1
00:00:07,590 --> 00:00:05,190
good afternoon and welcome to nasa's jet

2
00:00:09,430 --> 00:00:07,600
propulsion laboratory uh we're having a

3
00:00:12,549 --> 00:00:09,440
fabulous day here we've had a very

4
00:00:14,470 --> 00:00:12,559
successful flyby of comet hartley 2 by

5
00:00:16,710 --> 00:00:14,480
the recycled deep impact spacecraft

6
00:00:18,150 --> 00:00:16,720
which is part of the epoxy mission and

7
00:00:19,910 --> 00:00:18,160
we have a panel here that's going to

8
00:00:21,349 --> 00:00:19,920
tell you about some of those early

9
00:00:23,189 --> 00:00:21,359
images and what they've been able to

10
00:00:25,670 --> 00:00:23,199
discern from them so far

11
00:00:27,830 --> 00:00:25,680
i'll introduce our panelists to you

12
00:00:29,750 --> 00:00:27,840
first we have dr charles alachi he is

13
00:00:32,709 --> 00:00:29,760

the director of the jet propulsion

14
00:00:37,750 --> 00:00:35,590
next will be dr ed weiler he is the

15
00:00:42,950 --> 00:00:37,760
nasa's associate administrator for the

16
00:00:47,510 --> 00:00:45,910
tim larson he is the project manager for

17
00:00:52,150 --> 00:00:47,520
the epoxy mission from the jet

18
00:00:56,229 --> 00:00:54,549
dr mike ahern he is the principal

19
00:01:00,069 --> 00:00:56,239
investigator of the mission and he is

20
00:01:04,549 --> 00:01:02,150
and finally we'll hear from dr jessica

21
00:01:06,469 --> 00:01:04,559
sunshine she is the deputy principal

22
00:01:08,789 --> 00:01:06,479
investigator and she is also from the

23
00:01:10,950 --> 00:01:08,799
university of maryland and we're going

24
00:01:12,469 --> 00:01:10,960
to begin with dr alachi

25
00:01:14,310 --> 00:01:12,479
well good afternoon

26
00:01:16,710 --> 00:01:14,320
as you could imagine this has been a

27
00:01:18,390 --> 00:01:16,720
great day for nasa

28
00:01:20,469 --> 00:01:18,400
for jpl

29
00:01:23,190 --> 00:01:20,479
for university of maryland for bola

30
00:01:25,190 --> 00:01:23,200
aerospace and for our nation quest in

31
00:01:27,190 --> 00:01:25,200
exploration and discovery

32
00:01:29,030 --> 00:01:27,200
and i'm particularly proud of the epoxy

33
00:01:31,350 --> 00:01:29,040
team which really made this look like

34
00:01:33,030 --> 00:01:31,360
it's an easy thing you know to do well

35
00:01:34,230 --> 00:01:33,040
in reality these are always very

36
00:01:36,230 --> 00:01:34,240
challenging

37
00:01:38,789 --> 00:01:36,240
activity i thought just in case you

38
00:01:40,870 --> 00:01:38,799

forgot how it was exciting this morning

39
00:01:43,350 --> 00:01:40,880
uh during the encounter where i have

40
00:01:45,590 --> 00:01:43,360
about a 30 minute video sorry 30 second

41
00:01:47,830 --> 00:01:45,600
video

42
00:01:50,310 --> 00:01:47,840
it seemed like it had been a long day

43
00:01:54,789 --> 00:01:50,320
a 30 second video to show you how it was

44
00:01:58,149 --> 00:01:56,389
all right our first image from closest

45
00:01:59,270 --> 00:01:58,159
approach has been saved to our file

46
00:02:00,469 --> 00:01:59,280
system

47
00:02:02,310 --> 00:02:00,479
you can see we're all staring at the

48
00:02:14,470 --> 00:02:02,320
screen waiting for our software to pick

49
00:02:24,470 --> 00:02:16,949
congratulations on a fantastic flyby

50
00:02:28,630 --> 00:02:26,790
you see how easy they make it look like

51
00:02:31,430 --> 00:02:28,640
uh now before i introduce the next

52
00:02:33,589 --> 00:02:31,440
speaker we are very very honored uh

53
00:02:35,670 --> 00:02:33,599
today to have also with us as you saw in

54
00:02:37,830 --> 00:02:35,680
the picture here mr and mrs malcolm

55
00:02:39,670 --> 00:02:37,840
hartley after whom the comment is named

56
00:02:49,270 --> 00:02:39,680
malcolm and mrs hartley do you mind

57
00:02:53,270 --> 00:02:51,110
okay now i would like uh to introduce

58
00:02:57,270 --> 00:02:53,280
the next picture dr edweiler

59
00:03:02,070 --> 00:02:59,750
and oh

60
00:03:04,470 --> 00:03:02,080
i was reacting to that comment

61
00:03:05,670 --> 00:03:04,480
it takes a village charles

62
00:03:09,589 --> 00:03:05,680
uh

63
00:03:11,750 --> 00:03:09,599

i was in that room and i'm gonna say a

64
00:03:13,509 --> 00:03:11,760
few things about the human experience

65
00:03:16,070 --> 00:03:13,519
that uh was for me

66
00:03:19,350 --> 00:03:16,080
but i just wanted to point out that uh

67
00:03:21,830 --> 00:03:19,360
we uh so i selected uh deep impact

68
00:03:23,589 --> 00:03:21,840
uh must have been about 10 years ago now

69
00:03:25,990 --> 00:03:23,599
to go to uh

70
00:03:27,830 --> 00:03:26,000
uh it had a rather interesting idea it

71
00:03:30,869 --> 00:03:27,840
was going to carry a copper bullet about

72
00:03:32,470 --> 00:03:30,879
200 pounds and blasted into a comet and

73
00:03:34,070 --> 00:03:32,480
to understand what's what the comment

74
00:03:36,309 --> 00:03:34,080
was made out of

75
00:03:37,270 --> 00:03:36,319
somehow this survived peer review

76
00:03:39,750 --> 00:03:37,280
luckily

77
00:03:42,550 --> 00:03:39,760
and uh we selected it little did i know

78
00:03:43,350 --> 00:03:42,560
back in 2000 or 1999 i forget the exact

79
00:03:45,350 --> 00:03:43,360
year

80
00:03:47,270 --> 00:03:45,360
that i'd be sitting here today

81
00:03:49,750 --> 00:03:47,280
talking about a second use of that

82
00:03:50,710 --> 00:03:49,760
spacecraft and a really darn good

83
00:03:52,869 --> 00:03:50,720
bargain

84
00:03:55,830 --> 00:03:52,879
the original deep impact mission was

85
00:03:57,670 --> 00:03:55,840
about 260 million and then mikey hearn

86
00:03:59,750 --> 00:03:57,680
and his other people at maryland and

87
00:04:01,670 --> 00:03:59,760
other uh universities came up with the

88
00:04:03,350 --> 00:04:01,680

idea of you know we've had a successful

89
00:04:04,309 --> 00:04:03,360
deep impact mission

90
00:04:05,589 --> 00:04:04,319
um

91
00:04:08,229 --> 00:04:05,599
