1
00:00:09,440 --> 00:00:17,269
q1 is the bottom

2
00:00:20,950 --> 00:00:19,189
good afternoon i'm don savage public

3
00:00:22,150 --> 00:00:20,960
affairs officer for the office of space

4
00:00:24,390 --> 00:00:22,160
science

5
00:00:26,390 --> 00:00:24,400
and uh welcome today to the goddard

6
00:00:28,470 --> 00:00:26,400
space flight center and the latest of

7
00:00:29,509 --> 00:00:28,480
our comment update briefings here at

8
00:00:31,669 --> 00:00:29,519
goddard

9
00:00:35,030 --> 00:00:31,679
today we have a major announcement to

10
00:00:37,350 --> 00:00:35,040
make a major discovery by the hubble

11
00:00:39,190 --> 00:00:37,360
and uh our top news this morning we will

12
00:00:41,110 --> 00:00:39,200
also have

13
00:00:43,830 --> 00:00:41,120

dr renee pronjay who will tell us about

14
00:00:46,790 --> 00:00:43,840
how cometary debris is making the jovian

15
00:00:48,389 --> 00:00:46,800
aurora light up and uh dr lucy mcfadden

16
00:00:50,470 --> 00:00:48,399
will give us a worldwide wrap up and

17
00:00:52,310 --> 00:00:50,480
dave levy will be here for discussions

18
00:00:53,830 --> 00:00:52,320
on the observing

19
00:00:55,430 --> 00:00:53,840
i'd like to go ahead and introduce our

20
00:00:57,670 --> 00:00:55,440
panel right now

21
00:00:59,910 --> 00:00:57,680
to my left dr roger yell with the

22
00:01:02,150 --> 00:00:59,920
university of arizona he's a scientist

23
00:01:03,830 --> 00:01:02,160
from the university of arizona and a

24
00:01:05,830 --> 00:01:03,840
member of the hubble space telescope

25
00:01:08,070 --> 00:01:05,840
spectroscopy team

26
00:01:10,469 --> 00:01:08,080
to his left dr renee pronje from the

27
00:01:12,950 --> 00:01:10,479
institute astrophysics facial and orsay

28
00:01:14,950 --> 00:01:12,960
france she's a scientist from the french

29
00:01:18,630 --> 00:01:14,960
institute at orsay and a member of the

30
00:01:20,550 --> 00:01:18,640
hst upper atmosphere imaging team

31
00:01:22,390 --> 00:01:20,560
and the center to her left dr steve

32
00:01:24,310 --> 00:01:22,400
maron our moderator for today he's a

33
00:01:27,350 --> 00:01:24,320
senior staff scientist at the goddard

34
00:01:29,429 --> 00:01:27,360
space flight center to his left dr lucy

35
00:01:31,670 --> 00:01:29,439
mcfadden university of maryland and

36
00:01:33,670 --> 00:01:31,680
university of california a visiting

37
00:01:35,590 --> 00:01:33,680
professor at the university of maryland

38
00:01:37,590 --> 00:01:35,600

and coordinator of the worldwide comet

39
00:01:40,630 --> 00:01:37,600
observing campaign

40
00:01:42,310 --> 00:01:40,640
and to her left david levy co-discoverer

41
00:01:44,870 --> 00:01:42,320
of the comet and long-time common

42
00:01:47,270 --> 00:01:44,880
observer welcome panelist

43
00:01:48,550 --> 00:01:47,280
like to uh turn it over to you steve

44
00:01:50,069 --> 00:01:48,560
thank you don

45
00:01:51,190 --> 00:01:50,079
uh good morning ladies and gentlemen for

46
00:01:53,590 --> 00:01:51,200
those of you who had the advanced

47
00:01:55,670 --> 00:01:53,600
schedule i'm not eugene shoemaker and i

48
00:01:57,510 --> 00:01:55,680
won't have any uh

49
00:01:58,469 --> 00:01:57,520
explosive results for you it is a

50
00:02:01,350 --> 00:01:58,479
pleasure

51
00:02:03,910 --> 00:02:01,360
uh to be here again uh i've lost count

52
00:02:06,230 --> 00:02:03,920
of all these fragments but uh fragment

53
00:02:08,790 --> 00:02:06,240
p2 should have struck within the past

54
00:02:11,430 --> 00:02:08,800
hour and as i think you all know many of

55
00:02:14,309 --> 00:02:11,440
you led with it uh yesterday or or this

56
00:02:17,190 --> 00:02:14,319
morning the first of the three uh

57
00:02:18,070 --> 00:02:17,200
uh three other big fragments the qr and

58
00:02:20,390 --> 00:02:18,080
s

59
00:02:22,710 --> 00:02:20,400
that will be hitting jupiter at

60
00:02:24,949 --> 00:02:22,720
intervals of approximately equal to its

61
00:02:27,830 --> 00:02:24,959
10-hour rotation period so they'll hit

62
00:02:30,949 --> 00:02:27,840
it nearly the same spot at 10-hour

63
00:02:32,949 --> 00:02:30,959

intervals that will uh start at about 3

64
00:02:34,630 --> 00:02:32,959
32 eastern daylight

65
00:02:36,869 --> 00:02:34,640
uh this afternoon we'll hear a little

66
00:02:38,949 --> 00:02:36,879
bit more about that later now for this

67
00:02:39,830 --> 00:02:38,959
what i personally as an astronomer think

68
00:02:42,790 --> 00:02:39,840
is a

69
00:02:46,229 --> 00:02:42,800
very exciting scientific result

70
00:02:48,710 --> 00:02:46,239
to uh emerge from shoemaker levy there's

71
00:02:51,350 --> 00:02:48,720
more to it than just the big show we're

72
00:02:53,509 --> 00:02:51,360
fortunate to have roger yell at the

73
00:02:55,430 --> 00:02:53,519
university of arizona

74
00:02:58,070 --> 00:02:55,440
tell us about this hubble spectroscopy

75
00:02:59,990 --> 00:02:58,080
result well good morning and as you all

76
00:03:01,670 --> 00:03:00,000
know there's there's two ways two sorts

77
00:03:03,830 --> 00:03:01,680
of information that the hubble space

78
00:03:05,509 --> 00:03:03,840
telescope has been gathering

79
00:03:07,509 --> 00:03:05,519
what you've seen mostly is images where

80
00:03:09,830 --> 00:03:07,519
you see the entire planet and the impact

81
00:03:11,589 --> 00:03:09,840
site at a very specific color a specific

82
00:03:13,509 --> 00:03:11,599
wavelength but also with the

83
00:03:15,509 --> 00:03:13,519
spectrographs we look at one spot on the

84
00:03:17,030 --> 00:03:15,519
planet but look at all the colors all

85
00:03:18,869 --> 00:03:17,040
the wavelengths simultaneously and

86
00:03:20,470 --> 00:03:18,879
that's what we call spectroscopy so i'm

87
00:03:22,070 --> 00:03:20,480
going to report on some spectroscopy

88
00:03:24,470 --> 00:03:22,080

results

89
00:03:27,190 --> 00:03:24,480
you can see on the monitor i believe an

90
00:03:29,509 --> 00:03:27,200
image of the g impact site and it's the

91
00:03:30,789 --> 00:03:29,519
spectroscopy from the g impact site we

92
00:03:32,869 --> 00:03:30,799
knew that was going to be a big one so

93
00:03:35,190 --> 00:03:32,879
we pointed the spectrograph there

94
00:03:37,589 --> 00:03:35,200
several hours after the impact

95
00:03:40,789 --> 00:03:37,599
and um in the next uh could we have the

96
00:03:42,550 --> 00:03:40,799
next graphic please

97
00:03:43,750 --> 00:03:42,560
the arrow is pointing to the location of

98
00:03:45,910 --> 00:03:43,760
where our spectra were obtained

99
00:03:47,589 --> 00:03:45,920
spectrograph was a faint spain object

100
00:03:49,030 --> 00:03:47,599
spectrograph

101
00:03:50,470 --> 00:03:49,040
that's right

102
00:03:51,830 --> 00:03:50,480
um

103
00:03:54,789 --> 00:03:51,840
i don't know how to get that on next

104
00:03:58,789 --> 00:03:56,949
they'll have it up in a moment

105
00:04:00,229 --> 00:03:58,799
okay and what we're going to see in this

106
00:04:02,390 --> 00:04:00,239
graphic is the distribution of

107
00:04:04,309 --> 00:04:02,400
brightness from this spot as a function

108
00:04:05,190 --> 00:04:04,319
of wavelength or color

109
00:04:06,070 --> 00:04:05,200
um

110
00:04:07,910 --> 00:04:06,080
now

111
00:04:09,509 --> 00:04:07,920
different molecules

112
00:04:10,869 --> 00:04:09,519
okay there there it is and i'm going to

113
00:04:12,390 --> 00:04:10,879

be talking about

114
00:04:14,470 --> 00:04:12,400
that's ultraviolet light this is

115
00:04:16,629 --> 00:04:14,480
ultraviolet light the uh the wavelength

116
00:04:18,310 --> 00:04:16,639
is probably hard to read off that scale

117
00:04:21,509 --> 00:04:18,320
off the image there but it goes from

118
00:04:22,710 --> 00:04:21,519
about 150 nanometers to 3000 nanometers

119
00:04:23,749 --> 00:04:22,720
so this is light that doesn't get

120
00:04:24,950 --> 00:04:23,759
transmitted through the earth's

121
00:04:26,790 --> 00:04:24,960
atmosphere you need to be above the

122
00:04:29,189 --> 00:04:26,800
earth's atmosphere to observe it and

123
00:04:31,510 --> 00:04:29,199
that's why we use the uh

124
00:04:33,830 --> 00:04:31,520
the the hubble thin object spectrograph

125
00:04:37,110 --> 00:04:33,840
to make to make these measurements

126
00:04:38,870 --> 00:04:37,120
so what we see there is the ratio of the

127
00:04:40,710 --> 00:04:38,880
light from jupiter

128
00:04:42,550 --> 00:04:40,720
after the impact to the light from

129
00:04:43,510 --> 00:04:42,560
jupiter before the impact

130
00:04:45,590 --> 00:04:43,520
and

131
00:04:46,710 --> 00:04:45,600
uh you can see that the ratio is not one

132
00:04:48,310 --> 00:04:46,720
which tells us right away that

133
00:04:50,070 --> 00:04:48,320
something's changed it's less than if it

134
00:04:51,430 --> 00:04:50,080
were one it would be a straight line

135
00:04:53,590 --> 00:04:51,440
right if it were one it would be a

136
00:04:55,830 --> 00:04:53,600
straight line across the top of that

137
00:04:58,629 --> 00:04:55,840
image it's somewhere varies from about

138
00:05:00,790 --> 00:04:58,639

0.2 to i guess 0.7

139
00:05:03,749 --> 00:05:00,800
so what that tells us is that these

140
00:05:05,270 --> 00:05:03,759
spots are darker in the uv

141
00:05:07,430 --> 00:05:05,280
after the impact than they were before

142
00:05:09,590 --> 00:05:07,440
and we knew that already from the

143
00:05:11,430 --> 00:05:09,600
images it's no surprise but if you look

144
00:05:12,550 --> 00:05:11,440
very carefully distribution with light

145
00:05:15,990 --> 00:05:12,560
with wavelength you can look for

146
00:05:19,110 --> 00:05:16,000
molecules molecules absorb at specific

147
00:05:20,870 --> 00:05:19,120
specific wavelengths specific colors

148
00:05:22,790 --> 00:05:20,880
that are their own signatures so one

149
00:05:24,950 --> 00:05:22,800
molecule will absorb at one wavelength

150
00:05:26,710 --> 00:05:24,960
another molecule will absorb at another

151
00:05:29,029 --> 00:05:26,720
wavelength and by analyzing this you can

152
00:05:30,950 --> 00:05:29,039
identify some molecules yesterday keith

153
00:05:34,070 --> 00:05:30,960
knowl told you about ammonia

154
00:05:36,390 --> 00:05:34,080
which happens to absorb light

155
00:05:38,710 --> 00:05:36,400
right around 2000 angstroms where which

156
00:05:40,310 --> 00:05:38,720
is the minimum in that spectrum there

157
00:05:42,629 --> 00:05:40,320
and there's there's ripples there if you

158
00:05:44,230 --> 00:05:42,639
look here carefully you can see ripples

159
00:05:46,230 --> 00:05:44,240
in the spectrum which are characteristic

160
00:05:48,629 --> 00:05:46,240
of the ammonia what he didn't show you

161
00:05:49,430 --> 00:05:48,639
yesterday were the larger ripples to the

162
00:05:54,790 --> 00:05:49,440
right

163
00:05:55,670 --> 00:05:54,800

at about 27 270 nanometers

164
00:05:57,510 --> 00:05:55,680
um

165
00:05:58,950 --> 00:05:57,520
they're about well i think they're

166
00:06:00,870 --> 00:05:58,960
fairly obvious there it looks sort of

167
00:06:01,990 --> 00:06:00,880
like fish bones or something

168
00:06:03,430 --> 00:06:02,000
um

169
00:06:05,270 --> 00:06:03,440
and that was very exciting when we saw

170
00:06:08,390 --> 00:06:05,280
that yesterday but we had no idea what

171
00:06:09,990 --> 00:06:08,400
it was and so we spent the last 48 hours

172
00:06:11,749 --> 00:06:10,000
or so trying to figure out what this

173
00:06:14,230 --> 00:06:11,759
molecule was

174
00:06:17,110 --> 00:06:14,240
and it was some something of a mystery

175
00:06:18,870 --> 00:06:17,120
there are a few clues that you can that

176
00:06:21,909 --> 00:06:18,880
we went by in the spectrum first of all

177
00:06:23,189 --> 00:06:21,919
it's very regular spacing of ripples in

178
00:06:25,670 --> 00:06:23,199
that and that tells you that it's a

179
00:06:27,350 --> 00:06:25,680
simple molecule secondly the ripples are

180
00:06:29,029 --> 00:06:27,360
close together and that tells you that

181
00:06:30,230 --> 00:06:29,039
it's a heavy molecule

182
00:06:32,469 --> 00:06:30,240
so

183
00:06:34,390 --> 00:06:32,479
armed with that that eliminates

184
00:06:35,830 --> 00:06:34,400
some number of molecules in the universe

185
00:06:37,990 --> 00:06:35,840
but um

186
00:06:39,430 --> 00:06:38,000
i should have said first of all that we

187
00:06:41,909 --> 00:06:39,440
had expectations about what we were

188
00:06:43,430 --> 00:06:41,919

going to see um we knew what molecules

189
00:06:45,189 --> 00:06:43,440
to look for and where to look for them

190
00:06:47,029 --> 00:06:45,199
and we didn't see those we saw ammonia

191
00:06:49,029 --> 00:06:47,039
which was expected but this is something

192
00:06:50,790 --> 00:06:49,039
that was totally unexpected so we didn't

193
00:06:52,230 --> 00:06:50,800
we didn't recognize it right away we had

194
00:06:54,390 --> 00:06:52,240
to go off and search

195
00:06:56,469 --> 00:06:54,400
spectra of all the molecules that we

196
00:06:59,990 --> 00:06:56,479
could think of to find out what this was

197
00:07:02,070 --> 00:07:00,000
and none of the simple ones matched up

198
00:07:04,550 --> 00:07:02,080
so we got more and more complex uh

199
00:07:06,230 --> 00:07:04,560
perplexed and kept looking

200
00:07:09,110 --> 00:07:06,240
but as i said we had these clues it's

201
00:07:10,390 --> 00:07:09,120
heavy uh and it's simple and finally um

202
00:07:13,670 --> 00:07:10,400
about three o'clock in the morning we

203
00:07:15,749 --> 00:07:13,680
started zeroing in on sulfur and in fact

204
00:07:19,029 --> 00:07:15,759
it's a very those uh features are very

205
00:07:21,909 --> 00:07:19,039
good match to the spectrum of sulfur

206
00:07:25,029 --> 00:07:21,919
sulfur gas s2 the s2 molecule

207
00:07:26,950 --> 00:07:25,039
sometimes called the dimer the two

208
00:07:29,270 --> 00:07:26,960
similar molecules so similar atoms in

209
00:07:34,230 --> 00:07:29,280
the same molecule um

210
00:07:36,629 --> 00:07:35,110
um

211
00:07:38,070 --> 00:07:36,639
can't get them all it's a diatomic

212
00:07:39,990 --> 00:07:38,080
molecule

213
00:07:42,790 --> 00:07:40,000

it's um

214
00:07:45,670 --> 00:07:42,800
anyway so so that's a definite detection

215
00:07:46,710 --> 00:07:45,680
of s2 molecule in in the atmosphere of

216
00:07:47,510 --> 00:07:46,720
jupiter

217
00:07:49,350 --> 00:07:47,520
now

218
00:07:52,710 --> 00:07:49,360
also there's there's some more structure

219
00:07:56,309 --> 00:07:54,390
in addition to ammonia at the shorter

220
00:07:57,830 --> 00:07:56,319
wavelengths where that big minimum is

221
00:07:59,350 --> 00:07:57,840
and by looking carefully at that we

222
00:08:02,230 --> 00:07:59,360
think that there's probably some

223
00:08:04,230 --> 00:08:02,240
hydrogen sulfide h2s in the spectrum at

224
00:08:05,510 --> 00:08:04,240
that location that's not as clear-cut as

225
00:08:07,830 --> 00:08:05,520
the s2

226
00:08:10,629 --> 00:08:07,840
but um

227
00:08:12,390 --> 00:08:10,639
but nevertheless it it may be there the

228
00:08:14,550 --> 00:08:12,400
spectrum is consistent with the presence

229
00:08:16,070 --> 00:08:14,560
