 --> 00:27:42,399
another

649
00:27:47,990 --> 00:27:44,399
earth orbiting satellite the extreme

650
00:27:53,190 --> 00:27:48,000
ultraviolet explorer

651
00:27:56,950 --> 00:27:55,750
and a voice in oh no voice report first

652
00:27:59,590 --> 00:27:56,960
has not really

653
00:28:01,669 --> 00:27:59,600
uh changed that much yet which may or

654
00:28:03,269 --> 00:28:01,679
may not be a surprise since

655
00:28:04,950 --> 00:28:03,279
it'll take a little while for this stuff

656
00:28:08,310 --> 00:28:04,960
to reach the taurus

657
00:28:11,430 --> 00:28:08,320
but one thing we have seen is that the

658
00:28:13,430 --> 00:28:11,440
if we look at jupiter alone in the

659
00:28:16,630 --> 00:28:13,440
extreme ultraviolet we actually see

660
00:28:17,269 --> 00:28:16,640
signs of helium emission during the

661
00:28:19,990 --> 00:28:17,279
impacts

662
00:28:21,269 --> 00:28:20,000
that we don't see before the plumes did

663
00:28:25,110 --> 00:28:21,279

go up fairly high

664
00:28:26,710 --> 00:28:25,120
because we have to have thrown helium

665
00:28:29,350 --> 00:28:26,720
far up in the atmosphere to be able to

666
00:28:33,669 --> 00:28:29,360
see this several hundred kilometers

667
00:28:35,590 --> 00:28:33,679
in order to see see this emission

668
00:28:39,110 --> 00:28:35,600
through all the hydrogen that absorbs

669
00:28:43,990 --> 00:28:41,990
okay we're showing there um first of all

670
00:28:46,389 --> 00:28:44,000
two things one was a bright emission

671
00:28:47,510 --> 00:28:46,399
band from from helium seen in jupiter's

672
00:28:49,029 --> 00:28:47,520
atmosphere

673
00:28:52,149 --> 00:28:49,039
and then they're also reporting about

674
00:28:54,389 --> 00:28:52,159
the uh the taurus around io the moon of

675
00:28:55,830 --> 00:28:54,399
of jupiter which has which is a ring of

676
00:28:58,070 --> 00:28:55,840
charged particles and they're reporting

677
00:28:58,630 --> 00:28:58,080
that they have not seen any changes in

678
00:29:00,710 --> 00:28:58,640
the

679
00:29:02,950 --> 00:29:00,720
density of of charged particles around

680
00:29:04,310 --> 00:29:02,960
io so that's a preliminary negative

681
00:29:06,389 --> 00:29:04,320
result

682
00:29:08,630 --> 00:29:06,399
and finally we have images from

683
00:29:15,029 --> 00:29:08,640
australia from the siding spring

684
00:29:15,039 --> 00:29:19,750
when it says speak from my notes

685
00:29:19,760 --> 00:29:23,029
well

686
00:29:26,630 --> 00:29:25,590
i'm not prepared to speak to this but

687
00:29:28,470 --> 00:29:26,640
these are

688
00:29:29,669 --> 00:29:28,480

nice images and i haven't i haven't done

689
00:29:31,510 --> 00:29:29,679
my homework

690
00:29:34,470 --> 00:29:31,520
so i'm sorry australia but these are the

691
00:29:37,510 --> 00:29:34,480
c and g impacts

692
00:29:41,029 --> 00:29:37,520
at different wavelengths which my guess

693
00:29:43,510 --> 00:29:41,039
is which is looking at different

694
00:29:45,190 --> 00:29:43,520
uh levels into the atmosphere the first

695
00:29:47,350 --> 00:29:45,200
one looked like a methane band image

696
00:29:52,630 --> 00:29:47,360
don't you think lucy yeah we've got

697
00:29:57,830 --> 00:29:54,630
and i'm sorry we're just gonna have to

698
00:30:01,830 --> 00:30:00,389
okay uh maybe this is the time for us to

699
00:30:03,909 --> 00:30:01,840
turn it back over to you don

700
00:30:05,510 --> 00:30:03,919
okay we'll have a question to answer but

701
00:30:07,590 --> 00:30:05,520
first i want uh to make

702
00:30:09,830 --> 00:30:07,600
an important uh announcement on our

703
00:30:10,789 --> 00:30:09,840
schedule for tomorrow that's a friday

704
00:30:14,149 --> 00:30:10,799
briefing

705
00:30:15,750 --> 00:30:14,159
has been changed to 2 p.m eastern time

706
00:30:17,750 --> 00:30:15,760
we will not have an 8 o'clock in the

707
00:30:19,990 --> 00:30:17,760
morning briefing this is to

708
00:30:21,110 --> 00:30:20,000
to give the science team a time to

709
00:30:22,710 --> 00:30:21,120
prepare

710
00:30:24,630 --> 00:30:22,720
the information and images on the

711
00:30:27,510 --> 00:30:24,640
one-two punch of q r

712
00:30:29,990 --> 00:30:27,520
so we'll have that tomorrow at two and

713
00:30:32,149 --> 00:30:30,000

uh and then as a preview for saturday

714
00:30:33,430 --> 00:30:32,159
we're going to also change the time to

715
00:30:35,750 --> 00:30:33,440
11 o'clock

716
00:30:36,630 --> 00:30:35,760
am eastern time and on that one we

717
00:30:38,950 --> 00:30:36,640
expect to

718
00:30:41,110 --> 00:30:38,960
have evidence for sonic boom on jupiter

719
00:30:42,870 --> 00:30:41,120
observed and we'll

720
00:30:45,830 --> 00:30:42,880
also look at what is expected to be a

721
00:30:47,669 --> 00:30:45,840
dramatic plume from fragment w's impact

722
00:30:49,110 --> 00:30:47,679
and look at changes we're already seeing

723
00:30:52,310 --> 00:30:49,120
on the impact sites

724
00:30:53,350 --> 00:30:52,320
i'd like to open it up q a from goddard

725
00:30:55,269 --> 00:30:53,360
first

726
00:30:57,830 --> 00:30:55,279
please wait for the microphone state

727
00:31:00,710 --> 00:30:57,840
your name and affiliation please

728
00:31:01,350 --> 00:31:00,720
uh paul hoverstein usa today a question

729
00:31:05,110 --> 00:31:01,360
i guess for

730
00:31:08,230 --> 00:31:05,120
gene and david uh weeks ago

731
00:31:11,190 --> 00:31:08,240
uh there was so much emphasis put on uh

732
00:31:12,470 --> 00:31:11,200
we may see nothing uh let's be cautious

733
00:31:14,870 --> 00:31:12,480
and so on

734
00:31:16,870 --> 00:31:14,880
i'm wondering if if you can say now that

735
00:31:19,509 --> 00:31:16,880
that was a matter of

736
00:31:20,710 --> 00:31:19,519
maybe overestimating the resiliency of

737
00:31:23,509 --> 00:31:20,720
jupiter or was it

738
00:31:25,909 --> 00:31:23,519

underestimating the magnitude of these

739
00:31:27,509 --> 00:31:25,919
fragments or some combination

740
00:31:29,269 --> 00:31:27,519
we're being criticized because it's been

741
00:31:32,870 --> 00:31:29,279
too good

742
00:31:34,549 --> 00:31:32,880
i'd say the the thing that uh caused the

743
00:31:36,070 --> 00:31:34,559
most uncertainty

744
00:31:38,389 --> 00:31:36,080
prior to the actual beginning of the

745
00:31:41,669 --> 00:31:38,399
impacts was the whole issue

746
00:31:43,590 --> 00:31:41,679
how big are these fragments how much

747
00:31:46,070 --> 00:31:43,600
stuff is there

748
00:31:47,590 --> 00:31:46,080
now we had two estimates independent

749
00:31:49,430 --> 00:31:47,600
estimates

750
00:31:51,430 --> 00:31:49,440
that suggested that the original

751
00:31:54,549 --> 00:31:51,440
precursor body was of order

752
00:31:57,350 --> 00:31:54,559
10 kilometers across and the big biggest

753
00:31:59,110 --> 00:31:57,360
fragments might be in the ballpark of

754
00:32:01,430 --> 00:31:59,120
about three kilometers

755
00:32:02,470 --> 00:32:01,440
or an upper bound that was given by hal

756
00:32:05,590 --> 00:32:02,480
weaver

757
00:32:07,110 --> 00:32:05,600
from earlier hubble photometry was about

758
00:32:08,389 --> 00:32:07,120
four kilometers for the very biggest

759
00:32:10,230 --> 00:32:08,399
that would have been

760
00:32:11,830 --> 00:32:10,240
well that time was q that was that

761
00:32:15,029 --> 00:32:11,840
seemed to be the brightest

762
00:32:16,149 --> 00:32:15,039
now the issue was are we really seeing

763
00:32:18,630 --> 00:32:16,159

the nuclei

764
00:32:19,669 --> 00:32:18,640
or maybe the nuclear completely shrouded

765
00:32:22,230 --> 00:32:19,679
in dust

766
00:32:23,269 --> 00:32:22,240
so hal weaver and his team were trying

767
00:32:24,870 --> 00:32:23,279
to do this job

768
00:32:26,789 --> 00:32:24,880
tried to do the best job they could to

769
00:32:29,110 --> 00:32:26,799
subtract off

770
00:32:30,630 --> 00:32:29,120
the dust effect to see what's left

771
00:32:32,549 --> 00:32:30,640
what's there in the middle

772
00:32:34,389 --> 00:32:32,559
but you could argue that maybe that we

773
00:32:36,070 --> 00:32:34,399
weren't actually seeing anything else

774
00:32:36,950 --> 00:32:36,080
but dust and that the nuclei could be

775
00:32:39,269 --> 00:32:36,960
much smaller

776
00:32:40,830 --> 00:32:39,279
we're defeated by physics right

777
00:32:41,990 --> 00:32:40,840
basically it's a very difficult

778
00:32:43,750 --> 00:32:42,000
observation

779
00:32:45,350 --> 00:32:43,760
uh the other team that was proposing

780
00:32:48,710 --> 00:32:45,360
that these objects were big

781
00:32:51,830 --> 00:32:48,720
consisted of the dynamicist team

782
00:32:54,549 --> 00:32:51,840
at jpl paul chodes and don yeomans and

783
00:32:55,430 --> 00:32:54,559