you know there's enough fuel on this

92
00:04:10,710 --> 00:04:08,239
satellite to go to other places in fact

93
00:04:12,470 --> 00:04:10,720
a specific comet namely hartley two

94
00:04:15,670 --> 00:04:12,480
and they made a proposal

95
00:04:18,390 --> 00:04:15,680
and uh for reusing this used a satellite

96
00:04:20,789 --> 00:04:18,400
and we accepted it and uh

97
00:04:23,430 --> 00:04:20,799
today is the culmination of that uh for

98
00:04:25,430 --> 00:04:23,440
about 45 million dollars we got a full

99
00:04:28,390 --> 00:04:25,440
up discovery mission which is in today's

100
00:04:29,990 --> 00:04:28,400
dollars is probably worth 300 or 350. so

101
00:04:31,510 --> 00:04:30,000
for about 10 percent of the cost of a

102
00:04:33,590 --> 00:04:31,520
discovery mission we got a second

103
00:04:35,830 --> 00:04:33,600
discovery mission from the same uh

104
00:04:37,189 --> 00:04:35,840
spacecraft

105
00:04:38,629 --> 00:04:37,199
i like to do that again we're going to

106
00:04:39,990 --> 00:04:38,639
be looking at other satellites how we

107
00:04:41,990 --> 00:04:40,000
can do this again

108
00:04:44,230 --> 00:04:42,000
in these days of hard economic times

109
00:04:47,110 --> 00:04:44,240
this is a really good deal

110
00:04:48,950 --> 00:04:47,120
uh terms of the human experience uh i

111
00:04:50,870 --> 00:04:48,960
remember the seconds before the image

112
00:04:53,430 --> 00:04:50,880
came down and i thought to myself you

113
00:04:55,189 --> 00:04:53,440

know this is an exploration moment

114
00:04:56,550 --> 00:04:55,199
in the following sense here we are

115
00:04:58,629 --> 00:04:56,560
sitting in this little

116
00:05:00,310 --> 00:04:58,639
building in jpl and we're going to see

117
00:05:01,909 --> 00:05:00,320
something no other humans in the history

118
00:05:04,790 --> 00:05:01,919
of humankind have seen

119
00:05:07,430 --> 00:05:04,800
you know the nucleus of hartley ii

120
00:05:10,950 --> 00:05:07,440
and then it came up and

121
00:05:12,710 --> 00:05:10,960
it was incredible it was cigar shaped

122
00:05:14,070 --> 00:05:12,720
when i was growing up in astronomy we

123
00:05:15,350 --> 00:05:14,080
thought comets should be more or less

124
00:05:16,790 --> 00:05:15,360
uniform and

125
00:05:19,029 --> 00:05:16,800
every time we look at something we find

126
00:05:20,469 --> 00:05:19,039
out our textbooks were wrong

127
00:05:22,150 --> 00:05:20,479
this is what science is all about and

128
00:05:24,150 --> 00:05:22,160
i'd like to use the remaining minute i

129
00:05:25,350 --> 00:05:24,160
have here to talk about what what this

130
00:05:27,189 --> 00:05:25,360
should mean

131
00:05:29,029 --> 00:05:27,199
uh i have kids many people in this room

132
00:05:31,430 --> 00:05:29,039
have kids we have a generation of kids

133
00:05:33,430 --> 00:05:31,440
growing up playing with computers and

134
00:05:35,830 --> 00:05:33,440
video games and living in virtual

135
00:05:37,350 --> 00:05:35,840
reality they blow up comets they blow up

136
00:05:38,710 --> 00:05:37,360
planets they do all these great things

137
00:05:40,469 --> 00:05:38,720
on the computer

138
00:05:42,230 --> 00:05:40,479

but it's all virtual

139
00:05:44,550 --> 00:05:42,240
i'm hoping a few kids were watching

140
00:05:46,790 --> 00:05:44,560
today and if you were please understand

141
00:05:49,350 --> 00:05:46,800
this message what you saw today wasn't

142
00:05:50,870 --> 00:05:49,360
virtual it wasn't a computer simulation

143
00:05:53,350 --> 00:05:50,880
it was real

144
00:05:55,749 --> 00:05:53,360
it was the earth seeing this comet close

145
00:05:58,629 --> 00:05:55,759
up for the first time in history

146
00:06:01,029 --> 00:05:58,639
uh that's fun science can be fun just as

147
00:06:03,430 --> 00:06:01,039
much fun as a computer game but probably

148
00:06:05,430 --> 00:06:03,440
a lot more important to our society

149
00:06:08,469 --> 00:06:05,440
thank you

150
00:06:13,270 --> 00:06:11,189
as has been mentioned the um

151
00:06:15,430 --> 00:06:13,280
this epoxy mission is a bonus mission

152
00:06:16,870 --> 00:06:15,440
using the deep impact spacecraft

153
00:06:19,830 --> 00:06:16,880
if you count the temple one encounter

154
00:06:21,350 --> 00:06:19,840
five years ago and the solar planet

155
00:06:22,870 --> 00:06:21,360
observations that we did on the way to

156
00:06:24,309 --> 00:06:22,880
hartley 2 and now this encounter it's

157
00:06:26,230 --> 00:06:24,319
really been three missions that the

158
00:06:28,710 --> 00:06:26,240
spacecraft has accomplished

159
00:06:31,749 --> 00:06:28,720
and uh this morning i think everybody on

160
00:06:33,830 --> 00:06:31,759
the team uh uh felt really absolutely

161
00:06:35,590 --> 00:06:33,840
privileged to be a part of

162
00:06:37,350 --> 00:06:35,600
an event like this

163
00:06:39,749 --> 00:06:37,360

on the way here we traveled about 2.9

164
00:06:41,909 --> 00:06:39,759
billion miles so that was quite a road

165
00:06:43,430 --> 00:06:41,919
trip we had three earth flybys we took

166
00:06:46,230 --> 00:06:43,440
care of we took advantage of the gravity

167
00:06:47,670 --> 00:06:46,240
assist on these flybys to adjust our our

168
00:06:49,350 --> 00:06:47,680
trajectory just enough so that we could

169
00:06:51,670 --> 00:06:49,360
get out to the comet

170
00:06:52,950 --> 00:06:51,680
and uh starting with temple one and then

171
00:06:55,270 --> 00:06:52,960
now finishing with hartley two two

172
00:06:56,469 --> 00:06:55,280
common encounters for the spacecraft

173
00:06:58,710 --> 00:06:56,479
i'd like to

174
00:07:01,110 --> 00:06:58,720
point out the contributions of some

175
00:07:02,870 --> 00:07:01,120
really fantastic people because uh you

176
00:07:04,070 --> 00:07:02,880
can't get this done without an excellent

177
00:07:06,230 --> 00:07:04,080
team in place

178
00:07:08,629 --> 00:07:06,240
and we had a team a spacecraft team that