of hydrogen sulfide we haven't it might

230
00:08:17,670 --> 00:08:16,080
be possible to explain it with something

231
00:08:20,309 --> 00:08:17,680
else also and we're not sure of that yet

232
00:08:23,510 --> 00:08:20,319
but but it seems to be consistent with

233
00:08:28,150 --> 00:08:24,830
hey thank you

234
00:08:30,629 --> 00:08:28,160
roger s2 was found in comet irs iraqi

235
00:08:33,029 --> 00:08:30,639
alcock yes that's that's true it uh has

236
00:08:34,949 --> 00:08:33,039
been seen in one comet before

237
00:08:36,149 --> 00:08:34,959
sulfur is

238
00:08:39,509 --> 00:08:36,159

is um

239
00:08:41,589 --> 00:08:39,519
seen in all most comets i believe in uh

240
00:08:43,269 --> 00:08:41,599
although not in the s2 molecule and

241
00:08:44,790 --> 00:08:43,279
we're going to have to do some work to

242
00:08:46,230 --> 00:08:44,800
try to determine whether this sulfur

243
00:08:48,230 --> 00:08:46,240
there's of course sulfur also in the

244
00:08:50,230 --> 00:08:48,240
atmosphere of jupiter and it's not

245
00:08:52,150 --> 00:08:50,240
obvious just from this result at this

246
00:08:54,550 --> 00:08:52,160
point whether the sulfur is from the

247
00:08:55,829 --> 00:08:54,560
comet or from the atmosphere

248
00:08:58,230 --> 00:08:55,839
okay and of course

249
00:09:00,870 --> 00:08:58,240
as everyone knows hubble doesn't just

250
00:09:02,949 --> 00:09:00,880
take spectra it also takes images

251
00:09:05,030 --> 00:09:02,959
and one of the areas of the study the

252
00:09:06,870 --> 00:09:05,040
comet i think we have not heard about in

253
00:09:09,269 --> 00:09:06,880
these briefings thus far because we

254
00:09:11,829 --> 00:09:09,279
haven't had a lot of news in that area

255
00:09:13,430 --> 00:09:11,839
has to do with the effects involving the

256
00:09:17,110 --> 00:09:13,440
magnetic field of jupiter and the

257
00:09:18,870 --> 00:09:17,120
interaction with the comet and dr renee

258
00:09:21,829 --> 00:09:18,880
pranget from the onset of destro

259
00:09:23,430 --> 00:09:21,839
physique spatial and or say who can

260
00:09:24,389 --> 00:09:23,440
pronounce all those words much better

261
00:09:27,030 --> 00:09:24,399
than i

262
00:09:29,030 --> 00:09:27,040
is involved in the hubble imaging team

263
00:09:30,550 --> 00:09:29,040

working on these problems and tell us

264
00:09:31,910 --> 00:09:30,560
what you've been learning

265
00:09:34,470 --> 00:09:31,920
okay

266
00:09:36,710 --> 00:09:34,480
it's right but our one of our major

267
00:09:38,389 --> 00:09:36,720
interests in the in the observation

268
00:09:39,990 --> 00:09:38,399
on top of uh

269
00:09:42,389 --> 00:09:40,000
studying the up atmosphere of jupiter

270
00:09:44,230 --> 00:09:42,399
was to understand the physics at work in

271
00:09:47,110 --> 00:09:44,240
the meritosphere and since the

272
00:09:49,509 --> 00:09:47,120
magnetosphere is not a trivial

273
00:09:51,030 --> 00:09:49,519
object i will just briefly put it into

274
00:09:53,670 --> 00:09:51,040
context before i discuss the

275
00:09:55,750 --> 00:09:53,680
observations jupiter like the earth is a

276
00:09:57,829 --> 00:09:55,760
very strong magnet and the magnetic

277
00:09:58,949 --> 00:09:57,839
field lines delineate cars cavity in the

278
00:10:01,430 --> 00:09:58,959
surface

279
00:10:02,870 --> 00:10:01,440
where a lot of plasma which plasma

280
00:10:06,069 --> 00:10:02,880
dragon is a

281
00:10:07,910 --> 00:10:06,079
tenuous ionized gas of electrons and

282
00:10:09,829 --> 00:10:07,920
ions are confined

283
00:10:11,590 --> 00:10:09,839
this cavity is very extended it's

284
00:10:13,269 --> 00:10:11,600
millions of kilometers in diameter it's

285
00:10:15,670 --> 00:10:13,279
five times the sun

286
00:10:18,389 --> 00:10:15,680
and the tails extends

287
00:10:20,949 --> 00:10:18,399
still farther at times it goes up

288
00:10:23,750 --> 00:10:20,959

up or down as you would like to saturn

289
00:10:25,990 --> 00:10:23,760
which is five astronomical units

290
00:10:28,470 --> 00:10:26,000
so the magnetosphere of any magnus

291
00:10:29,990 --> 00:10:28,480
planet is a huge natural laboratory from

292
00:10:31,990 --> 00:10:30,000
plasma physics and that's why we're

293
00:10:34,069 --> 00:10:32,000
interested in that

294
00:10:35,829 --> 00:10:34,079
unlike the atmosphere that you have seen

295
00:10:37,590 --> 00:10:35,839
a lot in the last few days the minor

296
00:10:39,670 --> 00:10:37,600
sphere of jupiter is not visible

297
00:10:41,430 --> 00:10:39,680
practically invisible at all wavelengths

298
00:10:43,990 --> 00:10:41,440
except in the dissymmetric radio

299
00:10:46,389 --> 00:10:44,000
wavelength which is which has been used

300
00:10:49,430 --> 00:10:46,399
to discover the magnetic field jupiter

301
00:10:51,590 --> 00:10:49,440
so we can only study the magnetosphere

302
00:10:53,509 --> 00:10:51,600
by deep space mission in situ

303
00:10:54,310 --> 00:10:53,519
measurements or

304
00:10:57,509 --> 00:10:54,320
by

305
00:11:00,310 --> 00:10:57,519
monitoring remotely the oral emissions

306
00:11:01,590 --> 00:11:00,320
and that's why we are interested in that

307
00:11:05,030 --> 00:11:01,600
the arrays

308
00:11:08,630 --> 00:11:05,040
that you again are like the orion earth

309
00:11:10,470 --> 00:11:08,640
or which are also because polar lights

310
00:11:12,550 --> 00:11:10,480
they are at the end of the chain of

311
00:11:14,389 --> 00:11:12,560
processes in magnetosphere

312
00:11:16,710 --> 00:11:14,399
it's at the at the place where

313
00:11:19,750 --> 00:11:16,720

energetic chart particles

314
00:11:20,550 --> 00:11:19,760
so electron and ions finally fall and we

315
00:11:21,910 --> 00:11:20,560
say

316
00:11:24,069 --> 00:11:21,920
precipitate

317
00:11:25,430 --> 00:11:24,079
on the top of the upper atmosphere and

318
00:11:27,030 --> 00:11:25,440
the energy of the collision of these

319
00:11:29,269 --> 00:11:27,040
particles and the constituents the

320
00:11:31,430 --> 00:11:29,279
species of the atmosphere

321
00:11:34,150 --> 00:11:31,440
makes the atmosphere shine

322
00:11:36,389 --> 00:11:34,160
either in the uv or indian fried not in

323
00:11:37,269 --> 00:11:36,399
the visible spectrum

324
00:11:39,269 --> 00:11:37,279
and

325
00:11:41,030 --> 00:11:39,279
you can see on this

326
00:11:44,069 --> 00:11:41,040
picture which is on top which is an

327
00:11:46,310 --> 00:11:44,079
image of the with peak 2 camera

328
00:11:48,790 --> 00:11:46,320
about around

329
00:11:49,750 --> 00:11:48,800
below 2000 angstrom in the far ultra

330
00:11:51,190 --> 00:11:49,760
violet

331
00:11:53,350 --> 00:11:51,200
so it's not visible

332
00:11:57,030 --> 00:11:53,360
just by naked eyes

333
00:11:59,030 --> 00:11:57,040
on both sides and polar the polar

334
00:12:01,910 --> 00:11:59,040
region north and south you can see this

335
00:12:04,069 --> 00:12:01,920
light kinds of ovals with spots which

336
00:12:05,910 --> 00:12:04,079
are the footprint of magnetic field

337
00:12:08,310 --> 00:12:05,920
lines will go far away in the

338
00:12:09,590 --> 00:12:08,320

magnetosphere jupiter and where the

339
00:12:11,110 --> 00:12:09,600
particles

340
00:12:13,750 --> 00:12:11,120
which are along these magnetic field

341
00:12:15,509 --> 00:12:13,760
lines they fall down and they impact the

342
00:12:17,430 --> 00:12:15,519
atmosphere they make it shine

343
00:12:21,269 --> 00:12:17,440
for us it's a signature what happens in

344
00:12:24,470 --> 00:12:23,110
we have been using two cameras we have

345
00:12:25,750 --> 00:12:24,480
been using the with pic 2 which is the

346
00:12:27,750 --> 00:12:25,760
american

347
00:12:29,750 --> 00:12:27,760
camera we have been also using the faint

348
00:12:32,069 --> 00:12:29,760
of the camera which is the european

349
00:12:33,509 --> 00:12:32,079
camera on board

350
00:12:35,990 --> 00:12:33,519
hst

351
00:12:37,750 --> 00:12:36,000
this is an image which has been taken

352
00:12:39,430 --> 00:12:37,760
on july 13

353
00:12:40,870 --> 00:12:39,440
before the impact two days before the

354
00:12:41,910 --> 00:12:40,880
first impact

355
00:12:46,150 --> 00:12:41,920
and

356
00:12:47,910 --> 00:12:46,160
already one week after the first uh

357
00:12:49,350 --> 00:12:47,920
dust been

358
00:12:50,550 --> 00:12:49,360
consistent

359
00:12:52,790 --> 00:12:50,560
sufficient dust was inside the

360
00:12:54,710 --> 00:12:52,800
magnetosphere that you could expect some

361
00:12:55,990 --> 00:12:54,720
effect from the dust with the plasma in

362
00:12:57,430 --> 00:12:56,000
the magnetosphere there had been a lot

363
00:12:59,670 --> 00:12:57,440

of prediction of what could happen in

364
00:13:01,509 --> 00:12:59,680
the magnetosphere some effects could

365
00:13:03,910 --> 00:13:01,519
come from the dust in the living leading

366
00:13:05,269 --> 00:13:03,920
edge some could come from the comet of

367
00:13:06,870 --> 00:13:05,279
the matrix

368
00:13:08,389 --> 00:13:06,880
the comet itself

369
00:13:09,750 --> 00:13:08,399
interfering with the plasma in the

370
00:13:11,910 --> 00:13:09,760
magnetosphere

371
00:13:14,790 --> 00:13:11,920
and we could expect to see some effect

372
00:13:15,990 --> 00:13:14,800
even before like precursors of the

373
00:13:18,150 --> 00:13:16,000
impacts

374
00:13:21,190 --> 00:13:18,160
in this image you can see also the north

375
00:13:23,750 --> 00:13:21,200
pole the south pole we cannot see the

376
00:13:25,350 --> 00:13:23,760
can we have that graphic back please

377
00:13:26,949 --> 00:13:25,360
so we can we cannot have the whole

378
00:13:29,269 --> 00:13:26,959
planet because the field of view of the

379
00:13:31,190 --> 00:13:29,279
faint object camera is much smaller than

380
00:13:32,150 --> 00:13:31,200
the field of view of the weave peak too

381
00:13:34,150 --> 00:13:32,160
but

382
00:13:36,310 --> 00:13:34,160
the interest of the internet camera is

383
00:13:39,030 --> 00:13:36,320
that you can get we have a very very

384
00:13:40,629 --> 00:13:39,040
good spatial resolution you can get very

385
00:13:42,150 --> 00:13:40,639
faint details so they're very

386
00:13:44,790 --> 00:13:42,160
complementary

387
00:13:46,629 --> 00:13:44,800
and on this graphic you can see what we

388
00:13:48,870 --> 00:13:46,639

are somewhat too frustrated because we

389
00:13:50,470 --> 00:13:48,880
didn't see anything spectacular before

390
00:13:52,389 --> 00:13:50,480
before the impacts

391
00:13:54,150 --> 00:13:52,399
we already had

392
00:13:56,150 --> 00:13:54,160
images of the of the aurora they looked

393
00:13:59,030 --> 00:13:56,160
like that except that the north aurora

394
00:14:01,750 --> 00:13:59,040
consistently look somewhat fainter maybe

395
00:14:03,670 --> 00:14:01,760
at times much fainter than usual

396
00:14:04,949 --> 00:14:03,680
and it looks fainter than south aurora

397
00:14:06,710 --> 00:14:04,959
which is a

398
00:14:07,910 --> 00:14:06,720
nice necklace

399
00:14:11,509 --> 00:14:07,920
on the

400
00:14:13,509 --> 00:14:11,519
we got the same kind of result with our

401
00:14:15,990 --> 00:14:13,519
ue we have been monitoring the aurora

402
00:14:17,509 --> 00:14:16,000
with by ue4 several weeks already and we

403
00:14:19,110 --> 00:14:17,519
found that the north aurora was weaker

404
00:14:21,590 --> 00:14:19,120
we cannot tell why we cannot understand

405
00:14:23,269 --> 00:14:21,600
that we expect that if any fainting we

406
00:14:25,590 --> 00:14:23,279
expected it in the south because the

407
00:14:28,310 --> 00:14:25,600
dust could be inhibiting the

408
00:14:29,829 --> 00:14:28,320
process that would give rise to zero

409
00:14:32,470 --> 00:14:29,839
we get it right in the north maybe it's

410
00:14:34,150 --> 00:14:32,480
just coincidence but we have to but

411
00:14:35,750 --> 00:14:34,160
maybe it's brighter couldn't it be

412
00:14:37,829 --> 00:14:35,760
brighter in the south and it's being

413
00:14:39,350 --> 00:14:37,839

enhanced by the dust from the comet

414
00:14:41,030 --> 00:14:39,360
fragments oh it's clearly fainter i

415
00:14:43,350 --> 00:14:41,040
don't know we have a lot of trouble

416
00:14:45,430 --> 00:14:43,360
getting the nose okay normally this you

417
00:14:47,670 --> 00:14:45,440
can see a novel which is around you have

418
00:14:49,430 --> 00:14:47,680
a spot in the middle this is very very

419
00:14:51,350 --> 00:14:49,440
obvious in all the data and you find

420
00:14:52,790 --> 00:14:51,360
this both with the hubble telescope and

421
00:14:54,629 --> 00:14:52,800
with the international ultraviolet

422
00:14:56,230 --> 00:14:54,639
explorer with both

423
00:14:58,310 --> 00:14:56,240
so we can tell for sure it's an effect

424
00:15:00,150 --> 00:14:58,320
of the combat but it may be an effect a

425
00:15:01,750 --> 00:15:00,160
general global effect of of the deaths

426
00:15:05,189 --> 00:15:01,760
in the magnetosphere

427
00:15:07,350 --> 00:15:05,199
then we got this nice image on july two

428
00:15:09,509 --> 00:15:07,360
days ago with july 18

429
00:15:11,750 --> 00:15:09,519
yes with the we've picked two that i

430
00:15:13,110 --> 00:15:11,760
hope we'll get here

431
00:15:17,189 --> 00:15:13,120
on the screen

432
00:15:21,910 --> 00:15:20,069
and you can compare this image to the

433
00:15:23,750 --> 00:15:21,920
the one we got before

434
00:15:26,069 --> 00:15:23,760
you can see the aurora on top the north

435
00:15:27,750 --> 00:15:26,079
it's still fainter you can see the the

436
00:15:29,829 --> 00:15:27,760
left edge you can see the aurora and the

437
00:15:32,069 --> 00:15:29,839
south and below

438
00:15:35,110 --> 00:15:32,079

the the north oral valley you have two

439
00:15:37,350 --> 00:15:35,120
bright spots which are very low for us

440
00:15:39,590 --> 00:15:37,360
it's very low latitude it's totally

441
00:15:42,230 --> 00:15:39,600
unusual it was not unexpected i can't

442
00:15:44,710 --> 00:15:42,240
tell there have been predictions

443
00:15:46,949 --> 00:15:44,720
that maybe the the comet

444
00:15:48,949 --> 00:15:46,959
plasma could be ionized

445
00:15:51,749 --> 00:15:48,959
they could this could drive current and

446
00:15:53,829 --> 00:15:51,759
it and it could enhance the

447
00:15:55,590 --> 00:15:53,839
create okay so the two bright spots

448
00:15:57,749 --> 00:15:55,600
you're talking about are the upper left

449
00:15:59,590 --> 00:15:57,759
and the upper left on the

450
00:16:00,949 --> 00:15:59,600
just at the footprints of this new

451
00:16:02,389 --> 00:16:00,959
magnetic field lines which have been

452
00:16:04,230 --> 00:16:02,399
drawn now

453
00:16:07,590 --> 00:16:04,240
and this is quite new we never saw that

454
00:16:09,269 --> 00:16:07,600
we never saw any aura below what is the

455
00:16:11,509 --> 00:16:09,279
one you have seen on the

456
00:16:14,790 --> 00:16:11,519
previous two graphics so that's to make

457
00:16:17,030 --> 00:16:14,800
sure i understand what you're proposing

458
00:16:19,189 --> 00:16:17,040
you think that material from the from

459
00:16:21,269 --> 00:16:19,199
the south pole where the fragments are

460
00:16:22,949 --> 00:16:21,279