zdenek sekinina and they said if they

784
00:32:57,830 --> 00:32:55,440
try to do their

785
00:33:00,470 --> 00:32:57,840
best fit to the to the actual

786
00:33:03,029 --> 00:33:00,480
orientation of the string of pearls

787
00:33:04,070 --> 00:33:03,039
that they found a breakup of the comet

788
00:33:06,230 --> 00:33:04,080

initially

789
00:33:07,590 --> 00:33:06,240
about an hour and a half after it passed

790
00:33:09,990 --> 00:33:07,600
perijove

791
00:33:11,430 --> 00:33:10,000
and they get from that com just that

792
00:33:13,590 --> 00:33:11,440
dynamical solution

793
00:33:15,029 --> 00:33:13,600
they gave a size for you can get the

794
00:33:16,230 --> 00:33:15,039
size of the original object because

795
00:33:18,149 --> 00:33:16,240
where the things go in the string of

796
00:33:19,909 --> 00:33:18,159
pearls depends on where they are

797
00:33:22,149 --> 00:33:19,919
relative to jupiter at the time of

798
00:33:24,950 --> 00:33:22,159
breakup so that's how you get the number

799
00:33:26,470 --> 00:33:24,960
uh and it turns out their result agreed

800
00:33:28,870 --> 00:33:26,480
very nicely

801
00:33:30,789 --> 00:33:28,880
with with the weaver team and we were we

802
00:33:32,389 --> 00:33:30,799
were very happy about that but now there

803
00:33:35,590 --> 00:33:32,399
were other solutions

804
00:33:37,669 --> 00:33:35,600
on jay milage and jim scotty for for

805
00:33:37,990 --> 00:33:37,679
example that assume the breakup happens

806
00:33:40,230 --> 00:33:38,000
right

807
00:33:42,310 --> 00:33:40,240
at perijove then the original parrot

808
00:33:45,509 --> 00:33:42,320
body is much smaller

809
00:33:46,789 --> 00:33:45,519
and so you know we so that's that's

810
00:33:48,310 --> 00:33:46,799
where some of the confusion was

811
00:33:49,509 --> 00:33:48,320
occurring it turns out that solution is

812
00:33:52,630 --> 00:33:49,519
very sensitive

813
00:33:54,230 --> 00:33:52,640

to just exactly when the breakup occurs

814
00:33:56,070 --> 00:33:54,240
now the other thing that that had come

815
00:33:58,310 --> 00:33:56,080
out very recently

816
00:33:59,750 --> 00:33:58,320
particularly work by willie benz and

817
00:34:03,190 --> 00:33:59,760
ashfog

818
00:34:05,029 --> 00:34:03,200
i suggested that really the comet was

819
00:34:06,070 --> 00:34:05,039
just a pile of debris to begin with and

820
00:34:09,109 --> 00:34:06,080
you could account

821
00:34:11,589 --> 00:34:09,119
for the string of 20 pearls quite nicely

822
00:34:13,109 --> 00:34:11,599
if you just smashed the whole thing the

823
00:34:14,629 --> 00:34:13,119
whole thing just came apart

824
00:34:16,629 --> 00:34:14,639
but then it gravitationally

825
00:34:18,790 --> 00:34:16,639
re-aggregated by its own self-gravity

826
00:34:20,869 --> 00:34:18,800
into little clumps or knots

827
00:34:22,389 --> 00:34:20,879
and if the and actually there's a

828
00:34:23,190 --> 00:34:22,399
there's a lot of power behind that

829
00:34:25,270 --> 00:34:23,200
argument

830
00:34:26,950 --> 00:34:25,280
i think that we've got to address that

831
00:34:28,550 --> 00:34:26,960
argument because we i think that looks

832
00:34:30,470 --> 00:34:28,560
like a very strong argument

833
00:34:32,389 --> 00:34:30,480
so the question was are those clumps

834
00:34:34,069 --> 00:34:32,399
spread out in which case

835
00:34:35,589 --> 00:34:34,079
they may appear brighter and there may

836
00:34:37,430 --> 00:34:35,599
not be as much mass

837
00:34:39,430 --> 00:34:37,440
or the clump did the clumps get back

838
00:34:42,550 --> 00:34:39,440

together again so something like g

839
00:34:44,710 --> 00:34:42,560
or h hitting jupiter is really

840
00:34:45,990 --> 00:34:44,720
bound together grav by its own gravity

841
00:34:47,589 --> 00:34:46,000
and would come in maybe get

842
00:34:50,069 --> 00:34:47,599
slightly separated as it enters the

843
00:34:51,349 --> 00:34:50,079
atmosphere but effectively act like one

844
00:34:53,510 --> 00:34:51,359
projectile when it hits

845
00:34:54,869 --> 00:34:53,520
or what is just going to be pulled out

846
00:34:56,629 --> 00:34:54,879
in a long string

847
00:34:58,630 --> 00:34:56,639
and as paul weissman said sort of hit

848
00:34:59,270 --> 00:34:58,640
jupiter like a string of machine gun

849
00:35:00,710 --> 00:34:59,280
bullets

850
00:35:02,470 --> 00:35:00,720
and that was the source of the idea of

851
00:35:04,790 --> 00:35:02,480
the great fizzle

852
00:35:06,390 --> 00:35:04,800
it looks as though jupiter is telling us

853
00:35:09,349 --> 00:35:06,400
in my view at least

854
00:35:11,109 --> 00:35:09,359
that that you had pretty good clumps for

855
00:35:13,349 --> 00:35:11,119
the guys that are on the line that's

856
00:35:14,950 --> 00:35:13,359
just what we were talking about today

857
00:35:16,950 --> 00:35:14,960
so they're the ones that got back

858
00:35:18,550 --> 00:35:16,960
together and made pretty good clumps and

859
00:35:20,630 --> 00:35:18,560
the ones that are off the line are the

860
00:35:23,270 --> 00:35:20,640
more diffused swarms

861
00:35:24,310 --> 00:35:23,280
that's been a guess and it looks as

862
00:35:25,030 --> 00:35:24,320
though what we're really seeing on

863
00:35:28,950 --> 00:35:25,040

jupiter

864
00:35:32,470 --> 00:35:30,710
uh bill hartwick cbs and just to follow

865
00:35:35,349 --> 00:35:32,480
up on that was part of the question i

866
00:35:36,950 --> 00:35:35,359
wanted to ask the the mechanism for

867
00:35:38,470 --> 00:35:36,960
the ones on the line and then the later

868
00:35:39,270 --> 00:35:38,480
break-offs where you have these off the

869
00:35:41,109 --> 00:35:39,280
line

870
00:35:42,870 --> 00:35:41,119
i'm interpreting what you just said that

871
00:35:43,990 --> 00:35:42,880
it was all clumps to start with some got

872
00:35:45,349 --> 00:35:44,000
together and made big clumps

873
00:35:47,109 --> 00:35:45,359
and some never managed to do that is

874
00:35:49,109 --> 00:35:47,119
that what you're saying the mechanism of

875
00:35:50,950 --> 00:35:49,119
it and the second question was

876
00:35:52,710 --> 00:35:50,960
in the g impact site where there was

877
00:35:54,150 --> 00:35:52,720
that sharply defined ring that

878
00:35:55,670 --> 00:35:54,160
we said we're going to look later and

879
00:35:56,870 --> 00:35:55,680
see if it was expanding has anybody

880
00:35:58,870 --> 00:35:56,880
looked and is it

881
00:36:00,230 --> 00:35:58,880
do you know what that is yet let's take

882
00:36:01,750 --> 00:36:00,240
the first part and then

883
00:36:03,589 --> 00:36:01,760
i think i want to throw the second part

884
00:36:05,190 --> 00:36:03,599
to some others here uh

885
00:36:06,710 --> 00:36:05,200
the first part is that some of the

886
00:36:10,790 --> 00:36:06,720
things that are off the line

887
00:36:13,750 --> 00:36:10,800
demonstrably split off from other clumps

888
00:36:14,470 --> 00:36:13,760

late late in the history of the comet uh

889
00:36:16,230 --> 00:36:14,480
because

890
00:36:17,829 --> 00:36:16,240
we we essentially almost caught them in

891
00:36:20,150 --> 00:36:17,839
the act of separating

892
00:36:20,950 --> 00:36:20,160
with the images taken last july with

893
00:36:22,950 --> 00:36:20,960
hubble

894
00:36:25,349 --> 00:36:22,960
q1 and q2 are just starting to come

895
00:36:27,910 --> 00:36:25,359
apart and p1 and p2

896
00:36:29,670 --> 00:36:27,920
were actually not very far separated so

897
00:36:30,790 --> 00:36:29,680
it's clear that those things began to

898
00:36:32,710 --> 00:36:30,800
separate

899
00:36:34,150 --> 00:36:32,720
even after the event and those things

900
00:36:35,589 --> 00:36:34,160
that separated late

901
00:36:38,150 --> 00:36:35,599
in part seem to be the things that have

902
00:36:41,030 --> 00:36:38,160
drifted off and maybe mostly swarms

903
00:36:43,109 --> 00:36:41,040
yeah the q fragment actually uh there's

904
00:36:44,870 --> 00:36:43,119
evidence that fragment q was

905
00:36:46,310 --> 00:36:44,880
starting to split up at the time of

906
00:36:48,550 --> 00:36:46,320
discovery of the comet

907
00:36:49,750 --> 00:36:48,560
and that the date of around april first

908
00:36:52,230 --> 00:36:49,760
93 for

909
00:36:52,950 --> 00:36:52,240
breakup of fragment queue might be

910
00:36:54,870 --> 00:36:52,960
making p

911
00:36:56,630 --> 00:36:54,880
probably at that time q and p being

912
00:36:58,470 --> 00:36:56,640
formed that way i was just going to say

913
00:36:58,870 --> 00:36:58,480

that i have a slight modification to

914
00:37:00,470 --> 00:36:58,880
what

915
00:37:02,150 --> 00:37:00,480
you know gene was saying my picture of

916
00:37:03,510 --> 00:37:02,160