179
00:07:10,790 --> 00:07:08,639
was comprised of jpl engineers

180
00:07:13,110 --> 00:07:10,800
operating the spacecraft and engineers

181
00:07:15,670 --> 00:07:13,120
from ball aerospace operating as well

182
00:07:17,270 --> 00:07:15,680
and i do want to i do want to thank

183
00:07:18,870 --> 00:07:17,280
several of you are in the audience today

184
00:07:20,390 --> 00:07:18,880
and i want to thank all of you for for

185
00:07:22,070 --> 00:07:20,400
your participation in the hard work that

186
00:07:24,469 --> 00:07:22,080
you did it it looks easy when it comes

187
00:07:26,469 --> 00:07:24,479
to this point but it's it's the end

188
00:07:28,629 --> 00:07:26,479

result of a tremendous amount of work

189
00:07:31,749 --> 00:07:28,639
and all the testing all the sequence

190
00:07:33,430 --> 00:07:31,759
design all the reviews and risk analysis

191
00:07:35,189 --> 00:07:33,440
everything that we've done along the way

192
00:07:37,350 --> 00:07:35,199
uh pays off at moments like this so

193
00:07:39,589 --> 00:07:37,360
thank all of you and then of course

194
00:07:41,510 --> 00:07:39,599
supporting a an international science

195
00:07:43,270 --> 00:07:41,520
team uh with folks from all around the

196
00:07:44,469 --> 00:07:43,280
world who are involved in interpreting

197
00:07:46,629 --> 00:07:44,479
these results and putting all these

198
00:07:49,430 --> 00:07:46,639
puzzles together so this has just been

199
00:07:51,510 --> 00:07:49,440
an absolute blast getting here

200
00:07:52,950 --> 00:07:51,520
in terms of mission events we started

201
00:07:54,550 --> 00:07:52,960
observing the comment back on september

202
00:07:55,749 --> 00:07:54,560
5th the very first day that we pointed

203
00:07:56,950 --> 00:07:55,759
our cameras at the comment and took

204
00:07:58,629 --> 00:07:56,960
images the comment was right there in

205
00:07:59,830 --> 00:07:58,639
the middle so it was great to see that

206
00:08:02,550 --> 00:07:59,840
from the very beginning we've been

207
00:08:04,230 --> 00:08:02,560
imaging almost continually since then we

208
00:08:06,790 --> 00:08:04,240
took a break of about four days to cool

209
00:08:08,150 --> 00:08:06,800
down the ir instrument and to perform a

210
00:08:10,390 --> 00:08:08,160
calibration of the instruments and a

211
00:08:12,550 --> 00:08:10,400
trajectory correction maneuver and then

212
00:08:15,670 --> 00:08:12,560
we started imaging again since october

213
00:08:17,029 --> 00:08:15,680

1st uh it's been non-stop imaging of

214
00:08:18,150 --> 00:08:17,039
this comet

215
00:08:20,070 --> 00:08:18,160
and that has generated a lot of

216
00:08:23,189 --> 00:08:20,080
interesting data along the way for the

217
00:08:24,950 --> 00:08:23,199
science team to to start chewing on and

218
00:08:26,469 --> 00:08:24,960
very early on we discovered some very

219
00:08:30,150 --> 00:08:26,479
very interesting behavior and unusual

220
00:08:33,190 --> 00:08:31,749
until a few days ago we didn't really

221
00:08:34,389 --> 00:08:33,200
know what this comet nucleus was going

222
00:08:35,909 --> 00:08:34,399
to look like it didn't have any idea

223
00:08:39,029 --> 00:08:35,919
what kind of shape it would be

224
00:08:41,509 --> 00:08:39,039
and uh thanks to thanks to the work from

225
00:08:42,870 --> 00:08:41,519
the arecibo radar observatory

226
00:08:44,230 --> 00:08:42,880
that gave us some of the first clues of

227
00:08:46,790 --> 00:08:44,240
what we might be looking at if you roll

228
00:08:47,829 --> 00:08:46,800
that video you'll see a compilation of

229
00:08:50,949 --> 00:08:47,839
images that have been turned into a

230
00:08:53,430 --> 00:08:50,959
movie of of this comet as seen by the

231
00:08:56,070 --> 00:08:53,440
arecibo radar observatory and that that

232
00:08:58,070 --> 00:08:56,080
gave us a very first glimp last week

233
00:08:59,829 --> 00:08:58,080
into uh into what we might be

234
00:09:02,790 --> 00:08:59,839
approaching as we got these images

235
00:09:04,550 --> 00:09:02,800
seeing this very elongated body um we

236
00:09:06,870 --> 00:09:04,560
started scratching our heads again and

237
00:09:09,430 --> 00:09:06,880
looking at our autonav software all over

238
00:09:11,350 --> 00:09:09,440

again uh to make sure that we didn't

239
00:09:13,269 --> 00:09:11,360
have any problems opposed to the

240
00:09:14,949 --> 00:09:13,279
performance of the autonav software this

241
00:09:17,269 --> 00:09:14,959
is the software that keeps us pointed at

242
00:09:19,030 --> 00:09:17,279
the comet all the way through the flyby

243
00:09:21,829 --> 00:09:19,040
and it was a little different use this

244
00:09:23,190 --> 00:09:21,839
time on on tempo one we stopped at a

245
00:09:24,630 --> 00:09:23,200
certain point and stayed in the shield

246
00:09:26,470 --> 00:09:24,640
mode this time we tracked the comet all

247
00:09:27,750 --> 00:09:26,480
the way across so we knew that it would

248
00:09:29,350 --> 00:09:27,760
be a little bit more of a challenge than

249
00:09:30,710 --> 00:09:29,360
the last time we used it

250
00:09:32,389 --> 00:09:30,720
but there'd been a lot of testing a lot

251
00:09:33,670 --> 00:09:32,399
of simulation done along the way to be

252
00:09:34,949 --> 00:09:33,680
sure that it could handle all kinds of

253
00:09:37,910 --> 00:09:34,959
different

254
00:09:39,110 --> 00:09:37,920
comet situations and comet shapes and

255
00:09:40,870 --> 00:09:39,120
so it was gratifying to see that it

256
00:09:44,230 --> 00:09:40,880
worked really well

257
00:09:45,269 --> 00:09:44,240
in terms of today's flyby um

258
00:09:46,710 --> 00:09:45,279
we couldn't have asked for a better

259
00:09:48,630 --> 00:09:46,720
performance from the spacecraft and from

260
00:09:50,389 --> 00:09:48,640
our navigation team

261
00:09:52,630 --> 00:09:50,399
we we were exactly where we wanted to be

262
00:09:56,310 --> 00:09:52,640