impacting might be drawn through the

461
00:16:25,350 --> 00:16:22,959
magnetic field lines up to the north

462
00:16:27,509 --> 00:16:25,360
pole right that's what i think

463
00:16:29,590 --> 00:16:27,519

there have been well if you

464
00:16:30,870 --> 00:16:29,600
if you look back to the the prediction

465
00:16:33,350 --> 00:16:30,880
has been made

466
00:16:35,670 --> 00:16:33,360
it's one it's clear that we expected

467
00:16:36,550 --> 00:16:35,680
some effect of the of the ionized plasma

468
00:16:41,670 --> 00:16:36,560
in the

469
00:16:43,430 --> 00:16:41,680
but we didn't know what we could do and

470
00:16:45,749 --> 00:16:43,440
in any case we expected to get something

471
00:16:46,870 --> 00:16:45,759
in the south not in the north

472
00:16:48,310 --> 00:16:46,880
and we

473
00:16:50,550 --> 00:16:48,320
we worked out a lot to get the

474
00:16:52,150 --> 00:16:50,560
possibility to have close field lines

475
00:16:54,629 --> 00:16:52,160
because the magnetosphere at times the

476
00:16:56,389 --> 00:16:54,639
field lines that are open to the to the

477
00:16:58,310 --> 00:16:56,399
solar wind so in that case something

478
00:17:00,069 --> 00:16:58,320
which happened in the south do not have

479
00:17:02,230 --> 00:17:00,079
any counterpart in the part in the other

480
00:17:03,430 --> 00:17:02,240
hemisphere so we worked the geometry so

481
00:17:05,590 --> 00:17:03,440
that we can get

482
00:17:08,949 --> 00:17:05,600
a close field line with a footprint

483
00:17:10,789 --> 00:17:08,959
print in the north visible also from her

484
00:17:11,909 --> 00:17:10,799
so the north and south are connected by

485
00:17:13,750 --> 00:17:11,919
the magnetic field okay they're

486
00:17:16,150 --> 00:17:13,760
connected they're connected and on top

487
00:17:17,909 --> 00:17:16,160
of that the footprint of the north is in

488
00:17:19,829 --> 00:17:17,919

front because the field line is

489
00:17:21,429 --> 00:17:19,839
distorted in the meridian plane so we

490
00:17:23,270 --> 00:17:21,439
can you can see the footprint in the

491
00:17:25,909 --> 00:17:23,280
south it's just right at the limb but

492
00:17:27,590 --> 00:17:25,919
you can see it's already 30 or 40

493
00:17:28,870 --> 00:17:27,600
degrees on the on the limb on the do you

494
00:17:30,470 --> 00:17:28,880
think the

495
00:17:32,549 --> 00:17:30,480
north if you imagine it's kind of a bar

496
00:17:35,110 --> 00:17:32,559
magnet inside jupiter that

497
00:17:38,070 --> 00:17:35,120
is responsible for magnetic field

498
00:17:40,470 --> 00:17:38,080
the uh in that model then the bar is off

499
00:17:42,070 --> 00:17:40,480
center and tilting off the center tilted

500
00:17:44,549 --> 00:17:42,080
and that's why it can be in

501
00:17:47,110 --> 00:17:44,559
these lines can be in back on the south

502
00:17:48,950 --> 00:17:47,120
and in front uh on the north so we are

503
00:17:49,909 --> 00:17:48,960
lucky we're not only working we work it

504
00:17:51,750 --> 00:17:49,919
out

505
00:17:53,350 --> 00:17:51,760
and we get this bright spot in the north

506
00:17:55,590 --> 00:17:53,360
but we have nothing in the star in the

507
00:17:57,430 --> 00:17:55,600
and we didn't get anything except you

508
00:17:59,750 --> 00:17:57,440
maybe you can

509
00:18:01,990 --> 00:17:59,760
see something very very faint and

510
00:18:03,909 --> 00:18:02,000
diffuse at the footprint of the

511
00:18:06,230 --> 00:18:03,919
larger in the south of the larger field

512
00:18:08,310 --> 00:18:06,240
line we cannot tell well that that's

513
00:18:09,830 --> 00:18:08,320

probably not precipitation of particles

514
00:18:11,510 --> 00:18:09,840
we do not know what it is it may be

515
00:18:13,590 --> 00:18:11,520
related

516
00:18:16,310 --> 00:18:13,600
but this on the on the north pole it's

517
00:18:18,310 --> 00:18:16,320
it's necessarily energetic particles so

518
00:18:20,870 --> 00:18:18,320
something happened some material from

519
00:18:23,110 --> 00:18:20,880
the coma from the comet itself

520
00:18:24,549 --> 00:18:23,120
was liberated in the south pole

521
00:18:26,390 --> 00:18:24,559
accelerated

522
00:18:28,310 --> 00:18:26,400
by somewhere along these magnetic field

523
00:18:31,350 --> 00:18:28,320
lines and fell into the northern

524
00:18:33,990 --> 00:18:31,360
hemisphere like like an iron gun in fact

525
00:18:35,430 --> 00:18:34,000
now renee would these be visible in

526
00:18:36,789 --> 00:18:35,440
visible light where our eyes are

527
00:18:39,270 --> 00:18:36,799
sensitive

528
00:18:40,230 --> 00:18:39,280
ultraviolet the oral emission i mean the

529
00:18:42,230 --> 00:18:40,240
emission

530
00:18:43,990 --> 00:18:42,240
exact collisionally excited and the

531
00:18:46,630 --> 00:18:44,000
atmosphere jupiter they cannot be seen

532
00:18:48,870 --> 00:18:46,640
in the visible only in the ultraviolet

533
00:18:51,270 --> 00:18:48,880
from the it depends on the composition

534
00:18:54,150 --> 00:18:51,280
of the atmosphere on earth it's visible

535
00:18:56,549 --> 00:18:54,160
on jupiter it's mainly from hydrogen or

536
00:18:59,190 --> 00:18:56,559
for hydrocarbons and it's either

537
00:19:01,750 --> 00:18:59,200
ultraviolet or infrared unfortunately

538
00:19:03,909 --> 00:19:01,760

you can see them in the visible

539
00:19:05,430 --> 00:19:03,919
so that's a major i think it's a major

540
00:19:07,750 --> 00:19:05,440
discovery we have to understand what

541
00:19:09,590 --> 00:19:07,760
happens we have two options so far maybe

542
00:19:11,190 --> 00:19:09,600
there are other options open but we

543
00:19:13,510 --> 00:19:11,200
thought of two

544
00:19:16,390 --> 00:19:13,520
either the the

545
00:19:18,150 --> 00:19:16,400
material was liberated after impact

546
00:19:19,990 --> 00:19:18,160
and we got it along the field lines and

547
00:19:22,070 --> 00:19:20,000
we we seen the north and that's why we

548
00:19:23,990 --> 00:19:22,080
do not see anything in the south or

549
00:19:25,669 --> 00:19:24,000
another possibility which has was

550
00:19:28,070 --> 00:19:25,679
predicted in fact and i i think i should

551
00:19:30,390 --> 00:19:28,080
send an email to dr wing ip we have said

552
00:19:33,350 --> 00:19:30,400
the published a paper

553
00:19:37,029 --> 00:19:33,360
very uh short ago telling that within

554
00:19:40,070 --> 00:19:37,039
one jovian radius we have the conditions

555
00:19:42,870 --> 00:19:40,080
so that the coma entering before impact

556
00:19:45,029 --> 00:19:42,880
could uh create a current along the

557
00:19:47,669 --> 00:19:45,039
field lines which would be the condition

558
00:19:49,510 --> 00:19:47,679
for such an effect to appear so you have

559
00:19:51,270 --> 00:19:49,520
to do more

560
00:19:53,190 --> 00:19:51,280
than just

561
00:19:56,070 --> 00:19:53,200
throw stuff up from the impact you have

562
00:19:58,789 --> 00:19:56,080
to have an elec electrical or magnetic

563
00:20:01,190 --> 00:19:58,799

process that accelerates these uh

564
00:20:02,789 --> 00:20:01,200
electrified particles and drives them up

565
00:20:04,870 --> 00:20:02,799
the magnetic field

566
00:20:06,710 --> 00:20:04,880
you have to get like an electric circuit

567
00:20:09,190 --> 00:20:06,720
and then you have to have like

568
00:20:11,430 --> 00:20:09,200
kilo volts of potential drops to

569
00:20:13,190 --> 00:20:11,440
accelerate the particle to high enough

570
00:20:15,350 --> 00:20:13,200
thousands of volts to accelerate the

571
00:20:17,110 --> 00:20:15,360
particles so it's it's not not an easy

572
00:20:18,789 --> 00:20:17,120
process and we have to to work on that

573
00:20:20,230 --> 00:20:18,799
and it's a lot of modelling probably and

574
00:20:21,909 --> 00:20:20,240
we learned a lot about the plasma

575
00:20:24,470 --> 00:20:21,919
physics in general and jupiter in

576
00:20:26,950 --> 00:20:24,480
particular great thank you dr pranje i

577
00:20:29,270 --> 00:20:26,960
think these are two uh

578
00:20:30,870 --> 00:20:29,280
really fascinating findings from the

579
00:20:32,789 --> 00:20:30,880
hubble telescope

580
00:20:34,630 --> 00:20:32,799
and we had an assist from the iue and

581
00:20:37,510 --> 00:20:34,640
i'm sure we'll be hearing more about iue

582
00:20:39,510 --> 00:20:37,520
as the week goes on now i have to tear

583
00:20:41,510 --> 00:20:39,520
myself away from this orbiting

584
00:20:43,029 --> 00:20:41,520
observatory there are

585
00:20:45,590 --> 00:20:43,039
we used to say there were hundreds of

586
00:20:47,830 --> 00:20:45,600
telescopes looking at jupiter this week

587
00:20:50,149 --> 00:20:47,840
now from the reports coming in that

588
00:20:53,029 --> 00:20:50,159

amateur astronomers and the public are

589
00:20:56,070 --> 00:20:53,039
streaming into uh observatory science

590
00:20:57,750 --> 00:20:56,080
museums i think lucy mcfadden

591
00:20:59,830 --> 00:20:57,760
told me this morning hundreds of people

592
00:21:03,510 --> 00:20:59,840
are coming to the university of maryland

593
00:21:06,630 --> 00:21:03,520
observatory uh over here near uh adelphi

594
00:21:09,029 --> 00:21:06,640
uh the uh there probably are thousands

595
00:21:10,470 --> 00:21:09,039
of telescopes looking they won't all see

596
00:21:12,789 --> 00:21:10,480
an aurora that you have to look in

597
00:21:14,950 --> 00:21:12,799
ultraviolet light but what are the

598
00:21:17,270 --> 00:21:14,960
telescopes on the ground finding lucy

599
00:21:18,630 --> 00:21:17,280
mcfadden well actually steve with that

600
00:21:21,029 --> 00:21:18,640
with that introduction i think i'm going

601
00:21:24,870 --> 00:21:21,039
to let david levy talk about the

602
00:21:26,549 --> 00:21:24,880
hundreds of of telescopes that that uh

603
00:21:28,310 --> 00:21:26,559
are being pointed toward jupiter and let

604
00:21:29,990 --> 00:21:28,320
him talk about what the amateurs are

605
00:21:31,750 --> 00:21:30,000
seeing and the role they can play in the

606
00:21:33,590 --> 00:21:31,760
science and then i'll come back and okay

607
00:21:35,909 --> 00:21:33,600
we'll go fill in on ground based okay

608
00:21:37,830 --> 00:21:35,919
this is almost a contest as to uh which

609
00:21:39,190 --> 00:21:37,840
is which is the best surprise which is

610
00:21:40,710 --> 00:21:39,200
the biggest surprise of this whole

611
00:21:43,510 --> 00:21:40,720
magnificent week

612
00:21:45,510 --> 00:21:43,520
and i i can't say that the fact that

613
00:21:47,190 --> 00:21:45,520

these dark spots are visible for

614
00:21:48,870 --> 00:21:47,200
virtually everybody to see is the

615
00:21:49,990 --> 00:21:48,880
biggest surprise but it sure is one of

616
00:21:53,510 --> 00:21:50,000
the biggest

617
00:21:55,750 --> 00:21:53,520
nobody expected this uh we have some

618
00:22:00,149 --> 00:21:55,760
very large spots on jupiter they seem to

619
00:22:01,909 --> 00:22:00,159
be uh the the the brightest ones at the

620
00:22:04,470 --> 00:22:01,919
latest that i heard still is the one

621
00:22:07,029 --> 00:22:04,480
from the impact of fragment g

622
00:22:08,070 --> 00:22:07,039
and it seems to me

623
00:22:10,070 --> 00:22:08,080
that

624
00:22:12,070 --> 00:22:10,080
no matter what part of the world you're

625
00:22:14,470 --> 00:22:12,080
on and no matter what area you're

626
00:22:16,870 --> 00:22:14,480
watching that's by now there are enough

627
00:22:19,669 --> 00:22:16,880
of these spots that no matter where you

628
00:22:21,909 --> 00:22:19,679
are when jupiter gets to be

629
00:22:23,909 --> 00:22:21,919
when jupiter is in the sky after dark

630
00:22:25,029 --> 00:22:23,919
you will probably be seeing some spots

631
00:22:27,590 --> 00:22:25,039
you didn't mean right it's most

632
00:22:29,909 --> 00:22:27,600
prominent it's actually dark for i meant

633
00:22:31,510 --> 00:22:29,919
darkest yes when i say brightest i mean

634
00:22:35,190 --> 00:22:31,520
darkness thank you

635
00:22:40,710 --> 00:22:37,909
no these these uh the one report that i

636
00:22:42,630 --> 00:22:40,720
got from a professional astronomer who

637
00:22:45,110 --> 00:22:42,640
actually began as an amateur and still

638
00:22:46,950 --> 00:22:45,120

has his original telescope is from clark

639
00:22:48,310 --> 00:22:46,960
chapman of the planetary science

640
00:22:51,110 --> 00:22:48,320
institute

641
00:22:52,230 --> 00:22:51,120
he said that the the spot from fragment

642
00:22:58,710 --> 00:22:52,240
g

643
00:23:00,149 --> 00:22:58,720
most obvious feature ever to appear on

644
00:23:03,830 --> 00:23:00,159
this planet

645
00:23:06,789 --> 00:23:03,840
and he is uh challenged over the um over

646
00:23:08,789 --> 00:23:06,799
the internet anyone to argue that and so

647
00:23:10,789 --> 00:23:08,799
far nobody has he sent me to the

648
00:23:13,350 --> 00:23:10,799
telescope last night and it was pretty

649
00:23:15,669 --> 00:23:13,360
spectacular so i looked directly through

650
00:23:17,430 --> 00:23:15,679
the eyepiece and there it was so yes i

651
00:23:19,029 --> 00:23:17,440
encourage everybody including all the

652
00:23:21,510 --> 00:23:19,039
crew and everyone doing the support work

653
00:23:22,549 --> 00:23:21,520
for all this event lucy i forgot to say

654
00:23:24,070 --> 00:23:22,559
that but

655
00:23:25,909 --> 00:23:24,080
uh we have and you're going to tell us

656
00:23:27,909 --> 00:23:25,919
about this we have more than just

657
00:23:29,750 --> 00:23:27,919
telescopes on the ground and telescopes

658
00:23:31,750 --> 00:23:29,760
in space we have something

659
00:23:34,149 --> 00:23:31,760
kind of part way up isn't that right

660
00:23:35,350 --> 00:23:34,159
yeah but let's let's let gene uh david

661
00:23:38,070 --> 00:23:35,360
finish

662
00:23:40,149 --> 00:23:38,080
with his points yeah i think i think the

663
00:23:42,390 --> 00:23:40,159

them it's hard to tell at the moment

664
00:23:45,350 --> 00:23:42,400
just why these spots are so prominent

665
00:23:47,669 --> 00:23:45,360
one of the uh theories that to explain

666
00:23:50,549 --> 00:23:47,679
them has to do with these are

667
00:23:52,710 --> 00:23:50,559
comet dust or a form of soot that is

668
00:23:54,470 --> 00:23:52,720
from the comet there are other theories

669
00:23:55,350 --> 00:23:54,480
but this is one of them

670
00:23:57,990 --> 00:23:55,360
um

671
00:24:00,630 --> 00:23:58,000
it's it's very important to emphasize

672
00:24:02,870 --> 00:24:00,640
that if if you are an amateur astronomer

673
00:24:05,510 --> 00:24:02,880
if you have any experience at all

674
00:24:07,590 --> 00:24:05,520
looking at jupiter any experience these

675
00:24:08,630 --> 00:24:07,600
spots should be extremely easy for you

676
00:24:10,390 --> 00:24:08,640
to see

677
00:24:12,710 --> 00:24:10,400
if however you have never looked at

678
00:24:15,510 --> 00:24:12,720
jupiter before my recommendation is that

679
00:24:17,750 --> 00:24:15,520
you go to one of the many star parties

680
00:24:20,710 --> 00:24:17,760
that are being organized by planetariums

681
00:24:23,750 --> 00:24:20,720
and amateur astronomy clubs all over all

682
00:24:25,590 --> 00:24:23,760
over the world right now and get someone