what's going on of you know

917
00:37:05,510 --> 00:37:03,520
for these fragments that are off the

918
00:37:07,750 --> 00:37:05,520
train is that in fact

919
00:37:09,270 --> 00:37:07,760
there still are you know single large

920
00:37:09,750 --> 00:37:09,280
bodies at the centers of each of those

921
00:37:11,430 --> 00:37:09,760
things

922
00:37:13,910 --> 00:37:11,440
they're anomalously bright because they

923
00:37:16,069 --> 00:37:13,920
have more dust the younger object

924
00:37:18,069 --> 00:37:16,079
the younger the object is the more dust

925
00:37:18,790 --> 00:37:18,079
it has we see that even for the main

926
00:37:20,870 --> 00:37:18,800
fragments

927
00:37:22,390 --> 00:37:20,880
the amount of small dust gets blown away

928
00:37:22,870 --> 00:37:22,400
eventually by the solar radiation

929
00:37:24,870 --> 00:37:22,880
pressure

930
00:37:26,150 --> 00:37:24,880
and is removed from the system that

931
00:37:27,829 --> 00:37:26,160
makes the comet appear

932
00:37:29,829 --> 00:37:27,839
fainter because what you're observing

933
00:37:32,790 --> 00:37:29,839
for the most part is this dust

934
00:37:34,310 --> 00:37:32,800
and if you have a younger object you

935
00:37:35,589 --> 00:37:34,320
know if you compare

936
00:37:37,030 --> 00:37:35,599
the brightness of that object to

937
00:37:38,470 --> 00:37:37,040
something that's on the train you're

938
00:37:40,790 --> 00:37:38,480

comparing them essentially at different

939
00:37:43,829 --> 00:37:40,800
times in the in their dust production

940
00:37:47,430 --> 00:37:43,839
and so uh using the brightness is

941
00:37:49,270 --> 00:37:47,440
is uh basically misleading you

942
00:37:51,030 --> 00:37:49,280
as an indicator of the size because

943
00:37:52,230 --> 00:37:51,040
there's more dust associated with these

944
00:37:55,349 --> 00:37:52,240
things off the train

945
00:37:57,270 --> 00:37:55,359
than the ones on the train and

946
00:37:58,390 --> 00:37:57,280
but i think that for example when you

947
00:38:00,550 --> 00:37:58,400
look at the

948
00:38:02,550 --> 00:38:00,560
this interesting q region as gene was

949
00:38:04,950 --> 00:38:02,560
mentioning in at the end of march

950
00:38:06,710 --> 00:38:04,960
you actually see one of those small ones

951
00:38:09,030 --> 00:38:06,720
the so-called p2

952
00:38:09,829 --> 00:38:09,040
break up almost before our eyes into two

953
00:38:11,990 --> 00:38:09,839
separate

954
00:38:12,950 --> 00:38:12,000
you know condensations essentially i

955
00:38:14,390 --> 00:38:12,960
don't believe that that could be

956
00:38:16,550 --> 00:38:14,400
explained by a

957
00:38:18,069 --> 00:38:16,560
swarm model it's hard to make it's hard

958
00:38:19,589 --> 00:38:18,079
to believe that it's more naturally

959
00:38:21,670 --> 00:38:19,599
explained it seems to me

960
00:38:23,349 --> 00:38:21,680
as having a single object there that is

961
00:38:24,870 --> 00:38:23,359
now very fragile i mean we know these

962
00:38:27,510 --> 00:38:24,880
things are extremely fragile

963
00:38:29,109 --> 00:38:27,520

and then it just broke off again and

964
00:38:29,510 --> 00:38:29,119
that's why i was so interested in this q

965
00:38:31,430 --> 00:38:29,520
region

966
00:38:32,950 --> 00:38:31,440
watching it prior to its impact into

967
00:38:34,710 --> 00:38:32,960
jupiter thinking that

968
00:38:36,150 --> 00:38:34,720
wow this this region most of these

969
00:38:37,510 --> 00:38:36,160
fragments have already shown evidence

970
00:38:38,870 --> 00:38:37,520
that they're extremely weak maybe even

971
00:38:40,470 --> 00:38:38,880
weaker than the others

972
00:38:42,870 --> 00:38:40,480
and we might see these things coming

973
00:38:43,510 --> 00:38:42,880
apart but up until 10 hours prior to

974
00:38:45,190 --> 00:38:43,520
impact we

975
00:38:46,550 --> 00:38:45,200
didn't really see any evidence that q1

976
00:38:49,750 --> 00:38:46,560
and q2 were

977
00:38:51,990 --> 00:38:49,760
splitting into you know just a swarm

978
00:38:53,910 --> 00:38:52,000
can we answer the question about the

979
00:38:56,550 --> 00:38:53,920
ring read it could you

980
00:38:57,510 --> 00:38:56,560
i'd like to ask to defer that until

981
00:38:59,109 --> 00:38:57,520
tomorrow

982
00:39:00,950 --> 00:38:59,119
andrew ingersoll is back at the

983
00:39:02,630 --> 00:39:00,960
institute beavering away

984
00:39:05,270 --> 00:39:02,640
trying to get this all put together for

985
00:39:08,390 --> 00:39:05,280
you this is a part of his sonic

986
00:39:10,069 --> 00:39:08,400
uh boom scenario so i think we'll just

987
00:39:12,950 --> 00:39:10,079
kind of hold that and

988
00:39:14,390 --> 00:39:12,960

let him work it out for you come on

989
00:39:15,750 --> 00:39:14,400
there's a hint if he's saying it's a

990
00:39:21,910 --> 00:39:15,760
sonic sonic boom you

991
00:39:25,430 --> 00:39:23,430
uh it's alan merson from national

992
00:39:27,270 --> 00:39:25,440
geographic magazine um i guess this

993
00:39:29,109 --> 00:39:27,280
question is for hal or gene

994
00:39:31,030 --> 00:39:29,119
you mentioned that fragment m had

995
00:39:33,190 --> 00:39:31,040
disappeared for a couple of weeks

996
00:39:34,710 --> 00:39:33,200
and then reappeared at impact and i and

997
00:39:36,710 --> 00:39:34,720
you talked about the fact that this

998
00:39:37,990 --> 00:39:36,720
fragment turned on and turned off

999
00:39:41,030 --> 00:39:38,000
and i wonder if you could describe what

1000
00:39:44,069 --> 00:39:41,040
exactly that means and how that works

1001
00:39:47,190 --> 00:39:44,079
uh fragment m was only seen seen uh

1002
00:39:49,109 --> 00:39:47,200
last year okay uh all of this year

1003
00:39:51,430 --> 00:39:49,119
nobody has seen m and i think what

1004
00:39:53,349 --> 00:39:51,440
happened there was that small dust

1005
00:39:54,550 --> 00:39:53,359
uh basically got blown out of the system

1006
00:39:56,069 --> 00:39:54,560
leaving something that was a pretty

1007
00:39:56,950 --> 00:39:56,079
small object but still could be

1008
00:39:59,670 --> 00:39:56,960
substantial

1009
00:40:00,470 --> 00:39:59,680
and that's and the the fact that you see

1010
00:40:03,109 --> 00:40:00,480
evidence

1011
00:40:03,750 --> 00:40:03,119
for the impact on jupiter indicates to

1012
00:40:06,710 --> 00:40:03,760
me

1013
00:40:07,670 --> 00:40:06,720

substantial there maybe on the order of

1014
00:40:09,109 --> 00:40:07,680
500 meters

1015
00:40:11,030 --> 00:40:09,119
something like that something that was

1016
00:40:12,550 --> 00:40:11,040
below the detection limit of all the

1017
00:40:13,270 --> 00:40:12,560
telescopes that are looking for example

1018
00:40:14,550 --> 00:40:13,280
hubble

1019
00:40:16,309 --> 00:40:14,560
really wouldn't have been able to see

1020
00:40:17,510 --> 00:40:16,319
something that's smaller than about 500

1021
00:40:19,750 --> 00:40:17,520
meters in size

1022
00:40:20,870 --> 00:40:19,760
even if it had no dust cloud around it

1023
00:40:22,870 --> 00:40:20,880
and so uh

1024
00:40:24,790 --> 00:40:22,880
that's what we're seeing i should say

1025
00:40:26,470 --> 00:40:24,800
that this is kind of a classical problem

1026
00:40:29,190 --> 00:40:26,480
in observing comets

1027
00:40:31,030 --> 00:40:29,200
many comets have been observed to

1028
00:40:34,470 --> 00:40:31,040
essentially turn off

1029
00:40:37,670 --> 00:40:34,480
and disappear and we've always wondered

1030
00:40:38,150 --> 00:40:37,680
what the two hypotheses were did these

1031
00:40:40,630 --> 00:40:38,160
just

1032
00:40:41,910 --> 00:40:40,640
break up and dissipate or did they

1033
00:40:44,390 --> 00:40:41,920
simply shut down

1034
00:40:46,790 --> 00:40:44,400
they stopped being active and therefore

1035
00:40:49,990 --> 00:40:46,800
the all you have is the bear nucleus

1036
00:40:51,430 --> 00:40:50,000
and it's too faint to see and of course

1037
00:40:53,430 --> 00:40:51,440
i think hal and i are very much on the

1038
00:40:55,750 --> 00:40:53,440

same side of this this issue

1039
00:40:57,750 --> 00:40:55,760
and that's why it's so delightful to see

1040
00:41:00,150 --> 00:40:57,760
there really was something left

1041
00:41:02,309 --> 00:41:00,160
when when fragment in hit because it's

1042
00:41:04,069 --> 00:41:02,319
been gone for a long time as hal said

1043
00:41:06,630 --> 00:41:04,079
so the dust was gone but there was still

1044
00:41:09,910 --> 00:41:06,640
a body there and it came on in

1045
00:41:13,030 --> 00:41:09,920
and made an impact a question

1046
00:41:18,950 --> 00:41:16,870
uh jim reston for esquire um

1047
00:41:20,150 --> 00:41:18,960
dr bibi i'm still very confused about

1048