we were within two seconds of our flyby

263
00:09:58,790 --> 00:09:56,320

time uh which was uh

264
00:10:00,710 --> 00:09:58,800
exactly within the capabilities of our

265
00:10:03,430 --> 00:10:00,720
imaging sequences and keeping up with

266
00:10:05,430 --> 00:10:03,440
everything uh we were at uh 700

267
00:10:07,269 --> 00:10:05,440
kilometers that's what we aim for and we

268
00:10:08,790 --> 00:10:07,279
were just about we're our miss distance

269
00:10:10,870 --> 00:10:08,800
was still about 700 kilometers just

270
00:10:12,790 --> 00:10:10,880
about three kilometers over to the side

271
00:10:15,030 --> 00:10:12,800
and so that was absolutely fantastic

272
00:10:16,550 --> 00:10:15,040
performance uh in terms of navigating

273
00:10:19,190 --> 00:10:16,560
and getting there

274
00:10:21,110 --> 00:10:19,200
and uh our flyby velocity

275
00:10:23,430 --> 00:10:21,120
ended up being in the vicinity of 27 000

276
00:10:25,350 --> 00:10:23,440
miles per hour so this thing came by

277
00:10:26,949 --> 00:10:25,360
very very fast

278
00:10:28,310 --> 00:10:26,959
um it was a huge moment for our team we

279
00:10:29,750 --> 00:10:28,320
were trying to think what are going to

280
00:10:31,350 --> 00:10:29,760
what are the key transitions the key

281
00:10:32,790 --> 00:10:31,360
moments going to be for the team that

282
00:10:33,990 --> 00:10:32,800
tell us that this was successful and one

283
00:10:35,910 --> 00:10:34,000
of the first ones

284
00:10:37,829 --> 00:10:35,920
we knew we knew that that at the

285
00:10:40,389 --> 00:10:37,839
approximate time that that flyby would

286
00:10:42,389 --> 00:10:40,399
occur because we we that was in the plan

287
00:10:43,509 --> 00:10:42,399
and it's all set by by the trajectory as

288
00:10:44,870 --> 00:10:43,519

we approach

289
00:10:46,630 --> 00:10:44,880
but one of our key things that we're

290
00:10:47,829 --> 00:10:46,640
looking for is getting the signal back

291
00:10:48,790 --> 00:10:47,839
from the high gain antenna when we

292
00:10:50,470 --> 00:10:48,800
switch from the low gain to the high

293
00:10:51,990 --> 00:10:50,480
gain and seeing that signal come back

294
00:10:54,150 --> 00:10:52,000
that was uh that was a big sigh of

295
00:10:56,949 --> 00:10:54,160
relief for us we knew that we had

296
00:10:58,389 --> 00:10:56,959
survived the trip and we're ready to

297
00:11:00,870 --> 00:10:58,399
finish everything off

298
00:11:02,949 --> 00:11:00,880
and if you show uh this image

299
00:11:05,190 --> 00:11:02,959
on the screen here you'll see that uh

300
00:11:06,710 --> 00:11:05,200
when that first image came down showing

301
00:11:08,069 --> 00:11:06,720
the comet in the field of view as we

302
00:11:09,910 --> 00:11:08,079
were approaching it even though it was a

303
00:11:11,990 --> 00:11:09,920
distant image of the comet very small

304
00:11:13,269 --> 00:11:12,000
and we knew that we were there

305
00:11:15,269 --> 00:11:13,279
we knew that we pointed in the right

306
00:11:16,949 --> 00:11:15,279
places we knew that we'd uh got what we

307
00:11:18,870 --> 00:11:16,959
wanted and that everything else that

308
00:11:20,550 --> 00:11:18,880
would be coming down would would be

309
00:11:22,630 --> 00:11:20,560
exactly what we'd been looking for and

310
00:11:23,750 --> 00:11:22,640
and it was hugely gratifying to see this

311
00:11:25,670 --> 00:11:23,760
happen

312
00:11:28,389 --> 00:11:25,680
um so uh

313
00:11:30,069 --> 00:11:28,399

in terms of uh where we go from here

314
00:11:32,150 --> 00:11:30,079
we're gonna spend about three weeks

315
00:11:33,990 --> 00:11:32,160
imaging the comet as we go away from it

316
00:11:36,150 --> 00:11:34,000
so we'll get uh a lot of departure

317
00:11:37,829 --> 00:11:36,160
sampling of the comet to add to the the

318
00:11:38,949 --> 00:11:37,839
data we've already

319
00:11:40,790 --> 00:11:38,959
collected

320
00:11:43,190 --> 00:11:40,800
and then we'll perform one final

321
00:11:44,949 --> 00:11:43,200
calibration of the instruments to

322
00:11:46,069 --> 00:11:44,959
to help with the science data

323
00:11:47,269 --> 00:11:46,079
analysis

324
00:11:48,949 --> 00:11:47,279
and then after that we'll await further

325
00:11:51,030 --> 00:11:48,959
instructions from nasa

326
00:11:54,389 --> 00:11:51,040
so with that i'll pass it on to mike

327
00:11:57,269 --> 00:11:56,230
the first thing everyone wants to know

328
00:11:59,269 --> 00:11:57,279
about

329
00:12:02,389 --> 00:11:59,279
the scientific return from a mission is

330
00:12:04,550 --> 00:12:02,399
how much it's increased our knowledge

331
00:12:07,110 --> 00:12:04,560
but of course the scientific work is

332
00:12:10,150 --> 00:12:07,120
just beginning now uh the engineers did

333
00:12:12,150 --> 00:12:10,160
a fantastic job of getting us data now

334
00:12:13,990 --> 00:12:12,160
we have to make sense of it to advance

335
00:12:16,230 --> 00:12:14,000
the science but i'm

336
00:12:18,790 --> 00:12:16,240
from looking at the data we have i am

337
00:12:21,269 --> 00:12:18,800
convinced that comet hartley will have

338
00:12:24,470 --> 00:12:21,279

increased our knowledge of how comets

339
00:12:27,190 --> 00:12:24,480
work by at least three hartleys

340
00:12:30,230 --> 00:12:29,030
the hartley is a real unit of

341
00:12:32,389 --> 00:12:30,240
information

342
00:12:36,710 --> 00:12:32,399
and three hartley's is about a factor of

343
00:12:40,470 --> 00:12:38,949
so the first slide for first movie

344
00:12:42,550 --> 00:12:40,480
rather the video

345
00:12:44,230 --> 00:12:42,560
that should come up

346
00:12:47,829 --> 00:12:44,240
shows you

347
00:12:48,949 --> 00:12:47,839
observations we took on approach to the

348
00:12:51,269 --> 00:12:48,959
comet

349
00:12:55,750 --> 00:12:51,279
so we had results even before we got

350
00:12:56,629 --> 00:12:55,760
there and you see a movie in which

351