683
00:24:27,510 --> 00:24:25,600
to point it out point the spots out to

684
00:24:29,110 --> 00:24:27,520
you they're very easy to see

685
00:24:30,630 --> 00:24:29,120
but if you haven't had if you've never

686
00:24:32,909 --> 00:24:30,640
looked at jupiter before it helps if you

687
00:24:35,590 --> 00:24:32,919
get someone to point them out this is an

688
00:24:37,350 --> 00:24:35,600

extraordinary thing these these spots

689
00:24:38,710 --> 00:24:37,360
are major major

690
00:24:40,230 --> 00:24:38,720
um

691
00:24:43,269 --> 00:24:40,240
effects from the collision they're

692
00:24:45,350 --> 00:24:43,279
visible to anybody the philosophical

693
00:24:46,470 --> 00:24:45,360
question is that if the comet had never

694
00:24:47,990 --> 00:24:46,480
been found

695
00:24:50,230 --> 00:24:48,000
right now

696
00:24:52,230 --> 00:24:50,240
people would be seeing one spot after

697
00:24:54,870 --> 00:24:52,240
another appearing on jupiter they'd be

698
00:24:56,149 --> 00:24:54,880
wiping off their lenses

699
00:24:58,549 --> 00:24:56,159
what's going on that's right they'd

700
00:25:00,950 --> 00:24:58,559
wonder what's going on

701
00:25:02,870 --> 00:25:00,960
probably the visual observers would have

702
00:25:05,590 --> 00:25:02,880
been spotting them first

703
00:25:07,830 --> 00:25:05,600
if there had just been one spot if the g

704
00:25:09,430 --> 00:25:07,840
impact cited in the only one someone

705
00:25:11,750 --> 00:25:09,440
might have said maybe there was an

706
00:25:14,230 --> 00:25:11,760
impact but these spots are now forming

707
00:25:15,750 --> 00:25:14,240
all over that area of jupiter and they

708
00:25:18,149 --> 00:25:15,760
would say maybe it was an impact and

709
00:25:20,149 --> 00:25:18,159
they'd say no how could you possibly get

710
00:25:21,830 --> 00:25:20,159
so many impacts in the course of a week

711
00:25:24,230 --> 00:25:21,840
and nobody would have i guess it's

712
00:25:25,990 --> 00:25:24,240
entirely possible that a comet

713
00:25:29,029 --> 00:25:26,000

we hadn't discovered yet could have

714
00:25:30,870 --> 00:25:29,039
jupiter make a spot that large yes

715
00:25:33,990 --> 00:25:30,880
i think we're lucky that these guys were

716
00:25:38,630 --> 00:25:36,310
so this is the time to get out and and

717
00:25:40,470 --> 00:25:38,640
if there's any been ever been a time

718
00:25:42,950 --> 00:25:40,480
to get out with a small telescope and

719
00:25:44,549 --> 00:25:42,960
look at jupiter ever since galileo first

720
00:25:47,510 --> 00:25:44,559
observed jupiter through a telescope in

721
00:25:49,430 --> 00:25:47,520
1610 this is the time to do it

722
00:25:51,350 --> 00:25:49,440
this is this is just a marvelous time to

723
00:25:53,269 --> 00:25:51,360
be looking at jupiter thank you

724
00:25:54,789 --> 00:25:53,279
can i just mention that there are

725
00:25:56,149 --> 00:25:54,799
interesting you probably talked about

726
00:25:57,909 --> 00:25:56,159
this earlier in the week but there's

727
00:26:00,390 --> 00:25:57,919
interesting strings of craters on some

728
00:26:01,590 --> 00:26:00,400
of the satellites of jupiter which are

729
00:26:03,350 --> 00:26:01,600
probably

730
00:26:05,510 --> 00:26:03,360
which have been theorized to be due to a

731
00:26:07,830 --> 00:26:05,520
similar process to break up of a comet

732
00:26:10,149 --> 00:26:07,840
falling upon a

733
00:26:11,430 --> 00:26:10,159
one of the satellites yes and it may

734
00:26:13,909 --> 00:26:11,440
have occurred to someone that that was

735
00:26:16,390 --> 00:26:13,919
similar to so that the multiply split

736
00:26:18,230 --> 00:26:16,400
comet may not be such a rare that's

737
00:26:19,750 --> 00:26:18,240
right yeah phenomenon it might have

738
00:26:21,029 --> 00:26:19,760

occurred and that's that's a good point

739
00:26:23,430 --> 00:26:21,039
that could have happened any time in the

740
00:26:24,870 --> 00:26:23,440
past four and a half billion years

741
00:26:27,110 --> 00:26:24,880
there's even there is even one of these

742
00:26:30,070 --> 00:26:27,120
crater chains on the moon and on top of

743
00:26:32,149 --> 00:26:30,080
the crater davey there's a series of uh

744
00:26:35,510 --> 00:26:32,159
of these craters and that's getting

745
00:26:38,390 --> 00:26:35,520
pretty close yeah but yes but to to

746
00:26:40,950 --> 00:26:38,400
these did not hit jupiter all at

747
00:26:43,269 --> 00:26:40,960
those crater chains hit hit callisto or

748
00:26:44,870 --> 00:26:43,279
the moon all at once all within a few

749
00:26:46,789 --> 00:26:44,880
seconds of each other

750
00:26:49,269 --> 00:26:46,799
these are things hitting over the period

751
00:26:51,909 --> 00:26:49,279
of a week and to make that intuitive

752
00:26:54,470 --> 00:26:51,919
leap to get the only way this could have

753
00:26:56,390 --> 00:26:54,480
done happened is that a comet passed

754
00:26:59,269 --> 00:26:56,400
near jupiter earlier at some earlier

755
00:27:01,350 --> 00:26:59,279
time broke apart completed another orbit

756
00:27:03,350 --> 00:27:01,360
and then hit and if someone had come up

757
00:27:07,110 --> 00:27:03,360
with a theory like that he he or she

758
00:27:08,789 --> 00:27:07,120
would have been laughed off the stage

759
00:27:11,590 --> 00:27:08,799
yes all of which however we're seeing

760
00:27:14,230 --> 00:27:11,600
occur now yes that's that's

761
00:27:15,750 --> 00:27:14,240
i think we need to get on to uh lucy's

762
00:27:19,590 --> 00:27:15,760
report leave room for questions while we

763
00:27:21,669 --> 00:27:19,600

have the satellite okay um we have some

764
00:27:23,510 --> 00:27:21,679
some some more images from ground-based

765
00:27:24,870 --> 00:27:23,520
observatories around the world um the

766
00:27:27,430 --> 00:27:24,880
first one coming up is from lick

767
00:27:30,950 --> 00:27:27,440
observatory from the 120 inch

768
00:27:33,430 --> 00:27:30,960
uh telescope there it is an image taken

769
00:27:34,870 --> 00:27:33,440
with speckle interferometry i'm sorry

770
00:27:36,870 --> 00:27:34,880
speckle imaging

771
00:27:38,630 --> 00:27:36,880
which is a process that astronomers and

772
00:27:41,510 --> 00:27:38,640
and members of the department of defense

773
00:27:43,830 --> 00:27:41,520
have both been developing over the years

774
00:27:46,830 --> 00:27:43,840
and with speckle imaging they have the

775
00:27:49,669 --> 00:27:46,840
uh they use computer

776
00:27:52,789 --> 00:27:49,679
uh uh let's see they use

777
00:27:55,350 --> 00:27:52,799
complex computer algorithms to clean up

778
00:27:58,230 --> 00:27:55,360
the noise and improve the uh spatial

779
00:28:01,190 --> 00:27:58,240
resolution of of the image and as you

780
00:28:04,789 --> 00:28:01,200
can see from looking at this the um

781
00:28:07,510 --> 00:28:04,799
the parallel cloud structure um is

782
00:28:10,470 --> 00:28:07,520
is quite prominent and it's very higher

783
00:28:13,029 --> 00:28:10,480
yes better defined than in most uh of

784
00:28:14,870 --> 00:28:13,039
the ground-based images not quite as as

785
00:28:16,230 --> 00:28:14,880
clear as as the hubble so it's not as

786
00:28:19,110 --> 00:28:16,240
good as getting above the earth that's

787
00:28:21,750 --> 00:28:19,120
the adoptive adaptive optics project led

788
00:28:24,389 --> 00:28:21,760

by dr claire max lawrence livermore

789
00:28:26,310 --> 00:28:24,399
national laboratory thank you steve um

790
00:28:28,149 --> 00:28:26,320
then next we have some more observations

791
00:28:30,950 --> 00:28:28,159
from the keck observatory where nasa and

792
00:28:32,789 --> 00:28:30,960
the nsf have been have contributed to

793
00:28:34,870 --> 00:28:32,799
building the instruments that from which

794
00:28:37,190 --> 00:28:34,880
we're taking these uh measurements and

795
00:28:38,710 --> 00:28:37,200
we have a mosaic now these are seven

796
00:28:40,950 --> 00:28:38,720
images not

797
00:28:42,789 --> 00:28:40,960
ignore the time difference each image is

798
00:28:45,190 --> 00:28:42,799
a different wavelength and in the upper

799
00:28:48,710 --> 00:28:45,200
left corner we start at a wavelength of

800
00:28:50,710 --> 00:28:48,720
1.2 microns and we go across the dark

801
00:28:54,149 --> 00:28:50,720
one the third one on the right

802
00:28:56,230 --> 00:28:54,159
is at 2.3 microns and we continue to go

803
00:28:58,230 --> 00:28:56,240
to longer wavelengths and the final one

804
00:28:59,510 --> 00:28:58,240
on the bottom that where jupiter is the

805
00:29:02,950 --> 00:28:59,520
darkest

806
00:29:05,110 --> 00:29:02,960
is at 4.2 microns i believe now the

807
00:29:08,149 --> 00:29:05,120
importance of this um

808
00:29:10,789 --> 00:29:08,159
all the features appear as bright spots

809
00:29:12,950 --> 00:29:10,799
so they're still radiating thermal

810
00:29:16,870 --> 00:29:12,960
heat heat they're just radiating the

811
00:29:20,310 --> 00:29:17,590
the

812
00:29:27,269 --> 00:29:20,320
wavelengths

813
00:29:29,830 --> 00:29:27,279

atmosphere so this is like a

814
00:29:30,950 --> 00:29:29,840
a stratigram we're looking at the

815
00:29:33,110 --> 00:29:30,960
layers

816
00:29:35,190 --> 00:29:33,120
through jupiter's atmosphere so i guess

817
00:29:37,110 --> 00:29:35,200
besides the fireball that came up that

818
00:29:39,269 --> 00:29:37,120
gene shoemaker's been talking about from

819
00:29:42,789 --> 00:29:39,279
the simulations you still have some hot

820
00:29:45,669 --> 00:29:42,799
material down under yeah that's glowing

821
00:29:47,269 --> 00:29:45,679
after days and after the event right and

822
00:29:50,470 --> 00:29:47,279
and this is important once we can

823
00:29:51,990 --> 00:29:50,480
interpret these and coordinate correlate

824
00:29:54,070 --> 00:29:52,000
the information from the different

825
00:29:56,549 --> 00:29:54,080
wavelengths we hope to be able to

826
00:29:59,190 --> 00:29:56,559
determine how deep the

827
00:30:01,190 --> 00:29:59,200
projectile went into the atmosphere i

828
00:30:03,269 --> 00:30:01,200
don't have any numbers and we haven't

829
00:30:05,830 --> 00:30:03,279
really understood that yet so i can only

830
00:30:07,510 --> 00:30:05,840
present it in a generic case

831
00:30:10,710 --> 00:30:07,520
we have a report from the kuiper

832
00:30:13,990 --> 00:30:10,720
airborne observatory which is a

833
00:30:16,190 --> 00:30:14,000
it's a c141 cargo aircraft it's a really

834
00:30:18,470 --> 00:30:16,200
spectacular aircraft there's it's been

835
00:30:19,830 --> 00:30:18,480
compartmentalized they blocked off one

836
00:30:22,310 --> 00:30:19,840
part of it where they place the

837
00:30:24,950 --> 00:30:22,320
telescope there's a 36 inch telescope in

838
00:30:27,110 --> 00:30:24,960

this compartment which is pressurized

839
00:30:28,950 --> 00:30:27,120
and they cut a hole in the side of the

840
00:30:30,950 --> 00:30:28,960
cargo plane

841
00:30:33,990 --> 00:30:30,960
and they point the telescope out the

842
00:30:36,710 --> 00:30:34,000
hole in the plane now this plane

843
00:30:38,549 --> 00:30:36,720
flies at 41 000 feet

844
00:30:41,750 --> 00:30:38,559
and there are astronomers on board and

845
00:30:44,870 --> 00:30:41,760
everyone who's flown on it uh reports an

846
00:30:48,310 --> 00:30:44,880
exciting adventure at 41 000 feet they

847
00:30:51,269 --> 00:30:48,320
are uh they have oxygen within reach um

848
00:30:52,950 --> 00:30:51,279
in case the um the interlock between the

849
00:30:54,630 --> 00:30:52,960
telescope and the observer's brakes

850
00:30:57,269 --> 00:30:54,640
they'll they have 15 seconds to get

851
00:30:59,350 --> 00:30:57,279
their oxygen masks on

852
00:31:02,549 --> 00:30:59,360
the advantage of this telescope is that

853
00:31:07,990 --> 00:31:02,559
they can fly anywhere around the world

854
00:31:11,509 --> 00:31:08,000
they get up above the atmosphere and we

855
00:31:14,630 --> 00:31:11,519
will have a report um from gordon

856
00:31:19,430 --> 00:31:14,640
boyaker from goddard space flight center

857
00:31:24,549 --> 00:31:21,990
we have two two channels one is a

858
00:31:26,789 --> 00:31:24,559
temperature channel and one is a search

859
00:31:28,870 --> 00:31:26,799
for water the temperature channel was

860
00:31:31,110 --> 00:31:28,880
truly dramatic and we have very good

861
00:31:32,549 --> 00:31:31,120
coverage of both the g and the k

862
00:31:34,470 --> 00:31:32,559
fragments

863
00:31:36,549 --> 00:31:34,480

after having looked at the g fragment

864
00:31:38,389 --> 00:31:36,559
then we decided to

865
00:31:39,750 --> 00:31:38,399
to set up the investigation a little

866
00:31:42,870 --> 00:31:39,760
differently

867
00:31:45,190 --> 00:31:42,880
for the k fragment we concentrated

868
00:31:46,789 --> 00:31:45,200
almost exclusively on the temperature we

869
00:31:49,590 --> 00:31:46,799
wanted to make sure that we pinned that

870
00:31:52,310 --> 00:31:49,600
down very precisely and we have

871
00:31:53,029 --> 00:31:52,320
even even better data for the k fragment

872
00:32:03,029 --> 00:31:53,039
the

873
00:32:05,110 --> 00:32:03,039
factor 25 so it was absolutely stunning

874
00:32:06,310 --> 00:32:05,120
and you know since we have some spatial

875
00:32:09,669 --> 00:32:06,320
resolution

876
00:32:12,389 --> 00:32:09,679
um you can see all of all of jupiter

877
00:32:14,389 --> 00:32:12,399
jupiter at once and then in the the limb

878
00:32:16,789 --> 00:32:14,399
of jupiter where the fireball was it's

879
00:32:19,350 --> 00:32:16,799
like seeing a supernova go off or a star

880
00:32:22,710 --> 00:32:19,360
go off the main reason for using the

881
00:32:24,269 --> 00:32:22,720
kuiper airborne observatory is that um

882
00:32:26,870 --> 00:32:24,279
you're flying above

883
00:32:29,909 --> 00:32:26,880
99.9 percent of the water vapor in the

884
00:32:33,590 --> 00:32:29,919
earth's atmosphere and you're above just

885
00:32:35,590 --> 00:32:33,600
80 percent of the total atmosphere

886
00:32:37,509 --> 00:32:35,600
our key thermometer is the methane

887
00:32:38,710 --> 00:32:37,519
molecule which is present in the earth's

888
00:32:41,350 --> 00:32:38,720

atmosphere

889
00:32:43,830 --> 00:32:41,360
by flying at 41 000 feet

890
00:32:47,190 --> 00:32:43,840
this opens up a window where we can

891
00:32:50,149 --> 00:32:47,200
measure very strong methane features on

892
00:32:53,509 --> 00:32:50,159
jupiter that are not measurable from

893
00:32:57,269 --> 00:32:54,950
now what's important here is that they

894
00:32:58,950 --> 00:32:57,279
have they're penetrating deeper into the

895
00:33:01,350 --> 00:32:58,960
atmosphere at 10 microns and they are

896
00:33:03,029 --> 00:33:01,360
measuring emission lines from methane so

897
00:33:05,509 --> 00:33:03,039
they're getting they're getting heated

898
00:33:07,350 --> 00:33:05,519
methane uh they're heating there's

899
00:33:08,830 --> 00:33:07,360
evidence of heating of the methane

900
00:33:10,070 --> 00:33:08,840
clouds in

901
00:33:11,190 --> 00:33:10,080
jupiter um

902
00:33:13,190 --> 00:33:11,200
that's the methane gas in the

903
00:33:14,870 --> 00:33:13,200