00:41:22,710 --> 00:41:20,160
this water

1049
00:41:25,270 --> 00:41:22,720
issue and the absence of of the

1050
00:41:28,710 --> 00:41:25,280
observation of water

1051
00:41:32,470 --> 00:41:28,720
can you explain just historically how

1052
00:41:36,630 --> 00:41:32,480
astronomers in the past decades deduced

1053
00:41:38,309 --> 00:41:36,640
that there was a band of water 50 to 100

1054
00:41:40,230 --> 00:41:38,319
kilometers deep into jupiter's

1055
00:41:42,790 --> 00:41:40,240
atmosphere

1056
00:41:44,870 --> 00:41:42,800
and that now when you're not seeing it

1057
00:41:46,870 --> 00:41:44,880
obviously

1058
00:41:48,870 --> 00:41:46,880
after all of these impacts does that not

1059
00:41:51,270 --> 00:41:48,880
suggest that there are

1060
00:41:53,030 --> 00:41:51,280
four options here one that there is no

1061
00:41:56,309 --> 00:41:53,040
water there

1062
00:41:57,190 --> 00:41:56,319
or secondly that uh these things are

1063
00:41:59,510 --> 00:41:57,200

exploding

1064
00:42:01,190 --> 00:41:59,520
higher in the atmosphere and not going

1065
00:42:03,349 --> 00:42:01,200
deep in

1066
00:42:04,309 --> 00:42:03,359
or that the impactors themselves are

1067
00:42:06,230 --> 00:42:04,319
much smaller

1068
00:42:09,750 --> 00:42:06,240
and therefore disintegrating before it

1069
00:42:13,109 --> 00:42:09,760
reaches the 50 to 100 kilometer

1070
00:42:16,550 --> 00:42:13,119
range or lastly that the black clouds

1071
00:42:16,950 --> 00:42:16,560
are masking the material that is ejected

1072
00:42:29,430 --> 00:42:16,960
the

1073
00:42:31,670 --> 00:42:29,440
okay would you would you take it first

1074
00:42:32,550 --> 00:42:31,680
how how it was deduced before we had

1075
00:42:34,790 --> 00:42:32,560
this experience

1076
00:42:35,829 --> 00:42:34,800
right don't blame the astronomers for

1077
00:42:40,790 --> 00:42:35,839
this

1078
00:42:44,230 --> 00:42:42,950
basically if you assume that jupiter was

1079
00:42:47,750 --> 00:42:44,240
made out of the same

1080
00:42:50,870 --> 00:42:47,760
thing that the sun was and you

1081
00:42:54,150 --> 00:42:50,880
do the the chemistry

1082
00:42:55,910 --> 00:42:54,160
you realize that when you're going

1083
00:42:57,829 --> 00:42:55,920
into the planet when you reach certain

1084
00:42:59,910 --> 00:42:57,839
temperature the ammonia ice will freeze

1085
00:43:02,230 --> 00:42:59,920
out

1086
00:43:03,670 --> 00:43:02,240
and if you go below that the ammonia ice

1087
00:43:05,910 --> 00:43:03,680
will be gaseous

1088
00:43:08,550 --> 00:43:05,920

but as you continue down doing doing

1089
00:43:10,950 --> 00:43:08,560
your equilibrium chemistry study your

1090
00:43:13,750 --> 00:43:10,960
balanced chemistry studies

1091
00:43:14,069 --> 00:43:13,760
you get to another layer where if there

1092
00:43:19,670 --> 00:43:14,079
is

1093
00:43:20,550 --> 00:43:19,680
they will combine and make a new kind of

1094
00:43:22,870 --> 00:43:20,560
ice

1095
00:43:25,030 --> 00:43:22,880
and finally as you go deeper and deeper

1096
00:43:29,270 --> 00:43:25,040
into this planet that actually

1097
00:43:30,870 --> 00:43:29,280
sends up 165 percent more energy than it

1098
00:43:32,710 --> 00:43:30,880
absorbs from the sun

1099
00:43:34,790 --> 00:43:32,720
to get down to those deeper temperatures

1100
00:43:36,790 --> 00:43:34,800
you finally get down there to where

1101
00:43:38,309 --> 00:43:36,800
the temperature is about zero degrees

1102
00:43:40,790 --> 00:43:38,319
centigrade

1103
00:43:42,150 --> 00:43:40,800
and then you're going to have water if

1104
00:43:43,829 --> 00:43:42,160
there's any oxygen

1105
00:43:46,150 --> 00:43:43,839
because you've got hydrogen all the way

1106
00:43:49,030 --> 00:43:46,160
through now

1107
00:43:51,990 --> 00:43:49,040
an obvious reason that we are not seeing

1108
00:43:55,270 --> 00:43:52,000
this water is we didn't get down to it

1109
00:43:57,510 --> 00:43:55,280
and that's an easy one but we then must

1110
00:43:59,030 --> 00:43:57,520
look very carefully at all the spectra

1111
00:44:02,150 --> 00:43:59,040
get identify

1112
00:44:03,990 --> 00:44:02,160
all of the molecules and try to get a

1113
00:44:06,630 --> 00:44:04,000

self-consistent idea and again

1114
00:44:07,829 --> 00:44:06,640
the chemists are going to come back and

1115
00:44:10,790 --> 00:44:07,839
take over in the final

1116
00:44:11,270 --> 00:44:10,800
analysis and tell us whether we're right

1117
00:44:12,870 --> 00:44:11,280
that's

1118
00:44:15,270 --> 00:44:12,880
one of the very nice things about

1119
00:44:15,750 --> 00:44:15,280
studying planetary science we have

1120
00:44:18,790 --> 00:44:15,760
enough

1121
00:44:21,109 --> 00:44:18,800
different types of data that

1122
00:44:23,190 --> 00:44:21,119
the astronomer goes out and gets it and

1123
00:44:24,950 --> 00:44:23,200
then the chemist and the meteorologist

1124
00:44:26,790 --> 00:44:24,960
and everybody else tells us we're wrong

1125
00:44:28,710 --> 00:44:26,800
and starts working on new models that

1126
00:44:31,670 --> 00:44:28,720
improve it

1127
00:44:32,230 --> 00:44:31,680
so at this point in time i tend to favor

1128
00:44:35,430 --> 00:44:32,240
that we

1129
00:44:36,390 --> 00:44:35,440
didn't reach the water level but that

1130
00:44:38,950 --> 00:44:36,400
water

1131
00:44:41,030 --> 00:44:38,960
level is sort of a nebulous little thing

1132
00:44:44,309 --> 00:44:41,040
it ought to be there but we really have

1133
00:44:47,349 --> 00:44:44,319
never got a good sounding of it

1134
00:44:49,589 --> 00:44:47,359
so i just to encapsulate it is the

1135
00:44:49,990 --> 00:44:49,599
historical view that there is a band of

1136
00:44:53,670 --> 00:44:50,000
water

1137
00:44:57,750 --> 00:44:53,680
50 to 100 yes is that in jeopardy

1138
00:44:59,589 --> 00:44:57,760

that theory no i don't think so

1139
00:45:01,829 --> 00:44:59,599
unless when we've worked this out we

1140
00:45:02,710 --> 00:45:01,839
decide that they had to penetrate that

1141
00:45:04,950 --> 00:45:02,720
deep

1142
00:45:07,030 --> 00:45:04,960
then we'll have to raise that question

1143
00:45:07,829 --> 00:45:07,040
and if that's the case then in december

1144
00:45:10,550 --> 00:45:07,839
of 95

1145
00:45:13,510 --> 00:45:10,560
the galileo probe goes in and we get

1146
00:45:16,550 --> 00:45:13,520
another crack at answering it

1147
00:45:18,230 --> 00:45:16,560
miles and we'll come back to this side

1148
00:45:19,589 --> 00:45:18,240
miles o'brien with cnn and this would be

1149
00:45:20,309 --> 00:45:19,599
for anybody who wants to take it there's

1150
00:45:22,790 --> 00:45:20,319
a report out

1151
00:45:24,230 --> 00:45:22,800
of australia this morning that observers

1152
00:45:27,109 --> 00:45:24,240
there actually saw

1153
00:45:27,829 --> 00:45:27,119
a flash in the ring of jupiter uh

1154
00:45:29,589 --> 00:45:27,839
question is

1155
00:45:32,069 --> 00:45:29,599
are you surprised that we haven't seen

1156
00:45:35,109 --> 00:45:32,079
more of these observations before

1157
00:45:37,109 --> 00:45:35,119
and what did you hope to learn from the

1158
00:45:38,870 --> 00:45:37,119
flash sightings indirectly in the first

1159
00:45:40,870 --> 00:45:38,880
place

1160
00:45:43,270 --> 00:45:40,880
well for one should remember seeing the

1161
00:45:46,150 --> 00:45:43,280
ring of jupiter is a bit of a feat

1162
00:45:48,550 --> 00:45:46,160
in itself it was of course discovered

1163
00:45:51,030 --> 00:45:48,560

with voyager 1

1164
00:45:52,309 --> 00:45:51,040
and only later was it actually seen from

1165
00:45:55,270 --> 00:45:52,319
telescopes on the ground

1166
00:45:55,829 --> 00:45:55,280
mostly you need a pretty big telescope

1167
00:45:58,790 --> 00:45:55,839
and

1168
00:45:59,750 --> 00:45:58,800
the best trick is to look uh in an in an

1169
00:46:02,710 --> 00:45:59,760
ammonia ban

1170
00:46:04,390 --> 00:46:02,720
excuse me a methane band so that you can

1171
00:46:06,630 --> 00:46:04,400
reduce the light of jupiter

1172
00:46:08,710 --> 00:46:06,640
but where the ring might be bright that

1173
00:46:10,470 --> 00:46:08,720
was being observed i should say a

1174
00:46:11,589 --> 00:46:10,480
palomar observatory with a 200 inch

1175
00:46:15,750 --> 00:46:11,599
telescope

1176
00:46:18,390 --> 00:46:15,760
another good one to do this experiment

1177
00:46:19,190 --> 00:46:18,400
but it's difficult what one really hopes

1178
00:46:21,589 --> 00:46:19,200
to see

1179
00:46:22,710 --> 00:46:21,599
since the ring is in close however it's

1180
00:46:25,910 --> 00:46:22,720
really faint

1181
00:46:27,750 --> 00:46:25,920
the ring is in close if you can capture

1182
00:46:29,589 --> 00:46:27,760