00:12:59,590 --> 00:12:56,639
the

352
00:13:01,269 --> 00:12:59,600
comet is brightening and getting fainter

353
00:13:04,069 --> 00:13:01,279
and you see what looks like jets

354
00:13:05,910 --> 00:13:04,079
sweeping around so we think even then we

355
00:13:10,470 --> 00:13:05,920
thought we probably had an elongated

356
00:13:15,030 --> 00:13:12,389
and every time

357
00:13:20,470 --> 00:13:15,040
the active area gets into sunlight which

358
00:13:24,949 --> 00:13:23,190
the uh jet gets active and spews out

359
00:13:27,030 --> 00:13:24,959
material and you're seeing it sweeping

360
00:13:29,509 --> 00:13:27,040
out and we already knew from looking at

361
00:13:31,829 --> 00:13:29,519
that that it's not just simple rotation

362
00:13:34,150 --> 00:13:31,839
it's probably doing this as well or

363
00:13:36,230 --> 00:13:34,160

maybe doing this and maybe doing this

364
00:13:38,150 --> 00:13:36,240
all on top of that it's very complex

365
00:13:40,069 --> 00:13:38,160
motion and that's why the jets don't

366
00:13:41,189 --> 00:13:40,079
repeat every time you see them each time

367
00:13:43,110 --> 00:13:41,199
you go through they're a little bit

368
00:13:45,590 --> 00:13:43,120
different

369
00:13:46,710 --> 00:13:45,600
so finding those jets on the way in was

370
00:13:48,389 --> 00:13:46,720
great

371
00:13:49,750 --> 00:13:48,399
but the next thing we found on the way

372
00:13:53,110 --> 00:13:49,760
in

373
00:13:56,710 --> 00:13:53,120
jets

374
00:13:58,310 --> 00:13:56,720
and the next still picture

375
00:14:01,750 --> 00:13:58,320
shows

376
00:14:03,990 --> 00:14:01,760
a whole series of pictures over two days

377
00:14:06,949 --> 00:14:04,000
in light that's been specially filtered

378
00:14:08,949 --> 00:14:06,959
just to show carbon dioxide

379
00:14:11,269 --> 00:14:08,959
dry ice from in the nucleus that's

380
00:14:13,269 --> 00:14:11,279
evaporated and come out

381
00:14:15,189 --> 00:14:13,279
mostly what we think of as coming out of

382
00:14:18,389 --> 00:14:15,199
comets is water

383
00:14:20,389 --> 00:14:18,399
from ordinary water ice the dry ice goes

384
00:14:22,069 --> 00:14:20,399
up and down in brightness dramatically

385
00:14:23,990 --> 00:14:22,079
you can see in that picture how it goes

386
00:14:25,430 --> 00:14:24,000
up and down from october 31st to

387
00:14:26,790 --> 00:14:25,440
november 2nd

388
00:14:28,710 --> 00:14:26,800

you can even see

389
00:14:30,230 --> 00:14:28,720
that it moves a little bit

390
00:14:32,949 --> 00:14:30,240
when it's really bright it's a little

391
00:14:35,110 --> 00:14:32,959
closer to the sun than when it's faint

392
00:14:37,030 --> 00:14:35,120
the sun in this picture is up

393
00:14:40,150 --> 00:14:37,040
so

394
00:14:42,389 --> 00:14:40,160
that was a great clue that uh we had a

395
00:14:43,269 --> 00:14:42,399
really interesting discovery

396
00:14:47,110 --> 00:14:43,279
and

397
00:14:48,790 --> 00:14:47,120
the next slide shows that the

398
00:14:50,629 --> 00:14:48,800
just three pictures when the comet is

399
00:14:52,710 --> 00:14:50,639
faint on the left

400
00:14:55,590 --> 00:14:52,720
when it's medium brightness on the right

401
00:14:57,350 --> 00:14:55,600
and when it's really bright on the right

402
00:14:59,590 --> 00:14:57,360
i'm sorry medium brightness in the

403
00:15:01,829 --> 00:14:59,600
middle and really bright on the right

404
00:15:04,310 --> 00:15:01,839
the top row is just the light of the

405
00:15:06,389 --> 00:15:04,320
carbon dioxide so that's where the dry

406
00:15:08,790 --> 00:15:06,399
ice is evaporating

407
00:15:11,509 --> 00:15:08,800
and the bottom picture is visible light

408
00:15:13,750 --> 00:15:11,519
that's mostly the solid grains

409
00:15:15,990 --> 00:15:13,760
so this says that there is one area in

410
00:15:17,110 --> 00:15:16,000
the comet that is incredibly rich in dry

411
00:15:20,069 --> 00:15:17,120
ice

412
00:15:22,629 --> 00:15:20,079
and that's what drags out the grains

413
00:15:24,389 --> 00:15:22,639

and produces all of the phenomena that

414
00:15:25,350 --> 00:15:24,399
we see traditionally we've thought that

415
00:15:27,990 --> 00:15:25,360
it was

416
00:15:29,749 --> 00:15:28,000
excess water driving these jets this is

417
00:15:32,470 --> 00:15:29,759
a pretty clear demonstration that it's

418
00:15:34,310 --> 00:15:32,480
really extra dry ice somewhere close

419
00:15:35,430 --> 00:15:34,320
below the surface that's driving these

420
00:15:37,269 --> 00:15:35,440
jets

421
00:15:39,350 --> 00:15:37,279
so that was our first one of our great

422
00:15:40,949 --> 00:15:39,360
discoveries on the way in

423
00:15:42,710 --> 00:15:40,959
but that was before we had a picture of

424
00:15:45,430 --> 00:15:42,720
the comet so now i'm going to hand it

425
00:15:47,350 --> 00:15:45,440
over to jessica who will tell you

426
00:15:48,710 --> 00:15:47,360
about the pictures of the nucleus and

427
00:15:51,030 --> 00:15:48,720
actually show you where we think that

428
00:15:52,710 --> 00:15:51,040
dry ice came from

429
00:15:54,150 --> 00:15:52,720
thanks mike um

430
00:15:56,389 --> 00:15:54,160
well i know we all had a great treat

431
00:15:58,790 --> 00:15:56,399
this morning uh we got to see a wonder

432
00:15:59,990 --> 00:15:58,800
spectacular set of images and i first

433
00:16:02,069 --> 00:16:00,000
wanted to start with showing you the

434
00:16:03,430 --> 00:16:02,079
five images we took nearest closest

435
00:16:04,389 --> 00:16:03,440
approach

436
00:16:07,030 --> 00:16:04,399
thank you

437
00:16:09,509 --> 00:16:07,040
and they progress in this montage from

438
00:16:11,990 --> 00:16:09,519

the upper left clockwise

439
00:16:13,829 --> 00:16:12,000
down to the lower left and what you're

440
00:16:17,189 --> 00:16:13,839
seeing is the images as the spacecraft

441
00:16:19,269 --> 00:16:17,199
took as it approached hartley 2

442
00:16:21,030 --> 00:16:19,279