stratosphere they're observing

904
00:33:16,789 --> 00:33:14,880
okay it's not below okay so it's the

905
00:33:18,789 --> 00:33:16,799
high the stratosphere the high levels

906
00:33:19,830 --> 00:33:18,799
higher levels of the atmosphere okay and

907
00:33:21,430 --> 00:33:19,840
they're they're floating in our

908
00:33:24,470 --> 00:33:21,440
stratosphere as they do it that's right

909
00:33:26,549 --> 00:33:24,480
stratosphere stratosphere okay um now i

910
00:33:29,110 --> 00:33:26,559
think out of time let's see well the

911
00:33:29,909 --> 00:33:29,120
next images are from the i from the irtf

912
00:33:31,190 --> 00:33:29,919
at

913
00:33:32,630 --> 00:33:31,200

mauna kea

914
00:33:35,029 --> 00:33:32,640
um

915
00:33:37,509 --> 00:33:35,039
and those show

916
00:33:38,389 --> 00:33:37,519
these are at four different wavelengths

917
00:33:40,230 --> 00:33:38,399
we have

918
00:33:41,909 --> 00:33:40,240
in the

919
00:33:43,990 --> 00:33:41,919
four different wavelengths

920
00:33:45,830 --> 00:33:44,000
at the upper left is the temperature in

921
00:33:48,230 --> 00:33:45,840
the upper atmosphere the one on the

922
00:33:50,549 --> 00:33:48,240
right is ammonia in the region of

923
00:33:53,269 --> 00:33:50,559
ammonia band the one on the lower left

924
00:33:55,110 --> 00:33:53,279
is the region of methane and

925
00:33:56,310 --> 00:33:55,120
the lower right is another ammonia

926
00:33:58,070 --> 00:33:56,320
region

927
00:33:59,590 --> 00:33:58,080
let's go on to the next one we can take

928
00:34:02,230 --> 00:33:59,600
questions about that later we've

929
00:34:04,470 --> 00:34:02,240
reported have a report from galileo that

930
00:34:09,589 --> 00:34:07,190
the photo photopolarimeter radiometer

931
00:34:11,109 --> 00:34:09,599
has uh

932
00:34:14,230 --> 00:34:11,119
has detected

933
00:34:17,750 --> 00:34:14,240
uh the impact of fragment

934
00:34:19,990 --> 00:34:17,760
fragment g i believe um and they radioed

935
00:34:22,389 --> 00:34:20,000
they sent back some

936
00:34:24,790 --> 00:34:22,399
preliminary observations these are not

937
00:34:26,310 --> 00:34:24,800
images so i do not have a visual for

938
00:34:28,629 --> 00:34:26,320

that but

939
00:34:30,230 --> 00:34:28,639
galileo we have data back from galileo

940
00:34:31,349 --> 00:34:30,240
and remember galileo is getting the

941
00:34:32,629 --> 00:34:31,359
direct

942
00:34:37,270 --> 00:34:32,639
eye

943
00:34:39,669 --> 00:34:37,280
collisions and the

944
00:34:40,790 --> 00:34:39,679
profile uh the change in time of the

945
00:34:42,550 --> 00:34:40,800
intensity measured by the

946
00:34:45,030 --> 00:34:42,560
photopolarimeter

947
00:34:47,349 --> 00:34:45,040
will show us how the flash intensifies

948
00:34:49,829 --> 00:34:47,359
in the rate at which the flash decays

949
00:34:52,069 --> 00:34:49,839
um then our last images are h actually

950
00:34:54,550 --> 00:34:52,079
okay thank you and our last images are

951
00:35:00,069 --> 00:34:54,560
from a mcdonald observatory um and we

952
00:35:04,150 --> 00:35:01,510
we were able to get on in with both of

953
00:35:06,710 --> 00:35:04,160
the telescopes and start imaging

954
00:35:08,310 --> 00:35:06,720
uh so we didn't actually catch the flash

955
00:35:10,950 --> 00:35:08,320
of l but we were able to start looking

956
00:35:12,630 --> 00:35:10,960
at the morphology of the l-site very

957
00:35:13,349 --> 00:35:12,640
very quickly

958
00:35:15,990 --> 00:35:13,359
the

959
00:35:18,069 --> 00:35:16,000
conditions turned spectacular very soon

960
00:35:19,589 --> 00:35:18,079
on we had excellent excellent

961
00:35:21,510 --> 00:35:19,599
transparency

962
00:35:23,349 --> 00:35:21,520
almost all the night

963
00:35:25,349 --> 00:35:23,359

and extremely stable atmospheric

964
00:35:27,510 --> 00:35:25,359
conditions so we have some really really

965
00:35:30,550 --> 00:35:27,520
pretty images that we've gotten out with

966
00:35:32,630 --> 00:35:30,560
both an ir camera on the 2.7 meter

967
00:35:33,750 --> 00:35:32,640
telescope and

968
00:35:51,270 --> 00:35:33,760
a

969
00:35:53,670 --> 00:35:51,280
structure of the spots in the eyepiece

970
00:35:55,750 --> 00:35:53,680
in good conditions and

971
00:35:58,710 --> 00:35:55,760
things are just changing and it's so

972
00:36:01,829 --> 00:36:00,630
jupiter change below our

973
00:36:03,349 --> 00:36:01,839
eyes

974
00:36:04,150 --> 00:36:03,359
image number two

975
00:36:07,109 --> 00:36:04,160
is

976
00:36:11,430 --> 00:36:07,119
a methane image taking the ccd camera

977
00:36:13,430 --> 00:36:11,440
and in this image we see a number of the

978
00:36:15,109 --> 00:36:13,440
spots but

979
00:36:17,670 --> 00:36:15,119
one of the striking features of this

980
00:36:20,230 --> 00:36:17,680
image is that the h spot is just

981
00:36:22,790 --> 00:36:20,240
rotating into onto the limb and we've

982
00:36:25,430 --> 00:36:22,800
caught it in this image at a point where

983
00:36:28,390 --> 00:36:25,440
we see it detached from the planet

984
00:36:30,870 --> 00:36:28,400
a hydrogen molecular band

985
00:36:33,990 --> 00:36:30,880
uh that is again observed with the ir

986
00:36:36,230 --> 00:36:34,000
camera on the 2.7 meter in this we have

987
00:36:37,510 --> 00:36:36,240
four spots and the great red spot in the

988
00:36:39,510 --> 00:36:37,520

middle of the planet

989
00:36:42,710 --> 00:36:39,520
uh we sent this in the conventional

990
00:36:44,790 --> 00:36:42,720
orientation we find amusing to turn this

991
00:36:47,109 --> 00:36:44,800
and some of the other images upside down

992
00:36:52,870 --> 00:36:47,119
and look at it you'll see why when you

993
00:36:57,030 --> 00:36:55,030
okay that sums it up thank you very much

994
00:36:59,270 --> 00:36:57,040
lucy and if i can just sum up all the

995
00:37:02,870 --> 00:36:59,280
news we've heard today or not all but

996
00:37:07,190 --> 00:37:02,880
the high spots uh we have the detection

997
00:37:09,910 --> 00:37:07,200
of the diatomic sulfur molecule s sub 2

998
00:37:10,870 --> 00:37:09,920
s2 from the hubble space telescope with

999
00:37:13,030 --> 00:37:10,880
the

1000
00:37:16,069 --> 00:37:13,040
faint object spectrograph roger yell

1001
00:37:18,470 --> 00:37:16,079
told us about that we have the

1002
00:37:21,109 --> 00:37:18,480
these wonderful auroral glows at the

1003
00:37:23,750 --> 00:37:21,119
foot points of magnetic field lines in

1004
00:37:25,750 --> 00:37:23,760
the north polar cap of jupiter at a

1005
00:37:28,630 --> 00:37:25,760
lower or more southern

1006
00:37:31,270 --> 00:37:28,640
more southerly northern latitude than

1007
00:37:33,510 --> 00:37:31,280
aurora has been observed before that was

1008
00:37:35,589 --> 00:37:33,520
done in ultraviolet light as explained

1009
00:37:37,990 --> 00:37:35,599
to us by renee prange

1010
00:37:39,670 --> 00:37:38,000
with the wide field and planetary camera

1011
00:37:42,150 --> 00:37:39,680
too and they know it wasn't there before

1012
00:37:44,150 --> 00:37:42,160
because a few days prior they looked

1013
00:37:46,950 --> 00:37:44,160

with the faint object camera also in the

1014
00:37:50,069 --> 00:37:46,960
ultraviolet david levy told us the g

1015
00:37:53,109 --> 00:37:50,079
impact site is so extraordinarily

1016
00:37:55,030 --> 00:37:53,119
prominent wonders if maybe that's

1017
00:37:57,750 --> 00:37:55,040
comet dust that's making it dark in

1018
00:37:59,109 --> 00:37:57,760
visible light the keck telescope

1019
00:38:02,069 --> 00:37:59,119
we saw the

1020
00:38:03,430 --> 00:38:02,079
hot impact spots still glowing in the

1021
00:38:05,750 --> 00:38:03,440
infrared

1022
00:38:08,470 --> 00:38:05,760
there's still some heat there after some

1023
00:38:11,030 --> 00:38:08,480
days after the first impacts the first

1024
00:38:12,710 --> 00:38:11,040
report back from the galileo space probe

1025
00:38:14,550 --> 00:38:12,720
you're wondering why we told you you

1026
00:38:16,510 --> 00:38:14,560
won't see anything for weeks from

1027
00:38:18,710 --> 00:38:16,520
galileo that's images these

1028
00:38:20,550 --> 00:38:18,720
photopolarimeter measurements the much

1029
00:38:22,790 --> 00:38:20,560
lower data rate you get it back pretty

1030
00:38:27,349 --> 00:38:22,800
rapidly galileo at a distance of about

1031
00:38:31,670 --> 00:38:27,359
150 million miles looking in the 90 450

1032
00:38:34,550 --> 00:38:31,680
nanometer 450 angstrom or 945 nanometers

1033
00:38:37,829 --> 00:38:36,630
the h-spot

1034
00:38:42,710 --> 00:38:37,839
the

1035
00:38:44,710 --> 00:38:42,720
audio report from gordon yoracker

1036
00:38:47,589 --> 00:38:44,720
told us about the heating of the methane

1037
00:38:49,589 --> 00:38:47,599
gas in the stratosphere and then anita

1038
00:38:51,829 --> 00:38:49,599

neil cochran at the mcdonald observatory

1039
00:38:54,950 --> 00:38:51,839
fort davis texas looking in the

1040
00:38:57,190 --> 00:38:54,960
molecular hydrogen or h2 band you see

1041
00:38:59,270 --> 00:38:57,200
some glowing features and spots you turn

1042
00:39:01,349 --> 00:38:59,280
it upside down and you have jupiter

1043
00:39:04,069 --> 00:39:01,359
doesn't seem so unhappy

1044
00:39:06,069 --> 00:39:04,079
after all don

1045
00:39:08,230 --> 00:39:06,079
thank you steve we're going to turn to

1046
00:39:09,750 --> 00:39:08,240
question and answers here at goddard and

1047
00:39:12,069 --> 00:39:09,760
i understand we have a lot of questions

1048
00:39:14,310 --> 00:39:12,079
from our center so i hope we have enough

1049
00:39:16,150 --> 00:39:14,320
time on the satellite we'll start here

1050
00:39:17,430 --> 00:39:16,160
front row with

1051
00:39:19,030 --> 00:39:17,440
bill

1052
00:39:21,430 --> 00:39:19,040
please state your name and affiliation

1053
00:39:23,030 --> 00:39:21,440
bill harwood cbs and i'm maybe asking

1054
00:39:24,710 --> 00:39:23,040
you if you'd maybe be more elementary in

1055
00:39:26,950 --> 00:39:24,720
terms of the significance of the sulfur

1056
00:39:28,870 --> 00:39:26,960
observation if you knew that sulfur is

1057
00:39:30,550 --> 00:39:28,880
in the atmosphere anyway and you don't

1058
00:39:32,710 --> 00:39:30,560
know where this sulfur comes from i'm

1059
00:39:34,550 --> 00:39:32,720
confused as to the significance of that

1060
00:39:35,829 --> 00:39:34,560
and also i was reading a message on the

1061
00:39:37,910 --> 00:39:35,839
internet yesterday from some other

1062
00:39:39,190 --> 00:39:37,920
university of arizona researchers who

1063
00:39:41,190 --> 00:39:39,200

were claiming that they had done some

1064
00:39:43,270 --> 00:39:41,200
studies or observations that indicated

1065
00:39:44,870 --> 00:39:43,280
they were actually seeing commentary

1066
00:39:46,470 --> 00:39:44,880
material and i'm wondering if these two

1067
00:39:47,990 --> 00:39:46,480
things are linking up somehow or there's

1068
00:39:49,910 --> 00:39:48,000
totally separate issues

1069
00:39:51,670 --> 00:39:49,920
um

1070
00:39:53,510 --> 00:39:51,680
okay first of all we we believe that

1071
00:39:54,630 --> 00:39:53,520
there's sulfur in the atmosphere of

1072
00:39:56,150 --> 00:39:54,640
jupiter

1073
00:39:58,069 --> 00:39:56,160
although we hadn't detected it yet just

1074
00:39:59,910 --> 00:39:58,079
because the solar system has sulfur in

1075
00:40:01,990 --> 00:39:59,920
it and jupiter should not be an

1076
00:40:03,670 --> 00:40:02,000
exception however that sulfur is deep in

1077
00:40:05,589 --> 00:40:03,680
the atmosphere

1078
00:40:07,750 --> 00:40:05,599
it's in the form of hydrogen sulfide we

1079
00:40:09,670 --> 00:40:07,760
believe h2s and as you go higher in

1080
00:40:11,430 --> 00:40:09,680
jupiter's atmosphere it gets colder just

1081
00:40:12,950 --> 00:40:11,440
like it does in the earth's atmosphere

1082
00:40:14,470 --> 00:40:12,960
you form clouds

1083
00:40:16,550 --> 00:40:14,480
and the

1084
00:40:18,630 --> 00:40:16,560
hydrogen sulfide should disappear into

1085
00:40:21,270 --> 00:40:18,640
clouds at a fairly deep level in

1086
00:40:23,510 --> 00:40:21,280
jupiter's atmosphere so

1087
00:40:25,430 --> 00:40:23,520
just as an example potentially we could

1088
00:40:26,550 --> 00:40:25,440

convince ourselves that this material

1089
00:40:28,630 --> 00:40:26,560
was coming

1090
00:40:30,069 --> 00:40:28,640
from jupiter not from the comet that

1091
00:40:32,550 --> 00:40:30,079
would tell us something about the depth

1092
00:40:34,309 --> 00:40:32,560
to which the cometary fragments

1093
00:40:35,829 --> 00:40:34,319
penetrated

1094
00:40:37,430 --> 00:40:35,839
i think maybe you're referring to the

1095
00:40:38,790 --> 00:40:37,440
second part of your question i think

1096
00:40:40,069 --> 00:40:38,800
perhaps you're referring to an article

1097
00:40:43,030 --> 00:40:40,079
that was in the new york times this

1098
00:40:44,309 --> 00:40:43,040
morning i understood on the internet

1099
00:40:47,109 --> 00:40:44,319
no

1100
00:40:50,950 --> 00:40:47,119
that the material was commentary

1101
00:40:52,710 --> 00:40:50,960
well i i didn't see it but what what's

1102
00:40:54,710 --> 00:40:52,720
what jumps out at us from looking at

1103
00:40:57,270 --> 00:40:54,720
this at least from the hst data is that

1104
00:40:59,589 --> 00:40:57,280
the molecules we've seen so far ammonia

1105
00:41:01,589 --> 00:40:59,599
and sulfur molecules are things that are

1106
00:41:03,190 --> 00:41:01,599
in the clouds of jupiter

1107
00:41:05,109 --> 00:41:03,200
um there's also an ammonia cloud in

1108
00:41:06,069 --> 00:41:05,119
jupiter the visible clouds on jupiter

1109
00:41:08,390 --> 00:41:06,079
that we

1110
00:41:10,550 --> 00:41:08,400
see those are ammonia that's right and

1111
00:41:12,630 --> 00:41:10,560
the there's an ammonia hydrosulfide

1112
00:41:14,230 --> 00:41:12,640
cloud which is at a deeper level below

1113
00:41:15,990 --> 00:41:14,240

one bar

1114
00:41:18,150 --> 00:41:16,000
there are other molecules associated

1115
00:41:19,910 --> 00:41:18,160
with comets oxygen

1116
00:41:21,670 --> 00:41:19,920
you might expect to see oxygen molecules

1117
00:41:23,589 --> 00:41:21,680
for example we don't see any of those

1118
00:41:25,510 --> 00:41:23,599
what we see so far is things from

1119
00:41:27,030 --> 00:41:25,520
jupiter and

1120
00:41:28,230 --> 00:41:27,040
well you know this is going to be a long

1121
00:41:31,349 --> 00:41:28,240
story but

1122
00:41:34,710 --> 00:41:31,359
i don't understand that that internet

1123
00:41:39,030 --> 00:41:36,790
i'm still awfully um ignorant of

1124
00:41:40,550 --> 00:41:39,040
chemistry what is exciting what bob cook

1125
00:41:42,630 --> 00:41:40,560
at newsday what is so exciting about

1126
00:41:43,910 --> 00:41:42,640
finding this sulfur is why would the man

1127
00:41:45,270 --> 00:41:43,920
in the street want to jump up and down

1128
00:41:47,109 --> 00:41:45,280
about this

1129
00:41:49,030 --> 00:41:47,119
um well as i just said i might tell you

1130
00:41:51,670 --> 00:41:49,040
something about the impact itself

1131
00:41:53,349 --> 00:41:51,680
uh the particular molecule

1132
00:41:54,950 --> 00:41:53,359