the flash of the initial entry meteor

1183
00:46:31,910 --> 00:46:29,599
that was one way we could

1184
00:46:33,190 --> 00:46:31,920
by observations on the ground determine

1185
00:46:35,750 --> 00:46:33,200
the actual moment

1186
00:46:37,589 --> 00:46:35,760
of entry into the atmosphere that those

1187
00:46:39,349 --> 00:46:37,599
first few seconds

1188
00:46:41,190 --> 00:46:39,359

as the meteor is just plunging in the

1189
00:46:42,710 --> 00:46:41,200
upper atmosphere we're hoping i should

1190
00:46:44,230 --> 00:46:42,720
get a timing on that of course it gets

1191
00:46:45,349 --> 00:46:44,240
them very bright as it approaches the

1192
00:46:48,309 --> 00:46:45,359
ammonia clouds

1193
00:46:50,069 --> 00:46:48,319
so being a that times the actual impact

1194
00:46:50,550 --> 00:46:50,079
for us and that's an important thing to

1195
00:46:52,230 --> 00:46:50,560
do

1196
00:46:53,589 --> 00:46:52,240
it's a delight we heard this morning

1197
00:46:55,190 --> 00:46:53,599
that they're actually seeing those

1198
00:46:58,390 --> 00:46:55,200
flashes now

1199
00:47:01,670 --> 00:46:58,400
and picking them up i think that's very

1200
00:47:04,950 --> 00:47:03,349
that people thought you might see

1201
00:47:06,870 --> 00:47:04,960
flashes and it was also some of the

1202
00:47:08,710 --> 00:47:06,880
satellites and i might be mistaken but i

1203
00:47:10,069 --> 00:47:08,720
don't think i've heard many reports of

1204
00:47:11,910 --> 00:47:10,079
flashes being observable in the

1205
00:47:14,710 --> 00:47:11,920
satellites right i can

1206
00:47:15,349 --> 00:47:14,720
i can speak to that miles um there have

1207
00:47:18,790 --> 00:47:15,359
i have

1208
00:47:22,069 --> 00:47:18,800
four negative reports of

1209
00:47:24,309 --> 00:47:22,079
uh the absence of flashes observed off

1210
00:47:25,670 --> 00:47:24,319
as reflected off of the satellites of

1211
00:47:30,069 --> 00:47:25,680
jupiter so

1212
00:47:30,079 --> 00:47:41,750
everything was that yes

1213
00:47:46,630 --> 00:47:44,230

um people people have looked for

1214
00:47:47,430 --> 00:47:46,640
evidence of flashes off of the galilean

1215
00:47:49,270 --> 00:47:47,440
satellites

1216
00:47:51,510 --> 00:47:49,280
the reflection from the flash as it

1217
00:47:54,790 --> 00:47:51,520
impacts jupiter

1218
00:47:57,270 --> 00:47:54,800
they have reported not seeing that so um

1219
00:47:58,790 --> 00:47:57,280
that has that has not happened and and

1220
00:48:00,309 --> 00:47:58,800
i'd like to talk to you later about

1221
00:48:01,589 --> 00:48:00,319
seeing flashes off the rings because

1222
00:48:02,390 --> 00:48:01,599
they were trying they were looking for

1223
00:48:11,190 --> 00:48:02,400
that and

1224
00:48:17,510 --> 00:48:14,390
candidate was k because

1225
00:48:18,549 --> 00:48:17,520
europa was in shadow those observations

1226
00:48:20,710 --> 00:48:18,559
were going to be made

1227
00:48:22,790 --> 00:48:20,720
mostly in australia uh could have been

1228
00:48:24,710 --> 00:48:22,800
made in hawaii that's the region

1229
00:48:26,069 --> 00:48:24,720
and i haven't heard they were made and

1230
00:48:28,549 --> 00:48:26,079
they reported negative

1231
00:48:30,790 --> 00:48:28,559
not seeing anything there is one

1232
00:48:34,309 --> 00:48:30,800
probable observation of a flash

1233
00:48:34,870 --> 00:48:34,319
from uh israel of a flash reflected on

1234
00:48:39,670 --> 00:48:34,880
europa

1235
00:48:42,150 --> 00:48:39,680
uh one of the satellites it is a 0.06

1236
00:48:42,870 --> 00:48:42,160
magnitude uh six hundredths of a

1237
00:48:45,270 --> 00:48:42,880
magnitude

1238
00:48:47,030 --> 00:48:45,280

increase right yeah it's listed as a

1239
00:48:48,870 --> 00:48:47,040
probable though not a definite

1240
00:48:50,870 --> 00:48:48,880
rita you had something you wanted to add

1241
00:48:52,950 --> 00:48:50,880
to this a second reason for wanting to

1242
00:48:55,190 --> 00:48:52,960
see the fireball is that you know

1243
00:48:56,870 --> 00:48:55,200
how far the ring is from the surface of

1244
00:48:58,390 --> 00:48:56,880
jupiter and if you can measure the

1245
00:49:01,589 --> 00:48:58,400
increase of brightness

1246
00:49:03,910 --> 00:49:01,599
off of that ring surface and

1247
00:49:05,910 --> 00:49:03,920
you have a little an idea of the

1248
00:49:09,430 --> 00:49:05,920
particle density in that ring from the

1249
00:49:12,390 --> 00:49:09,440
voyager data how thick the stuff is then

1250
00:49:14,069 --> 00:49:12,400
you would have a measure of the fireball

1251
00:49:14,950 --> 00:49:14,079
itself we haven't been seeing the

1252
00:49:17,030 --> 00:49:14,960
fireball

1253
00:49:18,870 --> 00:49:17,040
and had you gotten a sequence of these

1254
00:49:20,470 --> 00:49:18,880
even though you didn't understand the

1255
00:49:22,549 --> 00:49:20,480
ring

1256
00:49:23,750 --> 00:49:22,559
the difference in brightness would give

1257
00:49:27,829 --> 00:49:23,760
you

1258
00:49:29,670 --> 00:49:27,839
this relative strengths of the fireballs

1259
00:49:31,670 --> 00:49:29,680
when rita says fireball now she's

1260
00:49:34,390 --> 00:49:31,680
meaning what's traditionally used as

1261
00:49:36,150 --> 00:49:34,400
fireball for a very bright meteor

1262
00:49:38,309 --> 00:49:36,160
that's right rather rather than the

1263
00:49:39,190 --> 00:49:38,319

fireball we've been using it here in

1264
00:49:40,950 --> 00:49:39,200
this group

1265
00:49:42,630 --> 00:49:40,960
as as something formed deep in the

1266
00:49:44,470 --> 00:49:42,640
atmosphere performing the plume i just

1267
00:49:47,670 --> 00:49:44,480
wanted to clarify that

1268
00:49:49,910 --> 00:49:47,680
yes this would be the initial flush

1269
00:49:52,710 --> 00:49:49,920
which would be very closely related to

1270
00:49:54,470 --> 00:49:52,720
the amount of energy that was going in

1271
00:49:56,470 --> 00:49:54,480
it hasn't really even interacted with

1272
00:49:58,230 --> 00:49:56,480
the atmosphere yet so it would be very

1273
00:49:59,589 --> 00:49:58,240
fascinating to get a whole series of

1274
00:50:01,349 --> 00:49:59,599
these flashes and then just

1275
00:50:02,710 --> 00:50:01,359
well that one had the most energy and

1276
00:50:04,230 --> 00:50:02,720
right well galileo's doing

1277
00:50:06,790 --> 00:50:04,240
galileo is doing that the

1278
00:50:09,990 --> 00:50:06,800
photopolarimeter radiometer on galileo

1279
00:50:11,270 --> 00:50:10,000
will have that information we're going

1280
00:50:13,030 --> 00:50:11,280
to have time for about one more

1281
00:50:14,390 --> 00:50:13,040
question here and then we have to go to

1282
00:50:16,390 --> 00:50:14,400
headquarters and

1283
00:50:17,990 --> 00:50:16,400
we'll we'll have more time after the

1284
00:50:20,230 --> 00:50:18,000
satellite goes

1285
00:50:21,510 --> 00:50:20,240
uh david chandler from the boston globe

1286
00:50:25,990 --> 00:50:21,520
for dr bibi

1287
00:50:29,510 --> 00:50:26,000
um two questions um on the uh

1288
00:50:32,309 --> 00:50:29,520

uh latest color image of the g

1289
00:50:34,230 --> 00:50:32,319
impact site um how do you interpret that

1290
00:50:35,030 --> 00:50:34,240
uh apparent sort of brownish color that

1291
00:50:36,630 --> 00:50:35,040
we're seeing there

1292
00:50:38,390 --> 00:50:36,640
or can we learn anything from that

1293
00:50:41,430 --> 00:50:38,400
coloring and secondly

1294
00:50:44,069 --> 00:50:41,440
um comparing the initial

1295
00:50:44,870 --> 00:50:44,079
photos of the g impact site and the most

1296
00:50:46,710 --> 00:50:44,880
recent ones

1297
00:50:49,349 --> 00:50:46,720
what can you say about the evolution of

1298
00:50:51,190 --> 00:50:49,359
that impact site

1299
00:50:52,549 --> 00:50:51,200
well first of all this large feature

1300
00:50:56,390 --> 00:50:52,559
we're seeing

1301
00:51:00,069 --> 00:50:56,400
has to be high on the atmosphere because

1302
00:51:01,670 --> 00:51:00,079
looking at the different the image in

1303
00:51:03,990 --> 00:51:01,680
different colors

1304
00:51:06,230 --> 00:51:04,000
you can literally see the east-west

1305
00:51:06,630 --> 00:51:06,240
cloud patterns to the north of it just

1306
00:51:10,950 --> 00:51:06,640
pass

1307
00:51:13,670 --> 00:51:10,960
right through this structure i mean

1308
00:51:15,990 --> 00:51:13,680
this was an olympic ten dive when it

1309
00:51:16,870 --> 00:51:16,000
went in it didn't splash the atmosphere

1310
00:51:20,150 --> 00:51:16,880
the atmosphere

1311
00:51:22,790 --> 00:51:20,160
underneath looks very undisturbed

1312
00:51:24,790 --> 00:51:22,800
just passed right on through and what

1313
00:51:26,470 --> 00:51:24,800

came back out must have come right back