went underneath and continued to take

443
00:16:23,110 --> 00:16:21,040
images looking back

444
00:16:24,389 --> 00:16:23,120
so we had quite a range of perspectives

445
00:16:25,670 --> 00:16:24,399
across this

446
00:16:27,670 --> 00:16:25,680
uh and

447
00:16:29,269 --> 00:16:27,680
at this point i always maybe it's the

448
00:16:32,150 --> 00:16:29,279
right thing to do is just stop and look

449
00:16:33,910 --> 00:16:32,160
at this spectacular comment uh mr

450
00:16:35,749 --> 00:16:33,920
hartley's comment over here there's not

451
00:16:37,749 --> 00:16:35,759
much to say that you can say besides

452
00:16:38,790 --> 00:16:37,759
this just amazing

453
00:16:40,230 --> 00:16:38,800
however

454
00:16:42,949 --> 00:16:40,240
they wanted me to say something so we

455
00:16:45,430 --> 00:16:42,959
spent the last

456
00:16:46,790 --> 00:16:45,440
few hours trying to get some preliminary

457
00:16:47,910 --> 00:16:46,800
sense of what we think is going on on

458
00:16:49,910 --> 00:16:47,920
the comet which i'm going to share with

459
00:16:51,749 --> 00:16:49,920
you in a minute and try to see how it

460
00:16:54,150 --> 00:16:51,759
relates to what we've been studying as

461
00:16:56,470 --> 00:16:54,160
mike talked about uh in the coma

462
00:16:59,430 --> 00:16:56,480
uh the comet's atmosphere

463
00:17:01,990 --> 00:16:59,440

so uh if i could have the next image uh

464
00:17:03,670 --> 00:17:02,000
let's see where uh hartley 2 uh fits in

465
00:17:06,710 --> 00:17:03,680
our family portrait of comets we've seen

466
00:17:07,909 --> 00:17:06,720
five others before with spacecraft

467
00:17:09,750 --> 00:17:07,919
and

468
00:17:11,829 --> 00:17:09,760
you can see that it's actually quite

469
00:17:13,510 --> 00:17:11,839
small that's the the actual size is the

470
00:17:14,470 --> 00:17:13,520
little box in the lower

471
00:17:16,549 --> 00:17:14,480
right

472
00:17:18,309 --> 00:17:16,559
we've blown it up so you can see it

473
00:17:20,069 --> 00:17:18,319
on a relative size and while it's the

474
00:17:21,990 --> 00:17:20,079
smallest no question about it i think

475
00:17:25,110 --> 00:17:22,000
it's undoubtedly the most interesting

476
00:17:26,390 --> 00:17:25,120
and for its size is the most active

477
00:17:28,230 --> 00:17:26,400
uh and

478
00:17:30,390 --> 00:17:28,240
what we've been able to do with this

479
00:17:33,750 --> 00:17:30,400
mission is for the first time

480
00:17:34,789 --> 00:17:33,760
see uh jets going all the way to the

481
00:17:37,510 --> 00:17:34,799
surface

482
00:17:39,190 --> 00:17:37,520
and have a camera that's good enough to

483
00:17:41,190 --> 00:17:39,200
actually see the variability of the

484
00:17:42,870 --> 00:17:41,200
surface at the same time

485
00:17:45,270 --> 00:17:42,880
and what we're working on is trying to

486
00:17:47,270 --> 00:17:45,280
link those two that is how does the

487
00:17:49,110 --> 00:17:47,280
activity that's natural to the comet

488
00:17:51,750 --> 00:17:49,120

affect its surface

489
00:17:54,150 --> 00:17:51,760
so if i could have the next one please

490
00:17:56,470 --> 00:17:54,160
so here's a blow up of the the

491
00:17:59,510 --> 00:17:56,480
highest resolution we have so far

492
00:18:02,230 --> 00:17:59,520
uh the comet is 1.25 miles in the long

493
00:18:05,430 --> 00:18:02,240
axis in this image that's roughly the

494
00:18:07,669 --> 00:18:05,440
distance in washington dc from

495
00:18:09,669 --> 00:18:07,679
the u.s capital to the washington

496
00:18:14,150 --> 00:18:09,679
monument your average rally on the mall

497
00:18:18,710 --> 00:18:15,110
and

498
00:18:20,390 --> 00:18:18,720
you can see the the the dominant uh uh

499
00:18:22,390 --> 00:18:20,400
geologic signature is that we have two

500
00:18:24,310 --> 00:18:22,400
rough ends and a smooth middle i'm not

501
00:18:27,590 --> 00:18:24,320
sure what that makes it but that's what

502
00:18:29,830 --> 00:18:27,600
it is and uh what we see is that where

503
00:18:32,310 --> 00:18:29,840
the activity is where the jets are is

504
00:18:34,870 --> 00:18:32,320
the rough areas in particular if you

505
00:18:37,350 --> 00:18:34,880
look uh on the sun is still towards

506
00:18:38,870 --> 00:18:37,360
charles though actually it's totally

507
00:18:40,830 --> 00:18:38,880
it's over here now on the right sorry i

508
00:18:44,310 --> 00:18:40,840
got flipped around but this is the sun

509
00:18:46,230 --> 00:18:44,320
side uh and that's the rough area and

510
00:18:48,150 --> 00:18:46,240
we're uh fairly confident at this point

511
00:18:49,990 --> 00:18:48,160
that that is in fact the end of the

512
00:18:52,230 --> 00:18:50,000
nucleus the right end of the nucleus

513
00:18:53,510 --> 00:18:52,240

that is rotating in and out

514
00:18:55,430 --> 00:18:53,520
as we've been watching it all these

515
00:18:57,510 --> 00:18:55,440
weeks and in fact is where the dominant

516
00:19:00,390 --> 00:18:57,520
co2 and what we now think is the

517
00:19:01,990 --> 00:19:00,400
dominant dust is coming from

518
00:19:03,430 --> 00:19:02,000
uh and you'll see in a few images later

519
00:19:04,710 --> 00:19:03,440
that there are also jets on the other

520
00:19:08,230 --> 00:19:04,720
end

521
00:19:11,029 --> 00:19:08,240
but what we're seeing is that

522
00:19:12,789 --> 00:19:11,039
we have rough terrain where the jets are

523
00:19:14,789 --> 00:19:12,799
and in fact in many cases they seem to

524
00:19:16,870 --> 00:19:14,799
be correlated to specific topographic

525
00:19:19,110 --> 00:19:16,880
features

526
00:19:21,510 --> 00:19:19,120
and the middle in our best current

527
00:19:23,190 --> 00:19:21,520
interpretation we think is material

528
00:19:25,590 --> 00:19:23,200
fine-grained material that has been

529
00:19:27,909 --> 00:19:25,600
redistributed across the comet and

530
00:19:29,669 --> 00:19:27,919
collected in a topographic low

531