to be perfectly honest i don't know a

1133
00:41:57,510 --> 00:41:54,960
lot about it because i didn't expect to

1134
00:42:01,030 --> 00:41:59,510
so it's a surprise

1135
00:42:03,589 --> 00:42:01,040
it'll be interesting to watch how this

1136
00:42:05,349 --> 00:42:03,599
develops in time one of the

1137
00:42:07,430 --> 00:42:05,359
one of the reasons this is interesting i

1138
00:42:08,390 --> 00:42:07,440

study atmospheres rather than comets

1139
00:42:10,309 --> 00:42:08,400
although i think comments are

1140
00:42:11,990 --> 00:42:10,319
interesting too but the best way to

1141
00:42:13,430 --> 00:42:12,000
learn about something not just an

1142
00:42:15,270 --> 00:42:13,440
atmosphere is to poke it and see what

1143
00:42:17,190 --> 00:42:15,280
happens so we just gave jupiter's

1144
00:42:18,950 --> 00:42:17,200
atmosphere a giant poke and we're going

1145
00:42:20,150 --> 00:42:18,960
to see how it develops in time and

1146
00:42:21,990 --> 00:42:20,160
that's going to tell us something about

1147
00:42:24,230 --> 00:42:22,000
how atmospheres behave it's going to add

1148
00:42:26,069 --> 00:42:24,240
to our knowledge base of atmospheres and

1149
00:42:27,589 --> 00:42:26,079
that's going to be useful for uh for our

1150
00:42:31,990 --> 00:42:27,599
society it'll help us understand the

1151
00:42:35,589 --> 00:42:33,589
uh shin yoshi

1152
00:42:36,630 --> 00:42:35,599
i have a question a question to dr

1153
00:42:39,270 --> 00:42:36,640
branje

1154
00:42:41,589 --> 00:42:39,280
you told us about the change of aura of

1155
00:42:43,829 --> 00:42:41,599
jupiter and we have some example that

1156
00:42:46,470 --> 00:42:43,839
the same thing happened

1157
00:42:49,349 --> 00:42:46,480
to earth in the past and the what is the

1158
00:42:51,030 --> 00:42:49,359
meaning of your discovery from jupiter

1159
00:42:53,270 --> 00:42:51,040
to us like

1160
00:42:54,950 --> 00:42:53,280
knowing about the aura of earth and

1161
00:42:58,230 --> 00:42:54,960
knowing about the

1162
00:42:59,750 --> 00:42:58,240
meaning of the weather of earth and what

1163
00:43:02,150 --> 00:42:59,760

if something happened

1164
00:43:04,950 --> 00:43:02,160
like jupiter to earth

1165
00:43:06,790 --> 00:43:04,960
what is the meaning for our life i mean

1166
00:43:08,550 --> 00:43:06,800
like a short wave transmission or

1167
00:43:12,150 --> 00:43:08,560
something

1168
00:43:14,710 --> 00:43:12,160
well i think what we see

1169
00:43:18,150 --> 00:43:14,720
is the effect of the comet the

1170
00:43:20,230 --> 00:43:18,160
gas or the or both maybe the the dust in

1171
00:43:23,430 --> 00:43:20,240
the in the comma of the comet which has

1172
00:43:25,670 --> 00:43:23,440
been ionized or the other option the gas

1173
00:43:27,910 --> 00:43:25,680
which has been ejected in after the the

1174
00:43:29,670 --> 00:43:27,920
fireball and it was very very hot hot

1175
00:43:30,870 --> 00:43:29,680
enough to be ionized so these are the

1176
00:43:32,550 --> 00:43:30,880
two options

1177
00:43:35,430 --> 00:43:32,560
in the case we get

1178
00:43:38,230 --> 00:43:35,440
uh some ions and electrons which are

1179
00:43:40,390 --> 00:43:38,240
free in free space and we we know from

1180
00:43:42,069 --> 00:43:40,400
the fact that they have been

1181
00:43:43,990 --> 00:43:42,079
they have been able to go

1182
00:43:46,230 --> 00:43:44,000
along the field lines and to to excite

1183
00:43:47,829 --> 00:43:46,240
to glow they are on the other side we

1184
00:43:49,190 --> 00:43:47,839
know that they have been put at very

1185
00:43:51,030 --> 00:43:49,200
high energy

1186
00:43:53,510 --> 00:43:51,040
the kind of thing we can learn from that

1187
00:43:55,270 --> 00:43:53,520
is the processes in the in the

1188
00:43:56,069 --> 00:43:55,280

process in the command which how they

1189
00:44:00,710 --> 00:43:56,079
can

1190
00:44:03,270 --> 00:44:00,720
then how how these particles are

1191
00:44:06,150 --> 00:44:03,280
accelerated in the microsphere itself

1192
00:44:08,950 --> 00:44:06,160
this this is a problem which is of high

1193
00:44:11,190 --> 00:44:08,960
interest for physics and on earth there

1194
00:44:14,069 --> 00:44:11,200
are numbers of satellites which have

1195
00:44:16,309 --> 00:44:14,079
electron guns ion guns which

1196
00:44:17,430 --> 00:44:16,319
artificially accelerate ions and

1197
00:44:19,349 --> 00:44:17,440
electrons to

1198
00:44:21,109 --> 00:44:19,359
thousands of volts and see what happens

1199
00:44:23,510 --> 00:44:21,119
at the footprint on earth of course

1200
00:44:24,870 --> 00:44:23,520
there were one or more experiments i i

1201
00:44:27,270 --> 00:44:24,880
don't remember when but the first one

1202
00:44:29,910 --> 00:44:27,280
was authorized by president kennedy the

1203
00:44:32,150 --> 00:44:29,920
uh to explode a nuclear weapon up in the

1204
00:44:33,510 --> 00:44:32,160
magnetosphere and see the effect of the

1205
00:44:36,550 --> 00:44:33,520
precipitating

1206
00:44:38,230 --> 00:44:36,560
particles of the famous was debated

1207
00:44:41,349 --> 00:44:38,240
whether it would be safe or not and

1208
00:44:43,030 --> 00:44:41,359
finally kennedy called van allen he said

1209
00:44:44,550 --> 00:44:43,040
it's his belts and

1210
00:44:46,710 --> 00:44:44,560
he's all right

1211
00:44:48,550 --> 00:44:46,720
i think the other part of your question

1212
00:44:50,309 --> 00:44:48,560
was what would be the effect on the

1213
00:44:52,150 --> 00:44:50,319

earth well of course there might be

1214
00:44:55,270 --> 00:44:52,160
geomagnetic storm or something like that

1215
00:44:57,510 --> 00:44:55,280
but comet hits the earth then the

1216
00:45:00,230 --> 00:44:57,520
the uh effects and magnetosphere will be

1217
00:45:02,069 --> 00:45:00,240
of secondary interest to many of us

1218
00:45:04,309 --> 00:45:02,079
well i guess it wouldn't be a terrible

1219
00:45:07,430 --> 00:45:04,319
effect because storms it would affect

1220
00:45:10,309 --> 00:45:07,440
communication ionosphere but magnet even

1221
00:45:12,069 --> 00:45:10,319
great uh very strong magnetic stops from

1222
00:45:13,430 --> 00:45:12,079
the effect of the solar wind they do not

1223
00:45:19,109 --> 00:45:13,440
affect life

1224
00:45:23,750 --> 00:45:21,670
uh paul hoverstein usa today back on the

1225
00:45:25,750 --> 00:45:23,760
sulfur question for a moment

1226
00:45:26,870 --> 00:45:25,760
uh dr yell if it turns out that the

1227
00:45:28,710 --> 00:45:26,880
sulfur

1228
00:45:30,870 --> 00:45:28,720
is from the comet

1229
00:45:36,870 --> 00:45:30,880
and not the atmosphere what would be the

1230
00:45:40,790 --> 00:45:38,710
well it would tell you that there was

1231
00:45:42,069 --> 00:45:40,800
sulfur in this comet and

1232
00:45:43,589 --> 00:45:42,079
eventually you might be able to figure

1233
00:45:46,710 --> 00:45:43,599
out something about the abundance of

1234
00:45:49,910 --> 00:45:46,720
sulfur in the comet and the reason we

1235
00:45:51,349 --> 00:45:49,920
study the abundances of comets is is so

1236
00:45:52,950 --> 00:45:51,359
we can understand comet's one of the

1237
00:45:54,630 --> 00:45:52,960
building blocks of the solar system are

1238
00:45:56,790 --> 00:45:54,640

remnant of the building block of the

1239
00:45:58,150 --> 00:45:56,800
solar system so you might be able to say

1240
00:46:01,670 --> 00:45:58,160
eventually something about the

1241
00:46:03,430 --> 00:46:01,680
composition of the early solar system

1242
00:46:05,510 --> 00:46:03,440
i should also point out that when you do

1243
00:46:07,750 --> 00:46:05,520
observe comets

1244
00:46:09,510 --> 00:46:07,760
sulfur other molecules and comets you're

1245
00:46:11,670 --> 00:46:09,520
seeing gas around the

1246
00:46:14,390 --> 00:46:11,680
around the main body and most of the

1247
00:46:16,550 --> 00:46:14,400
masses in the main body and it's always

1248
00:46:18,309 --> 00:46:16,560
difficult to try to infer something

1249
00:46:19,510 --> 00:46:18,319
about the bulk composition from what you

1250
00:46:21,190 --> 00:46:19,520
see in the

1251
00:46:22,950 --> 00:46:21,200
in the coma because there's chemistry

1252
00:46:24,790 --> 00:46:22,960
that goes on and alters things and stuff

1253
00:46:26,710 --> 00:46:24,800
like that so what we just did is we just

1254
00:46:28,630 --> 00:46:26,720
pulverized the comet to find out what

1255
00:46:30,950 --> 00:46:28,640
was inside it perhaps

1256
00:46:33,750 --> 00:46:30,960
and um it's a different way to look at

1257
00:46:37,589 --> 00:46:35,750
miles all right miles o'brien with cnn

1258
00:46:39,030 --> 00:46:37,599
i'd appreciate from anybody here sort of

1259
00:46:40,630 --> 00:46:39,040
a little more of a layman's term

1260
00:46:42,950 --> 00:46:40,640
explanation of what's going on in the

1261
00:46:44,630 --> 00:46:42,960
magnetosphere of jupiter here uh i'm not

1262
00:46:46,150 --> 00:46:44,640
sure that i'm real clear on what's going

1263
00:46:48,150 --> 00:46:46,160

on

1264
00:46:50,150 --> 00:46:48,160
i think what we were what dr pranje was

1265
00:46:51,750 --> 00:46:50,160
talking about was that

1266
00:46:53,349 --> 00:46:51,760
these of course

1267
00:46:56,950 --> 00:46:53,359
observations we've only just seen the

1268
00:46:59,589 --> 00:46:56,960
last day or two but uh the uh

1269
00:47:00,390 --> 00:46:59,599
preliminary impression is that we have

1270
00:47:02,630 --> 00:47:00,400
this

1271
00:47:05,670 --> 00:47:02,640
big impact the big splash and the

1272
00:47:07,670 --> 00:47:05,680
fireball on the southern part of

1273
00:47:10,230 --> 00:47:07,680
uh jupiter and that to send up some

1274
00:47:13,430 --> 00:47:10,240
plasma like the fireball you saw some of

1275
00:47:16,230 --> 00:47:13,440
this material gets electrified loses the

1276
00:47:18,550 --> 00:47:16,240
atoms or molecules lose electrons and

1277
00:47:20,230 --> 00:47:18,560
then these uh they become charged right

1278
00:47:21,990 --> 00:47:20,240
you have charged particles now and i

1279
00:47:23,910 --> 00:47:22,000
think the electrons in particular

1280
00:47:25,990 --> 00:47:23,920
probably you're talking about they get

1281
00:47:29,190 --> 00:47:26,000
accelerated by some forces that have to

1282
00:47:30,710 --> 00:47:29,200
be worked out that uh but we know things

1283
00:47:32,630 --> 00:47:30,720
like this happen on the earth in other

1284
00:47:34,790 --> 00:47:32,640
situations

1285
00:47:36,829 --> 00:47:34,800
they get accelerated they travel

1286
00:47:39,349 --> 00:47:36,839
uh to the other side of the globe of

1287
00:47:41,270 --> 00:47:39,359
jupiter and cause an aurora there in a

1288
00:47:43,750 --> 00:47:41,280

place we've never seen before because

1289
00:47:45,990 --> 00:47:43,760
it's further south whatever makes the

1290
00:47:48,630 --> 00:47:46,000
aurora and jupiter ordinarily

1291
00:47:51,349 --> 00:47:48,640
doesn't bring it down that far uh south

1292
00:47:54,630 --> 00:47:51,359
it's like uh normally we see nice aurora

1293
00:47:56,390 --> 00:47:54,640
in canada and new england and so on and

1294
00:47:58,549 --> 00:47:56,400
it's a rare time when you see a mexico

1295
00:47:59,510 --> 00:47:58,559
city that does does happen after a big

1296
00:48:00,710 --> 00:47:59,520
flare

1297
00:48:06,470 --> 00:48:00,720
the

1298
00:48:08,230 --> 00:48:06,480
lines of magnetic field that you can see

1299
00:48:09,910 --> 00:48:08,240
in the image so they want to escape the

1300
00:48:11,270 --> 00:48:09,920
atmosphere but they they can't they have

1301
00:48:13,109 --> 00:48:11,280
to move along these field lines and end

1302
00:48:14,230 --> 00:48:13,119
up getting turned around and you know

1303
00:48:15,270 --> 00:48:14,240
come back on the other side of the

1304
00:48:16,710 --> 00:48:15,280
planet

1305
00:48:18,549 --> 00:48:16,720
so if you were on jupiter right now

1306
00:48:20,069 --> 00:48:18,559
you'd see northern lights like you've

1307
00:48:21,589 --> 00:48:20,079
never seen them before you'd be glad you

1308
00:48:22,950 --> 00:48:21,599
were seeing northern lights you weren't

1309
00:48:24,470 --> 00:48:22,960
down south

1310
00:48:26,470 --> 00:48:24,480
actually one of the things is there any

1311
00:48:28,870 --> 00:48:26,480
evidence that you've seen over the last

1312
00:48:30,630 --> 00:48:28,880
24 hours which has is settling one way

1313
00:48:32,150 --> 00:48:30,640

or another whether this is a comet or an

1314
00:48:34,230 --> 00:48:32,160
asteroid once

1315
00:48:35,270 --> 00:48:34,240
oh no that that's a very important

1316
00:48:37,430 --> 00:48:35,280
question

1317
00:48:40,309 --> 00:48:37,440
um but it's going to be very difficult

1318
00:48:42,150 --> 00:48:40,319
to get an answer to that um so

1319
00:48:44,150 --> 00:48:42,160
i'm i'm afraid i just have to say flat

1320
00:48:46,829 --> 00:48:44,160
out there's no evidence that will help

1321
00:48:49,030 --> 00:48:46,839
us determine whether it's a comet or an

1322
00:48:50,230 --> 00:48:49,040
asteroid well there may be evidence we

1323
00:48:51,910 --> 00:48:50,240
just haven't had enough time to think

1324
00:48:53,589 --> 00:48:51,920
about it exactly

1325
00:48:55,270 --> 00:48:53,599
i would like to go to some of the

1326
00:48:59,589 --> 00:48:55,280
centers for questions now as we're going

1327
00:48:59,599 --> 00:49:04,630
which first one up please

1328
00:49:08,710 --> 00:49:06,470
okay well we're holding on that is there

1329
00:49:11,510 --> 00:49:08,720
one more here first

1330
00:49:15,190 --> 00:49:13,270
matt crenson the dallas morning news for

1331
00:49:16,390 --> 00:49:15,200
dr yale uh i don't want all the gory

1332
00:49:17,510 --> 00:49:16,400
details but

1333
00:49:19,510 --> 00:49:17,520
in general

1334
00:49:22,230 --> 00:49:19,520
how can you tell whether the sulfur came

1335
00:49:23,510 --> 00:49:22,240
from jupiter or from the comet uh and

1336
00:49:26,630 --> 00:49:23,520
what are the chances that you'll be able

1337
00:49:29,910 --> 00:49:28,230
i don't know how the how good the

1338
00:49:31,349 --> 00:49:29,920

chances are but to finally get the

1339
00:49:33,109 --> 00:49:31,359
answer we're going to have to correlate

1340
00:49:34,950 --> 00:49:33,119
lots of different pieces of information

1341
00:49:37,109 --> 00:49:34,960
left

1342
00:49:38,790 --> 00:49:37,119
you know what we've seen so far as far

1343
00:49:40,790 --> 00:49:38,800
as chemistry goes through the molecules

1344
00:49:43,349 --> 00:49:40,800
that are easiest to detect with more

1345
00:49:45,109 --> 00:49:43,359
work and with all the other observations

1346
00:49:46,870 --> 00:49:45,119
being made we'll undoubtedly hear about

1347
00:49:48,950 --> 00:49:46,880
a lot more molecules you look at the

1348
00:49:50,630 --> 00:49:48,960
whole suite of molecules that will help

1349
00:49:52,150 --> 00:49:50,640
you try to infer something about the

1350
00:49:53,510 --> 00:49:52,160
temperatures in the fireball and that

1351
00:49:55,750 --> 00:49:53,520
will tell you about the chemistry in the

1352
00:49:57,589 --> 00:49:55,760
atmosphere that'll help you understand

1353