1314
00:51:27,109 --> 00:51:26,480
out the chimney that the in-going

1315
00:51:29,270 --> 00:51:27,119
particle

1316
00:51:31,109 --> 00:51:29,280
developed so what you've seen see now as

1317
00:51:34,390 --> 00:51:31,119
you see this

1318
00:51:37,670 --> 00:51:34,400
huge umbrella of material

1319
00:51:39,589 --> 00:51:37,680
above the site now the reason i'm on

1320
00:51:40,390 --> 00:51:39,599
this team is that i wanted to see a

1321
00:51:42,150 --> 00:51:40,400
bubble come up

1322
00:51:43,670 --> 00:51:42,160
out of that site and interact with the

1323
00:51:46,470 --> 00:51:43,680
winds and

1324
00:51:48,230 --> 00:51:46,480
uh i would then understand how much

1325
00:51:50,150 --> 00:51:48,240
energy it had taken for all the storms

1326
00:51:53,270 --> 00:51:50,160
i've been watching for the last 25

1327
00:51:56,950 --> 00:51:53,280
years but so far my bubble hasn't come

1328
00:51:58,549 --> 00:51:56,960
up and my bubble may be under that brown

1329
00:52:01,829 --> 00:51:58,559
material but if that brown

1330
00:52:04,230 --> 00:52:01,839
material were down on in the

1331
00:52:05,030 --> 00:52:04,240
ammonia cloud deck it would be stringing

1332
00:52:07,829 --> 00:52:05,040
out

1333
00:52:09,670 --> 00:52:07,839
it would be headed north along it would

1334
00:52:10,390 --> 00:52:09,680
be headed east along the north side of

1335
00:52:12,069 --> 00:52:10,400
the spot

1336
00:52:13,829 --> 00:52:12,079
and it would be headed west along the

1337
00:52:15,510 --> 00:52:13,839
south side of the spot so you just see

1338
00:52:18,470 --> 00:52:15,520

the things starting to

1339
00:52:19,670 --> 00:52:18,480
run out as abandoned street we don't see

1340
00:52:23,349 --> 00:52:19,680
that

1341
00:52:25,670 --> 00:52:23,359
tropospheric winds

1342
00:52:27,270 --> 00:52:25,680
and we expect those winds to drop off

1343
00:52:28,950 --> 00:52:27,280
with height in the atmosphere when you

1344
00:52:29,750 --> 00:52:28,960
get up to a certain point you wouldn't

1345
00:52:31,589 --> 00:52:29,760
expect

1346
00:52:33,270 --> 00:52:31,599
it to be sheared out so that that's

1347
00:52:35,030 --> 00:52:33,280
another limiting

1348
00:52:37,510 --> 00:52:35,040
piece of observation that says this

1349
00:52:41,589 --> 00:52:37,520
stuff is definitely high

1350
00:52:43,750 --> 00:52:41,599
to me that it's probably twofold it's

1351
00:52:44,829 --> 00:52:43,760
probably particle formation which really

1352
00:52:51,750 --> 00:52:44,839
obscures

1353
00:52:54,630 --> 00:52:53,430
we'll take questions from headquarters

1354
00:52:57,510 --> 00:52:54,640
now please state your name and

1355
00:53:02,870 --> 00:53:00,950
this is dick kerf science magazine

1356
00:53:04,069 --> 00:53:02,880
have there been any attempted

1357
00:53:06,630 --> 00:53:04,079
observations of

1358
00:53:09,510 --> 00:53:06,640
the impact of fragment j and if so what

1359
00:53:13,030 --> 00:53:11,750
i don't recall hearing anything anyone

1360
00:53:15,510 --> 00:53:13,040
else

1361
00:53:16,710 --> 00:53:15,520
that was one of the other missing nuclei

1362
00:53:18,230 --> 00:53:16,720
the thing that this one of the ones that

1363
00:53:20,549 --> 00:53:18,240

disappeared that was seen early

1364
00:53:21,750 --> 00:53:20,559
in the spring i guess last year in fact

1365
00:53:25,109 --> 00:53:21,760
that disappeared even before

1366
00:53:26,549 --> 00:53:25,119
uh before july of last year i believe

1367
00:53:29,109 --> 00:53:26,559
so that was you know that must have been

1368
00:53:30,630 --> 00:53:29,119
a really small one no no reports of that

1369
00:53:32,309 --> 00:53:30,640
i wouldn't be surprised if we look back

1370
00:53:38,309 --> 00:53:32,319
in our data and uh

1371
00:53:44,309 --> 00:53:41,349
david miller u.s news and world report

1372
00:53:46,230 --> 00:53:44,319
do we know the size of the diameter of

1373
00:53:51,430 --> 00:53:46,240
the so-called fireball from the impact

1374
00:53:56,069 --> 00:53:54,790
well i think we do have a pretty good

1375
00:53:59,510 --> 00:53:56,079
measure we saw

1376
00:54:03,829 --> 00:53:59,520
uh g uh well enough and

1377
00:54:06,309 --> 00:54:03,839
actually um one could compare it

1378
00:54:08,470 --> 00:54:06,319
with the with a whole series of uh

1379
00:54:13,109 --> 00:54:08,480
images that we saw on the limb from a

1380
00:54:18,309 --> 00:54:13,119
and from e that the initial fireball

1381
00:54:22,470 --> 00:54:18,319
would probably grow to a diameter

1382
00:54:27,349 --> 00:54:25,670
8 000 kilometers before it starts to

1383
00:54:30,870 --> 00:54:27,359
collapse

1384
00:54:36,710 --> 00:54:30,880
and then as it flattens back out again

1385
00:54:36,720 --> 00:54:41,190
does that answer the question

1386
00:54:47,589 --> 00:54:44,309
okay we're coming back to goddard now uh

1387
00:54:52,870 --> 00:54:48,950
this is mark crow of the houston

1388
00:54:56,150 --> 00:54:52,880

chronicle could you go over again

1389
00:54:56,789 --> 00:54:56,160
about when m hit and who saw it who

1390
00:54:59,190 --> 00:54:56,799
reported

1391
00:55:00,390 --> 00:54:59,200
who gets credit for that and how does

1392
00:55:03,910 --> 00:55:00,400
that change the

1393
00:55:05,990 --> 00:55:03,920
the total of of known impacts

1394
00:55:07,589 --> 00:55:06,000
that you think will happen and is it

1395
00:55:09,589 --> 00:55:07,599
possible that there are some other

1396
00:55:11,030 --> 00:55:09,599
fragments that have turned off and on

1397
00:55:13,430 --> 00:55:11,040
and that may have hit

1398
00:55:14,950 --> 00:55:13,440
and and will you go back somehow and try

1399
00:55:18,230 --> 00:55:14,960
to figure that out

1400
00:55:20,549 --> 00:55:18,240
okay um yeah this the reports of

1401
00:55:21,589 --> 00:55:20,559
observations of fragment m were made by

1402
00:55:25,030 --> 00:55:21,599
imka depayder

1403
00:55:27,910 --> 00:55:25,040
at the keck telescope on mauna kea

1404
00:55:29,430 --> 00:55:27,920
um and when she saw it she wasn't sure

1405
00:55:31,109 --> 00:55:29,440
if uh

1406
00:55:33,190 --> 00:55:31,119
you know she observed a flash but she

1407
00:55:35,190 --> 00:55:33,200
wasn't sure what was going on i mean so

1408
00:55:36,789 --> 00:55:35,200
she even didn't say anything about it

1409
00:55:38,870 --> 00:55:36,799
about it for a day

1410
00:55:39,829 --> 00:55:38,880
but then had a co i i talked to her on

1411
00:55:41,910 --> 00:55:39,839
the phone and she

1412
00:55:43,990 --> 00:55:41,920
we our interactions convinced her that

1413
00:55:45,430 --> 00:55:44,000

she had probably was probably detecting

1414
00:55:48,470 --> 00:55:45,440
it

1415
00:55:50,789 --> 00:55:48,480
this is the type of

1416
00:55:53,030 --> 00:55:50,799
thing that's going to make us go back

1417
00:55:56,309 --> 00:55:53,040
and look in our data for other

1418
00:55:57,349 --> 00:55:56,319
you know other small signals or

1419
00:56:01,349 --> 00:55:57,359
relatively small

1420
00:56:03,589 --> 00:56:01,359
signals in this case and and you know

1421
00:56:05,270 --> 00:56:03,599
do some quantitative calculations and i

1422
00:56:08,309 --> 00:56:05,280
think it's possible we'll

1423
00:56:15,589 --> 00:56:08,319
uh you know find more of these now i'm

1424
00:56:18,870 --> 00:56:17,270
yeah sorry i just wondered how this

1425
00:56:21,270 --> 00:56:18,880
changed the fragment

1426
00:56:21,990 --> 00:56:21,280
count now for the whole for the whole

1427
00:56:23,990 --> 00:56:22,000
training

1428
00:56:25,670 --> 00:56:24,000
count well boy i'm so confused that

1429
00:56:29,109 --> 00:56:25,680
counting is getting difficult

1430
00:56:30,710 --> 00:56:29,119
um i mean i would say okay we're saying

1431
00:56:33,510 --> 00:56:30,720
they're 21

1432
00:56:36,069 --> 00:56:33,520
and so that boy i don't even know if m

1433
00:56:38,069 --> 00:56:36,079
was included in our 21 count

1434
00:56:40,710 --> 00:56:38,079
too tough a question m and j were parts

1435
00:56:44,230 --> 00:56:40,720
of the original count of 21

1436
00:56:45,829 --> 00:56:44,240
uh as as designated from the mauna kea

1437
00:56:49,990 --> 00:56:45,839
observations by david

1438
00:56:53,030 --> 00:56:50,000

jewett and jane liu since that time

1439
00:56:54,870 --> 00:56:53,040
m and j had disappeared but more

1440
00:56:58,150 --> 00:56:54,880
fragments at four

1441
00:57:01,430 --> 00:56:58,160
so q split

1442
00:57:02,710 --> 00:57:01,440
uh into two fragments p split into two

1443
00:57:05,750 --> 00:57:02,720
fragments

1444
00:57:06,789 --> 00:57:05,760
mean times p2 disappeared or became a

1445
00:57:09,670 --> 00:57:06,799
puff

1446
00:57:11,190 --> 00:57:09,680