00:19:30,630 --> 00:19:29,679
so you get fine smooth material in the

532
00:19:32,070 --> 00:19:30,640
middle

533
00:19:35,590 --> 00:19:32,080
in that low

534
00:19:37,590 --> 00:19:35,600
we also found places where there are

535
00:19:39,990 --> 00:19:37,600
clumps of material

536
00:19:42,070 --> 00:19:40,000
they appear bright here i don't know if

537
00:19:43,510 --> 00:19:42,080
you can see the one along the upper

538
00:19:45,350 --> 00:19:43,520

uh

539
00:19:48,549 --> 00:19:45,360
edge but you can see it sticking off the

540
00:19:50,310 --> 00:19:48,559
edge of the the limb of the nucleus and

541
00:19:53,029 --> 00:19:50,320
we think that those might be

542
00:19:55,029 --> 00:19:53,039
materials that are remnants of activity

543
00:19:57,909 --> 00:19:55,039
that material that stayed behind

544
00:19:59,110 --> 00:19:57,919
whether as other materials were ejected

545
00:20:01,830 --> 00:19:59,120
or

546
00:20:04,950 --> 00:20:01,840
moved by the jets around

547
00:20:09,110 --> 00:20:07,270
let's see so let's go to the next image

548
00:20:11,350 --> 00:20:09,120
if you will and i promise to show you

549
00:20:13,029 --> 00:20:11,360
the other end and this is it

550
00:20:17,510 --> 00:20:13,039
um

551
00:20:19,909 --> 00:20:17,520
image it's uh

552
00:20:21,510 --> 00:20:19,919
it's the same exposure you saw before we

553
00:20:23,669 --> 00:20:21,520
just stretched it a bit to show you the

554
00:20:25,669 --> 00:20:23,679
jets and what's

555
00:20:27,669 --> 00:20:25,679
fascinating about this image is not only

556
00:20:28,789 --> 00:20:27,679
do we have major activity uh towards the

557
00:20:31,029 --> 00:20:28,799
bottom

558
00:20:32,549 --> 00:20:31,039
but you'll see on the terminator that is

559
00:20:34,710 --> 00:20:32,559
the line between the sun and the

560
00:20:36,470 --> 00:20:34,720
darkness there's a line of jets which

561
00:20:38,390 --> 00:20:36,480
are illuminating

562
00:20:40,789 --> 00:20:38,400
the nucleus so we can see the full

563
00:20:42,630 --> 00:20:40,799

extent and silhouette of the nucleus and

564
00:20:44,870 --> 00:20:42,640
we also see jets

565
00:20:46,950 --> 00:20:44,880
along that edge as well so we have jets

566
00:20:49,669 --> 00:20:46,960
in the night time we have jets along the

567
00:20:51,110 --> 00:20:49,679
edge and we have jets in the sun

568
00:20:52,549 --> 00:20:51,120
and this is probably as good a place as

569
00:20:54,630 --> 00:20:52,559
any to admit that we have a lot of work

570
00:20:56,070 --> 00:20:54,640
to do

571
00:20:57,830 --> 00:20:56,080
to try to understand what's going on

572
00:20:59,510 --> 00:20:57,840
here but this is

573
00:21:00,710 --> 00:20:59,520
just spectacular

574
00:21:03,110 --> 00:21:00,720
i certainly would personally like to

575
00:21:04,710 --> 00:21:03,120
thank everybody on the project

576
00:21:06,710 --> 00:21:04,720
and we'll start rolling that movie of

577
00:21:12,710 --> 00:21:06,720
the five images again and i'll send it

578
00:21:18,070 --> 00:21:15,510
okay i'm gonna see if they're gonna

579
00:21:19,430 --> 00:21:18,080
give them one second there there we go

580
00:21:31,430 --> 00:21:19,440
here comes our

581
00:21:33,990 --> 00:21:32,950
all right

582
00:21:35,350 --> 00:21:34,000
great job

583
00:21:37,990 --> 00:21:35,360
wonderful

584
00:21:39,990 --> 00:21:38,000
okay we are going to now take questions

585
00:21:41,590 --> 00:21:40,000
from here in the von karman auditorium

586
00:21:43,350 --> 00:21:41,600
from news media who may have questions

587
00:21:44,789 --> 00:21:43,360
and then we will take some

588
00:21:46,630 --> 00:21:44,799

by phone is there anyone here in the

589
00:21:49,190 --> 00:21:46,640
auditorium first of all who has a

590
00:21:52,710 --> 00:21:50,549
if there's no question here we can go

591
00:21:58,549 --> 00:21:52,720
ahead and take the call from kennedy

592
00:22:02,710 --> 00:22:01,029
and kramer space flight magazine and the

593
00:22:04,470 --> 00:22:02,720
planetary society what if you could talk

594
00:22:06,789 --> 00:22:04,480
a little bit more about these smooth

595
00:22:09,430 --> 00:22:06,799
area in the middle could this be due to

596
00:22:11,590 --> 00:22:09,440
any melting at all

597
00:22:13,830 --> 00:22:11,600
no i don't think so

598
00:22:15,590 --> 00:22:13,840
our best guess at the moment and

599
00:22:17,350 --> 00:22:15,600
slightly more than a guess is that it is

600
00:22:19,830 --> 00:22:17,360
in fact redistribution of materials

601
00:22:21,510 --> 00:22:19,840
we've seen it in other places

602
00:22:23,110 --> 00:22:21,520
of

603
00:22:25,270 --> 00:22:23,120
other asteroids

604
00:22:26,630 --> 00:22:25,280
asteroids for example several have these

605
00:22:31,190 --> 00:22:26,640
kinds of

606
00:22:35,990 --> 00:22:33,750
okay let's take one more and um when you

607
00:22:37,830 --> 00:22:36,000
expect to get some spectral data that

608
00:22:39,909 --> 00:22:37,840
you can release

609
00:22:41,909 --> 00:22:39,919
well i can personally say as the person

610
00:22:43,430 --> 00:22:41,919
who uh tends to lead the ir spectrum

611
00:22:45,029 --> 00:22:43,440
scene i haven't seen any yet because

612
00:22:47,750 --> 00:22:45,039
we've been busy

613
00:22:49,510 --> 00:22:47,760

so uh we have released the approach data

614
00:22:51,110 --> 00:22:49,520
and as we get stuff

615
00:22:52,549 --> 00:22:51,120
we haven't even looked at it yet so it's

616
00:22:55,510 --> 00:22:52,559
hard to predict when we'll know what's

617
00:22:56,789 --> 00:22:55,520
going on

618
00:22:58,070 --> 00:22:56,799
all right i'm going to take one more by

619
00:23:01,029 --> 00:22:58,080
phone and then we'll come back with the

620
00:23:05,909 --> 00:23:02,630
okay we're going to go to amina khan

621
00:23:07,510 --> 00:23:05,919
from the los angeles times next

622
00:23:08,950 --> 00:23:07,520
i think you want to see

623
00:23:10,470 --> 00:23:08,960