00:49:59,270 --> 00:49:57,599
what's going on by trying to correlate

1354
00:50:02,710 --> 00:49:59,280
all this i have hopes that we'll be able

1355
00:50:04,230 --> 00:50:02,720
to say something about how much of the

1356
00:50:06,309 --> 00:50:04,240
what we see is due to the comet and how

1357
00:50:08,309 --> 00:50:06,319
much of what we see is from jupiter

1358
00:50:10,150 --> 00:50:08,319
itself

1359
00:50:11,750 --> 00:50:10,160
so i'm optimistic but it's hard to put a

1360
00:50:13,349 --> 00:50:11,760
number on the chances we'll be coming

1361
00:50:14,950 --> 00:50:13,359
back to questions here

1362
00:50:16,549 --> 00:50:14,960
pardon excuse me we'll be coming back to

1363
00:50:18,950 --> 00:50:16,559

questions here in a moment but let's

1364
00:50:20,870 --> 00:50:18,960
have one from jpl uh please state your

1365
00:50:22,470 --> 00:50:20,880
name and affiliation

1366
00:50:25,589 --> 00:50:22,480
this is robert lee house from the los

1367
00:50:27,349 --> 00:50:25,599
angeles times two related questions one

1368
00:50:29,510 --> 00:50:27,359
i guess i'm surprised to be hearing at

1369
00:50:32,309 --> 00:50:29,520
this stage of the game that we're not

1370
00:50:34,069 --> 00:50:32,319
sure this is a comment uh can you tell

1371
00:50:34,950 --> 00:50:34,079
us why there's a

1372
00:50:36,549 --> 00:50:34,960
any

1373
00:50:38,630 --> 00:50:36,559
question at this stage why this might be

1374
00:50:41,430 --> 00:50:38,640
a comment or an asteroid and then

1375
00:50:43,990 --> 00:50:41,440
secondly is it uh disconcerting to you

1376
00:50:46,230 --> 00:50:44,000
folks that you're not seeing uh evidence

1377
00:50:49,030 --> 00:50:46,240
of water yet

1378
00:50:50,790 --> 00:50:49,040
okay i'll i'll field that one if if gene

1379
00:50:53,190 --> 00:50:50,800
where gene shoemaker were here he would

1380
00:50:56,069 --> 00:50:53,200
say oh it's definitely a comet and the

1381
00:50:57,990 --> 00:50:56,079
probability of it being a comet and gene

1382
00:50:59,750 --> 00:50:58,000
can argue persuasively that it's

1383
00:51:05,190 --> 00:50:59,760
probably a comet

1384
00:51:07,910 --> 00:51:05,200
dynamically it is possible um to to

1385
00:51:09,829 --> 00:51:07,920
give a gravitational push to an object

1386
00:51:12,710 --> 00:51:09,839
anywhere in the solar system and so

1387
00:51:14,950 --> 00:51:12,720
dynamically it's also possible to to

1388
00:51:17,030 --> 00:51:14,960

exert a gravitational force on an object

1389
00:51:18,790 --> 00:51:17,040
in the outer region of the asteroid belt

1390
00:51:20,870 --> 00:51:18,800
and perturb it so that it goes into

1391
00:51:22,870 --> 00:51:20,880
orbit around jupiter as this co as this

1392
00:51:25,190 --> 00:51:22,880
object did and we call it a comment

1393
00:51:28,230 --> 00:51:25,200
because it was discovered as a diffuse

1394
00:51:30,549 --> 00:51:28,240
object um which is the the

1395
00:51:32,790 --> 00:51:30,559
uh discriminating characteristic of a

1396
00:51:34,549 --> 00:51:32,800
comet observationally now it's a very

1397
00:51:37,190 --> 00:51:34,559
important question to determine whether

1398
00:51:39,030 --> 00:51:37,200
this was a comet or an asteroid because

1399
00:51:41,190 --> 00:51:39,040
the comets are

1400
00:51:43,270 --> 00:51:41,200
remnants of the

1401
00:51:44,950 --> 00:51:43,280
original solar system they've been kept

1402
00:51:47,109 --> 00:51:44,960
in cold storage for four and a half

1403
00:51:48,870 --> 00:51:47,119
billion years and we can get a better

1404
00:51:51,109 --> 00:51:48,880
handle on the starting material of the

1405
00:51:52,710 --> 00:51:51,119
solar system if we're studying a comet

1406
00:51:54,309 --> 00:51:52,720
if we're studying an asteroid the

1407
00:51:55,910 --> 00:51:54,319
asteroids have been in the inner solar

1408
00:51:58,069 --> 00:51:55,920
system they've been subjected to higher

1409
00:52:00,230 --> 00:51:58,079
temperatures they've been subjected to

1410
00:52:02,150 --> 00:52:00,240
greater uh frequency of collisions and

1411
00:52:03,670 --> 00:52:02,160
so the material is altered and we just

1412
00:52:04,870 --> 00:52:03,680
need to know what we're looking at and

1413
00:52:06,950 --> 00:52:04,880

presumably

1414
00:52:08,630 --> 00:52:06,960
the reason you might even though it's

1415
00:52:10,549 --> 00:52:08,640
diffuse you might think it could be an

1416
00:52:13,430 --> 00:52:10,559
asteroid is we know it's something that

1417
00:52:14,870 --> 00:52:13,440
was fragmented by the title

1418
00:52:17,109 --> 00:52:14,880
it could be dust

1419
00:52:19,910 --> 00:52:17,119
from this fragmentation and not an

1420
00:52:21,910 --> 00:52:19,920
atmosphere like a comet has of

1421
00:52:23,430 --> 00:52:21,920
evaporator or sublime gases and the

1422
00:52:25,270 --> 00:52:23,440
other question was about water are we

1423
00:52:28,710 --> 00:52:25,280
surprised that we haven't seen water

1424
00:52:32,150 --> 00:52:28,720
well yes or no yes and no um

1425
00:52:33,990 --> 00:52:32,160
uh i appreciate the difficulty in

1426
00:52:37,109 --> 00:52:34,000
analyzing the data from the kuiper

1427
00:52:39,910 --> 00:52:37,119
airborne observatory um

1428
00:52:41,750 --> 00:52:39,920
and and i continue to think of scenarios

1429
00:52:43,750 --> 00:52:41,760
which would exist where water is there

1430
00:52:45,750 --> 00:52:43,760
but we don't see it and it may not be

1431
00:52:47,670 --> 00:52:45,760
stable in jupiter's atmosphere for long

1432
00:52:49,109 --> 00:52:47,680
enough to get a

1433
00:52:50,950 --> 00:52:49,119
detectable signal with the

1434
00:52:52,790 --> 00:52:50,960
instrumentation or it could be some

1435
00:52:53,589 --> 00:52:52,800
chemical thing

1436
00:52:59,750 --> 00:52:53,599
so

1437
00:53:01,430 --> 00:52:59,760
results back let the the scientists

1438
00:53:03,750 --> 00:53:01,440

analyze their data instead of showing us

1439
00:53:06,870 --> 00:53:03,760
their raw images that have spectacular

1440
00:53:09,190 --> 00:53:06,880
uh signatures on them

1441
00:53:11,670 --> 00:53:09,200
just a quick follow can you tell us what

1442
00:53:14,470 --> 00:53:11,680
fragment we were looking at in the irtf

1443
00:53:17,990 --> 00:53:14,480
images

1444
00:53:18,000 --> 00:53:23,270
maybe

1445
00:53:28,549 --> 00:53:25,349
you always catch me on these questions

1446
00:53:31,030 --> 00:53:28,559
on which what image was it um oh

1447
00:53:33,910 --> 00:53:31,040
actually that was the a site

1448
00:53:35,829 --> 00:53:33,920
remember a long time ago so this is um

1449
00:53:37,750 --> 00:53:35,839
they were observing a to watch for its

1450
00:53:39,270 --> 00:53:37,760
evolution it's it's very

1451
00:53:40,950 --> 00:53:39,280
we're going to become interested in how

1452
00:53:43,510 --> 00:53:40,960
these things evolve with time so that

1453
00:53:45,109 --> 00:53:43,520
was the site of the first impact there

1454
00:53:48,549 --> 00:53:45,119
are so many of these sites now that

1455
00:53:50,309 --> 00:53:48,559
we've already seen reports where

1456
00:53:52,870 --> 00:53:50,319
as swiftly pointed out by their

1457
00:53:53,910 --> 00:53:52,880
colleagues astronomers are saying this

1458
00:53:55,589 --> 00:53:53,920
site

1459
00:53:57,829 --> 00:53:55,599
looked like thus and so and someone else

1460
00:53:59,750 --> 00:53:57,839
says no at that time you look you were

1461
00:54:01,270 --> 00:53:59,760
seeing a different side there's so many

1462
00:54:02,790 --> 00:54:01,280
of them now you

1463
00:54:04,549 --> 00:54:02,800

you need a program when you go to the

1464
00:54:06,790 --> 00:54:04,559
telescope to

1465
00:54:08,630 --> 00:54:06,800
tell the spots on jupiter

1466
00:54:10,150 --> 00:54:08,640
okay we have some questions now from the

1467
00:54:13,270 --> 00:54:10,160
kennedy space center in florida please

1468
00:54:15,510 --> 00:54:13,280
state your name and affiliation

1469
00:54:18,549 --> 00:54:15,520
hi jim banke of florida today a question

1470
00:54:19,910 --> 00:54:18,559
maybe for uh dave levy or lucy

1471
00:54:21,990 --> 00:54:19,920
you said earlier in the week that you

1472
00:54:24,069 --> 00:54:22,000
thought these spots would last for weeks

1473
00:54:26,230 --> 00:54:24,079
if not months is there any evidence from

1474
00:54:28,309 --> 00:54:26,240
the ground-based observatories the

1475
00:54:30,950 --> 00:54:28,319
telescopes that any of the earlier spots

1476
00:54:32,790 --> 00:54:30,960
are fading away we can ask lucy mcfadden

1477
00:54:35,670 --> 00:54:32,800
to answer that because dave levy was

1478
00:54:36,789 --> 00:54:35,680
called away he is in great demand

1479
00:54:39,510 --> 00:54:36,799
um

1480
00:54:41,670 --> 00:54:39,520
there is evidence of fading of some of

1481
00:54:44,230 --> 00:54:41,680
the spots changes in the brightness of

1482
00:54:46,630 --> 00:54:44,240
some of the spots um none of them have

1483
00:54:47,990 --> 00:54:46,640
disappeared remember some of the impacts

1484
00:54:49,270 --> 00:54:48,000
didn't leave a

1485
00:54:53,349 --> 00:54:49,280
scar

1486
00:54:54,549 --> 00:54:53,359
fragment b did not make a significant uh

1487
00:54:55,829 --> 00:54:54,559
feature

1488
00:54:57,990 --> 00:54:55,839

um

1489
00:55:00,950 --> 00:54:58,000
there's some change galileo people told

1490
00:55:01,910 --> 00:55:00,960
us that besides spotting h they looked

1491
00:55:04,150 --> 00:55:01,920
for

1492
00:55:07,670 --> 00:55:04,160
an impact site from b and did not see it

1493
00:55:11,750 --> 00:55:09,670
and the second question uh maybe a

1494
00:55:14,630 --> 00:55:11,760
little trivial for you folks but in the

1495
00:55:16,870 --> 00:55:14,640
forest of jupiter did the comet make a

1496
00:55:18,390 --> 00:55:16,880
sound when it uh when it hits

1497
00:55:20,470 --> 00:55:18,400
in i know there's no one there to hear

1498
00:55:23,349 --> 00:55:20,480
it but uh did it make a sound what would

1499
00:55:25,910 --> 00:55:23,359
be the sound of a comet hitting jupiter

1500
00:55:28,069 --> 00:55:25,920
very loud

1501
00:55:30,549 --> 00:55:28,079
made a very big sound

1502
00:55:34,549 --> 00:55:30,559
um one of the things we'll be looking at

1503
00:55:36,230 --> 00:55:34,559
for seismic waves which are a wave that

1504
00:55:37,349 --> 00:55:36,240
sounds through a wave i don't think

1505
00:55:39,270 --> 00:55:37,359
there's any

1506
00:55:41,349 --> 00:55:39,280
conclusions on that yet but it certainly

1507
00:55:43,589 --> 00:55:41,359
did make a big noise not just a sound

1508
00:55:45,270 --> 00:55:43,599
but it's a sonic boom that going on

1509
00:55:46,829 --> 00:55:45,280
there oh

1510
00:55:49,349 --> 00:55:46,839
undoubtedly

1511
00:55:51,510 --> 00:55:49,359
yes this is phil chan earth news for

1512
00:55:53,190 --> 00:55:51,520
roger and how certain are you that this

1513
00:55:55,670 --> 00:55:53,200

is sulfur have you eliminated all the

1514
00:55:56,789 --> 00:55:55,680
other possible molecules um is there any

1515
00:55:58,870 --> 00:55:56,799
possibility that this might be from the

1516
00:56:00,870 --> 00:55:58,880
iotaurus or from the magnetosphere some

1517
00:56:03,910 --> 00:56:00,880
kind of ionized sulfur

1518
00:56:09,349 --> 00:56:07,670
we're absolutely sure it's sulfur we um

1519
00:56:11,270 --> 00:56:09,359
you saw that it had this this very

1520
00:56:12,870 --> 00:56:11,280
interesting structure where the there

1521
00:56:14,630 --> 00:56:12,880
were wiggles up and down and there's

1522
00:56:17,750 --> 00:56:14,640
about 30 of those wiggles and they all

1523
00:56:20,870 --> 00:56:17,760
line up with 30 lines expected from

1524
00:56:23,109 --> 00:56:20,880
sulfur and then the distribution of

1525
00:56:24,630 --> 00:56:23,119
intensities is also understandable in

1526
00:56:26,950 --> 00:56:24,640
terms of sulfur so i think there's no

1527
00:56:28,069 --> 00:56:26,960
doubt now i also reported a more

1528
00:56:30,549 --> 00:56:28,079
tentative

1529
00:56:31,910 --> 00:56:30,559
detection of h2s and i want to be

1530
00:56:32,630 --> 00:56:31,920
careful with that

1531
00:56:36,069 --> 00:56:32,640
the

1532
00:56:38,950 --> 00:56:36,079
hydrogen sulfide but it might be

1533
00:56:40,470 --> 00:56:38,960
possible to explain that feature with

1534
00:56:42,230 --> 00:56:40,480
some combination of other molecules

1535
00:56:44,630 --> 00:56:42,240
we'll have to be more careful and wait

1536
00:56:45,910 --> 00:56:44,640
and see on that but for the for the s2

1537
00:56:47,670 --> 00:56:45,920
there's just no doubt couldn't be

1538
00:56:49,270 --> 00:56:47,680

anything else the other part of phil

1539
00:56:51,910 --> 00:56:49,280
chan's question was could this sulphur

1540
00:56:53,670 --> 00:56:51,920
be in the volcanoes on eo that's very

1541
00:56:56,069 --> 00:56:53,680
hard for me to imagine i think i'd have

1542
00:56:57,589 --> 00:56:56,079
to say no

1543
00:57:00,230 --> 00:56:57,599
okay and will you be making this data

1544
00:57:01,750 --> 00:57:00,240
available on the internet and using

1545
00:57:04,470 --> 00:57:01,760
heidi hamill's

1546
00:57:06,549 --> 00:57:04,480
analogy how bad is the traffic jam on

1547
00:57:08,870 --> 00:57:06,559
information superhighway

1548
00:57:10,950 --> 00:57:08,880
um traffic's very heavy on the

1549
00:57:14,230 --> 00:57:10,960
information super highway

1550
00:57:16,390 --> 00:57:14,240
i've have reports that the

1551
00:57:18,309 --> 00:57:16,400
computer up at space science telescope

1552
00:57:22,390 --> 00:57:18,319
institute is uh

1553
00:57:24,710 --> 00:57:22,400
jammed standstill just like los angeles

1554
00:57:26,950 --> 00:57:24,720
our computer at university of maryland

1555
00:57:28,950 --> 00:57:26,960
which is available for professional

1556
00:57:31,190 --> 00:57:28,960
astronomers and the observers

1557
00:57:32,950 --> 00:57:31,200
has been running at 50 to 70 percent

1558
00:57:35,270 --> 00:57:32,960
capacity

1559
00:57:37,670 --> 00:57:35,280
and we have anywhere from one to two

1560
00:57:39,990 --> 00:57:37,680
dozen people on at any one time

1561
00:57:41,589 --> 00:57:40,000
and we cannot compute

1562
00:57:43,670 --> 00:57:41,599
we can't keep track of how many people

1563
00:57:45,270 --> 00:57:43,680

log on and the same at hubble space

1564
00:57:47,109 --> 00:57:45,280
telescope they had to move their program

1565
00:57:48,390 --> 00:57:47,119
that counts how many people are logging

1566
00:57:50,309 --> 00:57:48,400
on to another machine because the

1567
00:57:51,510 --> 00:57:50,319
machine couldn't handle the incoming

1568
00:57:52,630 --> 00:57:51,520
traffic so

1569
00:57:54,390 --> 00:57:52,640
uh it's

1570
00:57:57,349 --> 00:57:54,400
it's busy

1571
00:57:59,510 --> 00:57:57,359
it's the way it's supposed to be i guess

1572
00:58:01,430 --> 00:57:59,520
we'll go to headquarters now for some

1573
00:58:10,950 --> 00:58:01,440
questions please state your name and

1574
00:58:14,230 --> 00:58:12,549
i'm not sure if we're having a technical

1575
00:58:18,710 --> 00:58:14,240
difficulty

1576
00:58:22,870 --> 00:58:20,870
okay we're going to have time for one

1577