uh in addition there was a fragment that

1447
00:57:14,870 --> 00:57:11,200
split off of

1448
00:57:16,549 --> 00:57:14,880
g g and rather more recently

1449
00:57:18,470 --> 00:57:16,559
this reminds me of the games my dad used

1450
00:57:21,510 --> 00:57:18,480
to play with me at dinner time and

1451
00:57:23,030 --> 00:57:21,520
doing sequence of arithmetic

1452
00:57:25,109 --> 00:57:23,040
where are we now if there's something

1453
00:57:26,789 --> 00:57:25,119
left from all of these splittings

1454
00:57:30,549 --> 00:57:26,799
then we've got a total count that's

1455
00:57:36,230 --> 00:57:33,589
possibly i can i can think of at least

1456
00:57:38,549 --> 00:57:36,240
four more or three more that you would

1457
00:57:39,910 --> 00:57:38,559
add to that count

1458
00:57:41,109 --> 00:57:39,920
now where they're all still there that's

1459
00:57:41,589 --> 00:57:41,119
comes out of the issue is there

1460
00:57:44,630 --> 00:57:41,599
something

1461
00:57:46,870 --> 00:57:44,640
left when the when that thing disappears

1462
00:57:48,710 --> 00:57:46,880
but you talk about 24 that we might hope

1463
00:57:50,950 --> 00:57:48,720

to see yeah and also just

1464
00:57:52,549 --> 00:57:50,960
um don't don't turn off the set quite

1465
00:57:55,670 --> 00:57:52,559
yet after tomorrow

1466
00:57:57,670 --> 00:57:55,680
uh the the trailing wing is going to

1467
00:57:58,950 --> 00:57:57,680
continue to impact jupiter these are

1468
00:58:01,030 --> 00:57:58,960
small small particles

1469
00:58:03,349 --> 00:58:01,040
a wing of dust mostly it's mostly a wing

1470
00:58:05,430 --> 00:58:03,359
of dust really tiny particles uh dust

1471
00:58:07,190 --> 00:58:05,440
sand grain size maybe even smaller

1472
00:58:09,349 --> 00:58:07,200
but we don't know what the real sources

1473
00:58:11,670 --> 00:58:09,359
of the dust were maybe they're boulders

1474
00:58:13,030 --> 00:58:11,680
yes they they may be larger but the the

1475
00:58:16,390 --> 00:58:13,040
interesting thing is that

1476
00:58:16,950 --> 00:58:16,400
the impact sites as you can see from the

1477
00:58:20,950 --> 00:58:16,960
site

1478
00:58:35,109 --> 00:58:20,960
of v w tomorrow much closer to the

1479
00:58:39,990 --> 00:58:38,069
closely available for the next few weeks

1480
00:58:43,270 --> 00:58:40,000
they're expected to be most common

1481
00:58:46,470 --> 00:58:43,280
the most active uh between

1482
00:58:48,630 --> 00:58:46,480
the end of the impacts tomorrow and

1483
00:58:50,390 --> 00:58:48,640
the end of september i think and they're

1484
00:58:52,630 --> 00:58:50,400
going to be progressively moving on to

1485
00:58:53,670 --> 00:58:52,640
the side that we see so the number of

1486
00:58:55,510 --> 00:58:53,680
fragments

1487
00:58:56,630 --> 00:58:55,520
if you count all these little guys

1488
00:58:58,549 --> 00:58:56,640

coming in could go up quite

1489
00:59:02,309 --> 00:58:58,559
substantially

1490
00:59:04,789 --> 00:59:02,319
we have time for one more here okay

1491
00:59:05,750 --> 00:59:04,799
i have questions on dr river uh i want

1492
00:59:07,670 --> 00:59:05,760
to ask about the

1493
00:59:09,349 --> 00:59:07,680
remaining or the bureau of dust you know

1494
00:59:11,990 --> 00:59:09,359
will that cause the

1495
00:59:13,190 --> 00:59:12,000
material shower you know every year to

1496
00:59:16,789 --> 00:59:13,200
jupiter or the

1497
00:59:19,990 --> 00:59:16,799
will it uh tighten the jupiter sling

1498
00:59:22,150 --> 00:59:20,000
or what happened to the fall dust yeah

1499
00:59:23,990 --> 00:59:22,160
there is a substantial amount of dust

1500
00:59:26,870 --> 00:59:24,000
that actually misses jupiter

1501
00:59:28,390 --> 00:59:26,880
it stays in orbit around jupiter uh gene

1502
00:59:30,470 --> 00:59:28,400
i'll have to defer to you as to what's

1503
00:59:32,069 --> 00:59:30,480
what's the ultimate fate of that dust

1504
00:59:34,230 --> 00:59:32,079
well uh there's a

1505
00:59:36,950 --> 00:59:34,240
an astrophysicist at the university of

1506
00:59:39,030 --> 00:59:36,960
colorado boulder by the name of haranye

1507
00:59:40,230 --> 00:59:39,040
who's done a very careful study of what

1508
00:59:43,109 --> 00:59:40,240
happens to the

1509
00:59:45,030 --> 00:59:43,119
dust that's in the tail which which will

1510
00:59:46,630 --> 00:59:45,040
all the collective tails which will stay

1511
00:59:48,789 --> 00:59:46,640
in orbit around jupiter

1512
00:59:50,230 --> 00:59:48,799
and his analysis indicates when you take

1513
00:59:53,750 --> 00:59:50,240

account of all the forces

1514
00:59:56,390 --> 00:59:53,760
acting on these particles which includes

1515
00:59:56,870 --> 00:59:56,400
magnetic forces because these will

1516
00:59:59,430 --> 00:59:56,880
become

1517
01:00:00,069 --> 00:59:59,440
charged as as well as the more

1518
01:00:01,750 --> 01:00:00,079
conventional

1519
01:00:03,030 --> 01:00:01,760
forces that we're used to thinking of i

1520
01:00:05,190 --> 01:00:03,040
don't want to give all these are

1521
01:00:07,270 --> 01:00:05,200
pointing robertson effect and there's

1522
01:00:08,710 --> 01:00:07,280
direct solar radiation pressure and so

1523
01:00:10,789 --> 01:00:08,720
on uh

1524
01:00:12,710 --> 01:00:10,799
his analysis indicates that this dust

1525
01:00:15,589 --> 01:00:12,720
will gradually settle down

1526
01:00:17,270 --> 01:00:15,599
into more or less circular orbits and

1527
01:00:21,190 --> 01:00:17,280
form a very diffuse

1528
01:00:22,470 --> 01:00:21,200
kind of tall ring outside of the present

1529
01:00:25,030 --> 01:00:22,480
ring

1530
01:00:26,470 --> 01:00:25,040
of jupiter now whether there will be

1531
01:00:29,190 --> 01:00:26,480
enough dust there for

1532
01:00:29,990 --> 01:00:29,200
anyone to see anything that's another

1533
01:00:31,750 --> 01:00:30,000
question

1534
01:00:34,789 --> 01:00:31,760
but at least that's that's where it's

1535
01:00:38,069 --> 01:00:37,190
okay uh we we're going to have to uh

1536
01:00:41,190 --> 01:00:38,079
stop at that

1537
01:00:42,789 --> 01:00:41,200
for right now and have time to uh and

1538
01:00:45,270 --> 01:00:42,799

let you remind you again about the

1539
01:00:47,829 --> 01:00:45,280
briefing changes tomorrow at 2 p.m

1540
01:00:49,270 --> 01:00:47,839
and saturday at 11 a.m eastern time we

1541
01:00:51,990 --> 01:00:49,280
will clean feed

1542
01:00:53,109 --> 01:00:52,000
the video and if i could also ask for

1543
01:00:55,589 --> 01:00:53,119
just a moment here and

1544
01:00:57,109 --> 01:00:55,599
introduce from nasa headquarters the

1545
01:01:01,030 --> 01:00:57,119
nasa chief scientist

1546
01:01:04,309 --> 01:01:03,349
thank you on behalf of the nasa

1547
01:01:05,829 --> 01:01:04,319
administrator

1548
01:01:07,910 --> 01:01:05,839
i'd like to congratulate all the

1549
01:01:09,750 --> 01:01:07,920
participants in this event

1550
01:01:11,750 --> 01:01:09,760
for the inspiration that they continue

1551
01:01:13,589 --> 01:01:11,760
to give and for their hard work and

1552
01:01:15,750 --> 01:01:13,599
dedication

1553
01:01:18,150 --> 01:01:15,760
who of us can never forget the faces of

1554
01:01:19,910 --> 01:01:18,160
the young observers as they saw the data

1555
01:01:21,829 --> 01:01:19,920
come across this computer screen for the

1556
01:01:24,150 --> 01:01:21,839
first time i know i'm not going to

1557
01:01:26,150 --> 01:01:24,160
forget the face of heidi hamill and my

1558
01:01:28,390 --> 01:01:26,160
own intense suspense as i saw

1559
01:01:29,750 --> 01:01:28,400
roger yell keeping us back from finding

1560
01:01:31,910 --> 01:01:29,760
out exactly what

1561
01:01:32,789 --> 01:01:31,920
was uh that element in the ultraviolet

1562
01:01:36,309 --> 01:01:32,799
spectrum of the g

1563
01:01:39,270 --> 01:01:36,319

impact site astronomy is about

1564
01:01:39,750 --> 01:01:39,280
transforming images those images that

1565
01:01:42,950 --> 01:01:39,760
turn

1566
01:01:44,950 --> 01:01:42,960
upside down our world view and that give

1567
01:01:46,630 --> 01:01:44,960
us a new perspective on ourselves and on

1568
01:01:48,309 --> 01:01:46,640
nature

1569
01:01:50,829 --> 01:01:48,319
what we see here this week is the

1570
01:01:52,150 --> 01:01:50,839
culmination of nearly a year of intense

1571
01:01:54,390 --> 01:01:52,160
preparation

1572
01:01:56,390 --> 01:01:54,400
our goal of providing information and

1573
01:01:58,549 --> 01:01:56,400
data in a timely fashion

1574
01:02:00,630 --> 01:01:58,559
is being accomplished and with the

1575
01:02:01,990 --> 01:02:00,640
continued participation of these various

1576
01:02:04,390 --> 01:02:02,000
individuals

1577
01:02:05,270 --> 01:02:04,400