00:58:24,710 --> 00:58:22,880
more question here and i've been

1578
00:58:29,510 --> 00:58:24,720
assured the panels will stay around for

1579
00:58:32,549 --> 00:58:30,950
this is mark carrara the houston

1580
00:58:33,670 --> 00:58:32,559
chronicle could you talk a little bit

1581
00:58:36,630 --> 00:58:33,680
about

1582
00:58:38,309 --> 00:58:36,640
qr and s and even the

1583
00:58:41,030 --> 00:58:38,319
the last fragments and how they're going

1584
00:58:42,710 --> 00:58:41,040
to how they compare in size brightness

1585
00:58:46,069 --> 00:58:42,720
or whatever with those that have hit

1586
00:58:51,109 --> 00:58:49,349
the qr and s impacts will occur within

1587
00:58:53,589 --> 00:58:51,119
about 10 hours of each other which means

1588
00:58:55,910 --> 00:58:53,599

they will land on jupiter at the same

1589
00:58:57,510 --> 00:58:55,920
location

1590
00:59:00,230 --> 00:58:57,520
let's see dave jewett at university of

1591
00:59:01,589 --> 00:59:00,240
hawaii has done some recent astrometry

1592
00:59:03,190 --> 00:59:01,599
he had a

1593
00:59:05,109 --> 00:59:03,200
an instrument which allowed which

1594
00:59:06,789 --> 00:59:05,119
blocked out the light from jupiter and

1595
00:59:09,030 --> 00:59:06,799
allowed him to look at the fragments as

1596
00:59:09,990 --> 00:59:09,040
they were approaching jupiter very close

1597
00:59:11,670 --> 00:59:10,000
and

1598
00:59:14,230 --> 00:59:11,680
with his measurements of the positions

1599
00:59:16,470 --> 00:59:14,240
of the fragments he enabled paul chotis

1600
00:59:19,030 --> 00:59:16,480
and don yeomans at jet propulsion lab to

1601
00:59:21,109 --> 00:59:19,040
update the impact times and those impact

1602
00:59:23,190 --> 00:59:21,119
times have moved forward about 15

1603
00:59:25,670 --> 00:59:23,200
minutes

1604
00:59:28,710 --> 00:59:25,680
so they but the spacing between them i

1605
00:59:30,150 --> 00:59:28,720
believe is still the same so we're we're

1606
00:59:32,230 --> 00:59:30,160
interested in watching what's going to

1607
00:59:34,069 --> 00:59:32,240
happen when these sites land on top of

1608
00:59:36,309 --> 00:59:34,079
each other and and

1609
00:59:38,630 --> 00:59:36,319
it's going to make it harder for us to

1610
00:59:41,270 --> 00:59:38,640
disentangle the information but we may

1611
00:59:43,430 --> 00:59:41,280
learn something from it as well q should

1612
00:59:46,150 --> 00:59:43,440
be big right i think that's part of the

1613
00:59:47,829 --> 00:59:46,160

question yeah q should be big p's p

1614
00:59:51,910 --> 00:59:47,839
should be big too they're they are

1615
00:59:55,030 --> 00:59:53,990
let's try headquarters again uh go ahead

1616
00:59:56,950 --> 00:59:55,040
please

1617
00:59:59,589 --> 00:59:56,960
uh yeah this is ron kellen from science

1618
01:00:01,270 --> 00:59:59,599
news for dr pronjay can you tell me how

1619
01:00:04,950 --> 01:00:01,280
many kilometers

1620
01:00:07,190 --> 01:00:04,960
uh this this new footprint is below the

1621
01:00:08,789 --> 01:00:07,200
the existing one is there a way to

1622
01:00:10,950 --> 01:00:08,799
understand why

1623
01:00:12,549 --> 01:00:10,960
this commentary debris just getting onto

1624
01:00:14,549 --> 01:00:12,559
the north pole why it wouldn't just

1625
01:00:16,710 --> 01:00:14,559
brighten the existing footprint why

1626
01:00:19,990 --> 01:00:16,720
would indeed create a new one and again

1627
01:00:24,470 --> 01:00:20,000
how many kilometers beneath is it

1628
01:00:28,309 --> 01:00:26,150
it's rather

1629
01:00:29,750 --> 01:00:28,319
narrow in terms of latitude it may be

1630
01:00:31,750 --> 01:00:29,760
like it's less than a thousand

1631
01:00:34,230 --> 01:00:31,760
kilometers in latitude

1632
01:00:36,870 --> 01:00:34,240
in longitude it's elongated and

1633
01:00:38,470 --> 01:00:36,880
i would say

1634
01:00:40,549 --> 01:00:38,480
probably like

1635
01:00:43,270 --> 01:00:40,559
a few thousand kilometers maybe 10 000

1636
01:00:45,030 --> 01:00:43,280
kilometers but out of that we cannot

1637
01:00:47,190 --> 01:00:45,040
tell whether i should spot which has

1638
01:00:48,069 --> 01:00:47,200

been moving on on top of the planet

1639
01:00:51,750 --> 01:00:48,079
because

1640
01:00:54,390 --> 01:00:51,760
the the exposures have been four

1641
01:00:57,030 --> 01:00:54,400
five six seconds six minutes long during

1642
01:00:59,670 --> 01:00:57,040
that time a fixed spot in the

1643
01:01:02,309 --> 01:00:59,680
magnetosphere rotates in the in front of

1644
01:01:04,549 --> 01:01:02,319
the of the telescope by about four

1645
01:01:06,870 --> 01:01:04,559
degrees i guess i'm not sure but that's

1646
01:01:09,190 --> 01:01:06,880
the order the spot itself we have

1647
01:01:12,309 --> 01:01:09,200
measured the trace which is about 15

1648
01:01:15,589 --> 01:01:12,319
degrees so in fact it's longer than that

1649
01:01:18,230 --> 01:01:15,599
either this is a remaining light and it

1650
01:01:19,910 --> 01:01:18,240
has been created locally by the by the

1651
01:01:21,910 --> 01:01:19,920
comet but the comet

1652
01:01:24,789 --> 01:01:21,920
in the last two hours the comet is going

1653
01:01:27,030 --> 01:01:24,799
from the dusk side to the node at noon

1654
01:01:30,230 --> 01:01:27,040
and then to the morning site very very

1655
01:01:33,589 --> 01:01:30,240
fast so in if you have emission

1656
01:01:35,349 --> 01:01:33,599
which is blowing growing from for say 10

1657
01:01:37,670 --> 01:01:35,359
minutes you will see it like a track on

1658
01:01:40,870 --> 01:01:37,680
the on the observations so we cannot

1659
01:01:42,710 --> 01:01:40,880
tell so far how how large is the spot if

1660
01:01:44,150 --> 01:01:42,720
it's a temporal effect of if it is a

1661
01:01:45,510 --> 01:01:44,160
special effect

1662
01:01:48,230 --> 01:01:45,520
and the other answer the other part of

1663
01:01:49,510 --> 01:01:48,240

ron cowan's question why doesn't it just

1664
01:01:52,390 --> 01:01:49,520
shine in the

1665
01:01:54,309 --> 01:01:52,400
normal a rural place is that it's not

1666
01:01:57,990 --> 01:01:54,319
like all the bees go to the same nest to

1667
01:02:00,069 --> 01:01:58,000
get honey but the the the magnetic line

1668
01:02:01,829 --> 01:02:00,079
from the normal northern or rural zone

1669
01:02:04,069 --> 01:02:01,839
doesn't come to the place where the

1670
01:02:05,190 --> 01:02:04,079
comet hit the normal the normal aura

1671
01:02:07,270 --> 01:02:05,200
comes from

1672
01:02:10,230 --> 01:02:07,280
apparently the last observation we got

1673
01:02:12,390 --> 01:02:10,240
with the with the hubble last year

1674
01:02:13,670 --> 01:02:12,400
suggests very very strongly in the

1675
01:02:15,990 --> 01:02:13,680
comparison with ulysses we did

1676
01:02:16,789 --> 01:02:16,000
comparison with herbal and ulysses this

1677
01:02:20,150 --> 01:02:16,799
year

1678
01:02:21,670 --> 01:02:20,160
and it's very strongly suggest that the

1679
01:02:24,230 --> 01:02:21,680
normal or

1680
01:02:27,029 --> 01:02:24,240
observed glow we see it's related to

1681
01:02:29,750 --> 01:02:27,039
currents which flow right at the limit

1682
01:02:31,430 --> 01:02:29,760
between what we call the polar cap and

1683
01:02:33,430 --> 01:02:31,440
the closed fill line inside the

1684
01:02:35,990 --> 01:02:33,440
magnetosphere the close field line they

1685
01:02:38,150 --> 01:02:36,000
rotate to the planet in 10 hours the

1686
01:02:40,470 --> 01:02:38,160
open field lines as we say in our jargon

1687
01:02:41,750 --> 01:02:40,480
the one which are pushed away in the

1688
01:02:43,750 --> 01:02:41,760

tail by the

1689
01:02:45,430 --> 01:02:43,760
solar pressure solar in pressure and

1690
01:02:47,510 --> 01:02:45,440
which are open to the solar wind

1691
01:02:49,349 --> 01:02:47,520
normally they do not rotate with the

1692
01:02:51,270 --> 01:02:49,359
with the

1693
01:02:54,150 --> 01:02:51,280
the planet itself this creates a

1694
01:02:56,390 --> 01:02:54,160
condition for strong currents and there

1695
01:02:58,870 --> 01:02:56,400
we see a sheet of precipitation this is

1696
01:03:00,390 --> 01:02:58,880
very very high latitude it is connected

1697
01:03:01,990 --> 01:03:00,400
at something like

1698
01:03:07,510 --> 01:03:02,000
60

1699
01:03:11,109 --> 01:03:07,520
the the glow we have seen this transient

1700
01:03:13,430 --> 01:03:11,119
glow is on field lines which go like two

1701
01:03:15,910 --> 01:03:13,440
or three rg at maximum at the equator

1702
01:03:18,309 --> 01:03:15,920
from the from the center of the planet

1703
01:03:20,309 --> 01:03:18,319
very very closely line in what we call

1704
01:03:22,549 --> 01:03:20,319
the inner magnetosphere in the inner

1705
01:03:26,309 --> 01:03:22,559
magnesium sphere normally we do not have

1706
01:03:28,789 --> 01:03:26,319
plasma to get this uh this effect

1707
01:03:32,150 --> 01:03:28,799
and it it was also connected to the path

1708
01:03:35,109 --> 01:03:33,190
i think we have one more from

1709
01:03:37,349 --> 01:03:35,119
headquarters

1710
01:03:40,870 --> 01:03:37,359
uh yes this is tracy

1711
01:03:46,789 --> 01:03:43,829
i wonder if you've seen any uh white at

1712
01:03:49,270 --> 01:03:46,799
the thin dark ring from

1713
01:03:50,870 --> 01:03:49,280

can you hear me no please repeat um i'm

1714
01:03:53,029 --> 01:03:50,880
wanting to see any whitening yet of the

1715
01:03:55,029 --> 01:03:53,039
thin dark ring from

1716
01:03:57,589 --> 01:03:55,039
from fragment g the one surrounding the

1717
01:03:59,109 --> 01:03:57,599
dark swatch

1718
01:04:01,589 --> 01:03:59,119
that's that's for me

1719
01:04:02,630 --> 01:04:01,599
sure it's a hubble question oh i don't

1720
01:04:04,470 --> 01:04:02,640
think we're

1721
01:04:08,309 --> 01:04:04,480
we have any more results on that at this

1722
01:04:12,950 --> 01:04:10,230
okay that's all the questions we have

1723
01:04:15,750 --> 01:04:12,960
time for today we'll rerun the video and

1724
01:07:20,230 --> 01:04:15,760
uh feed that on the satellite and uh

1725
01:07:24,470 --> 01:07:21,990
and start imaging

1726
01:07:26,069 --> 01:07:24,480
so we didn't actually catch the flash of

1727
01:07:28,870 --> 01:07:26,079
l but we were able to start looking at

1728
01:07:30,230 --> 01:07:28,880
the morphology of the l site very very

1729
01:07:33,270 --> 01:07:30,240
quickly

1730
01:07:35,750 --> 01:07:33,280
the conditions turned spectacular very

1731
01:07:37,190 --> 01:07:35,760
soon on we had excellent excellent

1732
01:07:39,109 --> 01:07:37,200
transparency

1733
01:07:40,950 --> 01:07:39,119
almost all the night

1734
01:07:42,950 --> 01:07:40,960
and extremely stable atmospheric

1735
01:07:45,190 --> 01:07:42,960
conditions so we have some really really

1736
01:07:48,230 --> 01:07:45,200
pretty images that we've gotten out with

1737
01:07:50,230 --> 01:07:48,240
both an ir camera on the 2.7 meter

1738
01:07:51,430 --> 01:07:50,240

telescope and

1739
01:08:08,870 --> 01:07:51,440
a

1740
01:08:11,349 --> 01:08:08,880
structure of the spots in the eyepiece

1741
01:08:13,349 --> 01:08:11,359
in good conditions and

1742
01:08:16,309 --> 01:08:13,359
things are just changing and it's so

1743
01:08:21,030 --> 01:08:19,430
jupiter change below our eyes

1744
01:08:21,749 --> 01:08:21,040
image number two

1745
01:08:24,709 --> 01:08:21,759
is

1746
01:08:29,030 --> 01:08:24,719
a methane image taking the ccd camera

1747
01:08:31,030 --> 01:08:29,040
and in this image we see a number of the

1748
01:08:32,709 --> 01:08:31,040
spots but

1749
01:08:35,349 --> 01:08:32,719
one of the striking features of this

1750
01:08:37,829 --> 01:08:35,359
image is that the h-spot is just

1751
01:08:40,470 --> 01:08:37,839
rotating into onto the limb and we've

1752
01:08:43,110 --> 01:08:40,480
caught it in this image at a point where

1753
01:08:46,070 --> 01:08:43,120
we see it detached from the planet

1754
01:08:48,550 --> 01:08:46,080
a hydrogen molecular band

1755
01:08:51,669 --> 01:08:48,560
uh that is again observed with the ir

1756
01:08:53,829 --> 01:08:51,679
camera on the 2.7 meter in this we have

1757
01:08:55,189 --> 01:08:53,839
four spots and the great red spot in the

1758
01:08:57,110 --> 01:08:55,199
middle of the planet

1759
01:08:58,470 --> 01:08:57,120
uh we sent this in the conventional

1760
01:09:01,030 --> 01:08:58,480
orientation

1761
01:09:02,950 --> 01:09:01,040
we find amusing to turn this and some of

1762
01:09:22,950 --> 01:09:02,960
the other images upside down and look at

1763
01:09:28,149 --> 01:09:25,510

we have two two channels one is a

1764
01:09:30,309 --> 01:09:28,159
temperature channel and one is a search

1765
01:09:32,470 --> 01:09:30,319
for water the temperature channel was

1766
01:09:34,709 --> 01:09:32,480
truly dramatic and we have very good

1767
01:09:36,070 --> 01:09:34,719
coverage of both the g and the k

1768
01:09:38,070 --> 01:09:36,080
fragments

1769
01:09:40,070 --> 01:09:38,080
after having looked at the g fragment

1770
01:09:41,990 --> 01:09:40,080
then we decided to

1771
01:09:43,349 --> 01:09:42,000
to set up the investigation a little

1772
01:09:46,390 --> 01:09:43,359
differently uh

1773
01:09:48,789 --> 01:09:46,400
for the k fragment we concentrated

1774
01:09:50,390 --> 01:09:48,799
almost exclusively on the temperature we

1775
01:09:53,189 --> 01:09:50,400
wanted to make sure that we pinned that

1776
01:09:55,830 --> 01:09:53,199
down very precisely and we have

1777
01:09:56,630 --> 01:09:55,840
even even better data for the k fragment

1778
01:10:06,550 --> 01:09:56,640
the

1779
01:10:08,630 --> 01:10:06,560
factor 25 so it was absolutely stunning

1780
01:10:10,630 --> 01:10:08,640
and you know since we have some spatial

1781
01:10:13,270 --> 01:10:10,640
resolution

1782
01:10:15,990 --> 01:10:13,280
you can see all of all of jupiter

1783
01:10:17,990 --> 01:10:16,000
jupiter at once and then in the the limb

1784
01:10:20,390 --> 01:10:18,000
of jupiter where the fireball was it's

1785
01:10:22,950 --> 01:10:20,400
like seeing a supernova go off or a star

1786
01:10:26,310 --> 01:10:22,960
go off the main reason for using the

1787
01:10:27,870 --> 01:10:26,320
kuiper airborne observatory is that um

1788
01:10:30,470 --> 01:10:27,880

you're flying above

1789
01:10:33,510 --> 01:10:30,480
99.9 percent of the water vapor in the

1790
01:10:37,189 --> 01:10:33,520
earth's atmosphere and you're above just

1791
01:10:39,189 --> 01:10:37,199
80 percent of the total atmosphere

1792
01:10:41,110 --> 01:10:39,199
our key thermometer is the methane

1793
01:10:42,310 --> 01:10:41,120
molecule which is present in the earth's

1794
01:10:44,950 --> 01:10:42,320
atmosphere

1795
01:10:47,430 --> 01:10:44,960
by flying at 41 000 feet

1796
01:10:50,790 --> 01:10:47,440
this opens up a window where we can

1797
01:10:52,310 --> 01:10:50,800
measure very strong methane features on

1798
01:10:54,310 --> 01:10:52,320
jupiter that

1799
01:11:35,750 --> 01:10:54,320
are not measurable from ground-based

1800
01:11:41,590 --> 01:11:38,709
for more information about the nasa sti

1801
01:11:44,870 --> 01:11:41,600
program please write to the nasa center