we will continue to bring news of this

1578
01:02:06,950 --> 01:02:05,280
comment

1579
01:02:09,990 --> 01:02:06,960
through saturday i understand there's

1580
01:02:11,589 --> 01:02:10,000
five uh pieces of the comet left to go

1581
01:02:13,109 --> 01:02:11,599
and in the next few months we'll be

1582
01:02:14,630 --> 01:02:13,119
observing the after effects of the

1583
01:02:17,109 --> 01:02:14,640
comet's impacts

1584
01:02:17,910 --> 01:02:17,119
expecting to gain new and unprecedented

1585
01:02:19,750 --> 01:02:17,920
insight

1586
01:02:21,510 --> 01:02:19,760
into the origin and evolution of the

1587
01:02:23,750 --> 01:02:21,520
solar system

1588
01:02:25,190 --> 01:02:23,760

i think in particular eugene and carolyn

1589
01:02:27,270 --> 01:02:25,200
shoemaker and david levy

1590
01:02:28,870 --> 01:02:27,280
the discoverers of the comet for their

1591
01:02:31,349 --> 01:02:28,880
efforts over the last week

1592
01:02:32,069 --> 01:02:31,359
to discuss not only the unique

1593
01:02:34,549 --> 01:02:32,079
scientific

1594
01:02:36,549 --> 01:02:34,559
values of these impacts but to express

1595
01:02:38,950 --> 01:02:36,559
the excitement of science

1596
01:02:41,910 --> 01:02:38,960
they're an inspiration to all of us and

1597
01:02:44,069 --> 01:02:41,920
i thank the young observer scientists

1598
01:02:45,829 --> 01:02:44,079
because they touch the future of lifting

1599
01:02:47,670 --> 01:02:45,839
the imaginations and fueling the

1600
01:02:49,670 --> 01:02:47,680
aspirations of young people all around

1601
01:02:51,190 --> 01:02:49,680
the world

1602
01:02:53,109 --> 01:02:51,200
the observations of this comet

1603
01:02:54,309 --> 01:02:53,119
constitute one of the best examples of

1604
01:02:56,950 --> 01:02:54,319
inner cooperation

1605
01:02:58,549 --> 01:02:56,960
between agencies also and we have a very

1606
01:03:00,710 --> 01:02:58,559
fruitful collaboration with the national

1607
01:03:03,750 --> 01:03:00,720
science foundation and nasa

1608
01:03:05,589 --> 01:03:03,760
in uh supporting uh many of these

1609
01:03:07,349 --> 01:03:05,599
observations

1610
01:03:08,710 --> 01:03:07,359
most professional observatories as

1611
01:03:10,069 --> 01:03:08,720
you've heard around the world are

1612
01:03:12,069 --> 01:03:10,079
observing the comet

1613
01:03:14,069 --> 01:03:12,079

and in addition observers all over the

1614
01:03:15,510 --> 01:03:14,079
world are using the computer electronic

1615
01:03:15,990 --> 01:03:15,520
bulletin board maintained at the

1616
01:03:18,390 --> 01:03:16,000
university

1617
01:03:21,270 --> 01:03:18,400
of maryland that lucy mcfadden has so

1618
01:03:23,190 --> 01:03:21,280
eloquently spoken to this week

1619
01:03:24,470 --> 01:03:23,200
networking specialists and computer

1620
01:03:26,069 --> 01:03:24,480
experts around the world

1621
01:03:28,309 --> 01:03:26,079
are playing an important role in making

1622
01:03:30,069 --> 01:03:28,319
this data easily available and very

1623
01:03:33,589 --> 01:03:30,079
quickly to to interested people

1624
01:03:34,630 --> 01:03:33,599
everywhere ground crews i'd like to

1625
01:03:36,710 --> 01:03:34,640
thank

1626
01:03:38,470 --> 01:03:36,720
for the spacecraft like the hubble

1627
01:03:40,630 --> 01:03:38,480
galileo ulysses

1628
01:03:42,549 --> 01:03:40,640
the international ultraviolet explorer

1629
01:03:44,390 --> 01:03:42,559
voyager and the extreme ultraviolet

1630
01:03:46,069 --> 01:03:44,400
explorer in the kaiperin airborne

1631
01:03:47,430 --> 01:03:46,079
observatory because they've been

1632
01:03:50,630 --> 01:03:47,440
preparing for the

1633
01:03:52,309 --> 01:03:50,640
these observations for many months we

1634
01:03:54,230 --> 01:03:52,319
anticipate their results with a great

1635
01:03:56,309 --> 01:03:54,240
sense of expectation

1636
01:03:57,829 --> 01:03:56,319
and finally i'd like to thank the staffs

1637
01:03:59,990 --> 01:03:57,839
of the goddard space flight center and

1638
01:04:01,829 --> 01:04:00,000

the space telescope science institute

1639
01:04:03,510 --> 01:04:01,839
for taking the lead and pulling together

1640
01:04:04,870 --> 01:04:03,520
in one place all the right people to

1641
01:04:07,430 --> 01:04:04,880
make sure what's happening

1642
01:04:08,950 --> 01:04:07,440
is available to the broader public and

1643
01:04:10,710 --> 01:04:08,960
the professional staffs of these

1644
01:04:13,190 --> 01:04:10,720
organizations

1645
01:04:14,710 --> 01:04:13,200
on behalf of mr golden i commend them

1646
01:04:16,950 --> 01:04:14,720
and their colleagues around the world

1647
01:04:18,870 --> 01:04:16,960
for their highly successful efforts

1648
01:04:21,109 --> 01:04:18,880
and on behalf of myself who am an

1649
01:04:23,510 --> 01:04:21,119
astronomer i thank you all for your

1650
01:04:33,190 --> 01:04:23,520
affirmation that science is fun

1651
01:04:36,390 --> 01:04:34,710
we'll see everyone again tomorrow

1652
01:04:38,230 --> 01:04:36,400
morning and

1653
01:04:40,309 --> 01:04:38,240
two excuse me tomorrow afternoon at two

1654
01:04:42,309 --> 01:04:40,319
and again saturday at 11 and

1655
01:04:52,829 --> 01:04:42,319
we'll have the clean feed coming on now

1656
01:04:52,839 --> 01:05:02,789
you

1657
01:05:05,829 --> 01:05:04,630
today we were pleasantly surprised to

1658
01:05:09,589 --> 01:05:05,839
pick up event

1659
01:05:11,109 --> 01:05:09,599
ill which was originally not expected to

1660
01:05:13,109 --> 01:05:11,119
be captured because of the timing

1661
01:05:13,829 --> 01:05:13,119
relative to the predictions of impact

1662
01:05:15,990 --> 01:05:13,839
but

1663
01:05:16,950 --> 01:05:16,000

the actual impact occurred later and we

1664
01:05:19,750 --> 01:05:16,960
picked it up

1665
01:05:20,230 --> 01:05:19,760
and this one is actually brighter than h

1666
01:05:23,910 --> 01:05:20,240
by

1667
01:05:26,549 --> 01:05:23,920
almost a factor of two it's more like uh

1668
01:05:27,349 --> 01:05:26,559
five to six percent the brightness of

1669
01:05:29,670 --> 01:05:27,359
jupiter

1670
01:05:31,829 --> 01:05:29,680
and it takes 35 seconds or so for the

1671
01:05:33,990 --> 01:05:31,839
light to die back down again

1672
01:05:34,870 --> 01:05:34,000
so we see we think that we are seeing

1673
01:05:46,630 --> 01:05:34,880
the

1674
01:05:49,990 --> 01:05:46,640
emission from that but over a very small

1675
01:05:51,910 --> 01:05:50,000
streak of light across jupiter

1676
01:05:53,109 --> 01:05:51,920
and this is a short duration and

1677
01:05:55,430 --> 01:05:53,119
precedes

1678
01:05:56,150 --> 01:05:55,440
the the plumes and the fireballs that

1679
01:06:15,750 --> 01:05:56,160
are being seen

1680
01:06:19,270 --> 01:06:18,390
it appears that the taurus has not

1681
01:06:21,750 --> 01:06:19,280
really

1682
01:06:23,589 --> 01:06:21,760
changed that much yet which may or may

1683
01:06:25,190 --> 01:06:23,599
not be a surprise since

1684
01:06:26,870 --> 01:06:25,200
it'll take a little while for this stuff

1685
01:06:30,230 --> 01:06:26,880
to reach the taurus

1686
01:06:33,349 --> 01:06:30,240
but one thing we have seen is that the

1687
01:06:35,349 --> 01:06:33,359
if we look at jupiter alone in the

1688
01:06:38,069 --> 01:06:35,359

extreme ultraviolet we actually see

1689
01:06:39,990 --> 01:06:38,079
signs of helium emission

1690
01:06:41,670 --> 01:06:40,000
during the impacts that we don't see

1691
01:06:44,710 --> 01:06:41,680
before the plumes

1692
01:06:46,950 --> 01:06:44,720
did go up fairly high because we have to

1693
01:06:48,630 --> 01:06:46,960
have thrown helium uh

1694
01:06:50,950 --> 01:06:48,640
far up in the atmosphere to be able to

1695
01:06:54,150 --> 01:06:50,960
see this several hundred kilometers

1696
01:06:56,150 --> 01:06:54,160
uh in order to see uh uh

1697
01:06:57,750 --> 01:06:56,160
see this emission uh through all the

1698
01:07:21,029 --> 01:06:57,760
hydrogen that absorbs the

1699
01:07:25,910 --> 01:07:24,150
by detecting a plume from the impact of

1700
01:07:28,549 --> 01:07:25,920
our

1701
01:07:30,549 --> 01:07:28,559
this is using methane filter 8900

1702
01:07:32,630 --> 01:07:30,559
angstroms

1703
01:07:34,549 --> 01:07:32,640
we're somewhat surprised at being able

1704
01:07:36,630 --> 01:07:34,559
to see it at all because there have

1705
01:07:37,990 --> 01:07:36,640
i don't recall there being that many

1706
01:07:41,589 --> 01:07:38,000
detections of plumes

1707
01:07:43,270 --> 01:07:41,599
in the visible most of them have been in

1708
01:07:45,510 --> 01:07:43,280
the infrared so far

1709
01:07:46,309 --> 01:07:45,520
it may mean that it was a bigger piece

1710
01:10:15,830 --> 01:07:46,319
than