oh i'm sorry about that looks like i got

624
00:23:13,190 --> 00:23:10,480
cut off i wanted to see if there were

625
00:23:15,750 --> 00:23:13,200
any other plans for um using the

626
00:23:17,750 --> 00:23:15,760
spacecraft to take a look at other

627
00:23:21,350 --> 00:23:17,760
comets

628
00:23:24,950 --> 00:23:23,750
we are uh currently in the middle of a

629
00:23:29,510 --> 00:23:24,960
uh

630
00:23:30,950 --> 00:23:29,520
information we sent one out a few months

631
00:23:33,590 --> 00:23:30,960
ago i guess

632
00:23:35,669 --> 00:23:33,600
uh asking the scientific community uh do

633
00:23:38,310 --> 00:23:35,679
you have any ideas of what this

634
00:23:41,110 --> 00:23:38,320
spacecraft might be used for it does not

635
00:23:42,710 --> 00:23:41,120
have enough fuel left regretfully to

636
00:23:45,430 --> 00:23:42,720
actually go through another encounter

637
00:23:47,350 --> 00:23:45,440
phase that is change its orbit and go to

638
00:23:49,350 --> 00:23:47,360

another comet or asteroid

639
00:23:52,310 --> 00:23:49,360
but it does have enough fuel to maintain

640
00:23:54,390 --> 00:23:52,320
its attitude etc and it does have

641
00:23:57,350 --> 00:23:54,400
cameras and star trackers which could be

642
00:23:58,950 --> 00:23:57,360
used for uh you know finding asteroids

643
00:24:00,470 --> 00:23:58,960
or doing astronomy

644
00:24:02,950 --> 00:24:00,480
so we've asked the community to come up

645
00:24:05,430 --> 00:24:02,960
with ideas and we'll be entertaining

646
00:24:06,950 --> 00:24:05,440
those ideas over the next few months and

647
00:24:08,710 --> 00:24:06,960
make some decisions

648
00:24:10,630 --> 00:24:08,720
but what i do know is it doesn't cost a

649
00:24:12,390 --> 00:24:10,640
lot to use a satellite the second third

650
00:24:13,990 --> 00:24:12,400
or even fourth time

651
00:24:19,269 --> 00:24:14,000
so we're looking forward to getting some

652
00:24:23,669 --> 00:24:21,430
okay on the phone line now we have uh

653
00:24:25,110 --> 00:24:23,679
tracy watson from aol news and after

654
00:24:26,950 --> 00:24:25,120
tracy's question we will come here to

655
00:24:28,950 --> 00:24:26,960
von karman to take a question

656
00:24:30,230 --> 00:24:28,960
go ahead tracy

657
00:24:31,990 --> 00:24:30,240
thank you i just

658
00:24:33,350 --> 00:24:32,000
tried

659
00:24:34,710 --> 00:24:33,360
uh this

660
00:24:39,750 --> 00:24:34,720
smooth middle

661
00:24:43,110 --> 00:24:41,510
more or less yes and we don't know

662
00:24:46,070 --> 00:24:43,120
exactly how deep it is yet we haven't

663
00:24:48,070 --> 00:24:46,080

gotten our stereo data yet but that's

664
00:24:49,190 --> 00:24:48,080
the idea

665
00:24:51,669 --> 00:24:49,200
okay and

666
00:24:53,430 --> 00:24:51,679
are you surprised by this you're just a

667
00:24:55,590 --> 00:24:53,440
different place and

668
00:24:58,070 --> 00:24:55,600
this makes clear we have a lot of

669
00:25:00,310 --> 00:24:58,080
if you could elaborate there

670
00:25:01,909 --> 00:25:00,320
i didn't catch that were you surprised

671
00:25:04,310 --> 00:25:01,919
about the number of jets and would you

672
00:25:06,310 --> 00:25:04,320
elaborate on that phenomenon yeah i'll

673
00:25:08,630 --> 00:25:06,320
take that this is michael hearn

674
00:25:10,950 --> 00:25:08,640
uh we've seen

675
00:25:12,470 --> 00:25:10,960
jets from the ground not anywhere near

676
00:25:14,549 --> 00:25:12,480
the nucleus but we

677
00:25:17,590 --> 00:25:14,559
know that many comets produce jets of

678
00:25:19,190 --> 00:25:17,600
material and this comet in particular

679
00:25:20,950 --> 00:25:19,200
has been producing jets that

680
00:25:22,390 --> 00:25:20,960
ground-based observers have seen for a

681
00:25:24,950 --> 00:25:22,400
couple of months

682
00:25:27,350 --> 00:25:24,960
so we were not surprised at the

683
00:25:29,190 --> 00:25:27,360
existence of the jets

684
00:25:31,269 --> 00:25:29,200
we've known from close flybys for

685
00:25:33,830 --> 00:25:31,279
example of hallie that there are

686
00:25:35,269 --> 00:25:33,840
numerous jets in some comets not all

687
00:25:38,310 --> 00:25:35,279
comets

688
00:25:40,789 --> 00:25:38,320

but the surprising thing was that for

689
00:25:42,870 --> 00:25:40,799
the first time we can probably track

690
00:25:45,029 --> 00:25:42,880
those jets really to individual

691
00:25:47,830 --> 00:25:45,039
topographic features on the nucleus and

692
00:25:53,430 --> 00:25:47,840
that that was the real surprise that the

693
00:25:58,070 --> 00:25:55,190
okay we're going to bring it over here

694
00:25:59,990 --> 00:25:58,080
to emily lochdawala and you want to

695
00:26:01,590 --> 00:26:00,000
state your organization and okay you've

696
00:26:03,669 --> 00:26:01,600
got to make it emily lochtawa with the

697
00:26:04,870 --> 00:26:03,679
planetary society should we be surprised

698
00:26:06,789 --> 00:26:04,880
that there are jets coming out of the

699
00:26:08,950 --> 00:26:06,799
night side of the comment

700
00:26:11,510 --> 00:26:08,960
or is that common with comments also i'm

701
00:26:13,750 --> 00:26:11,520
wondering if with the level of activity

702
00:26:17,510 --> 00:26:13,760
how much longer this comet can remain so

703
00:26:21,110 --> 00:26:17,520
active before it it burns out

704
00:26:22,870 --> 00:26:21,120
uh okay i'll take that one also um

705
00:26:25,590 --> 00:26:22,880
there have been indications from

706
00:26:28,950 --> 00:26:25,600
previous flybys of comets that there

707
00:26:30,789 --> 00:26:28,960
were jets coming from the night side

708
00:26:32,149 --> 00:26:30,799
but this is by far the clearest

709
00:26:35,430 --> 00:26:32,159
demonstration

710
00:26:39,430 --> 00:26:37,029
the

711
00:26:42,310 --> 00:26:39,440
rate of loss of material and how soon

712
00:26:44,310 --> 00:26:42,320
the comet will die depends on how they

713
00:26:47,430 --> 00:26:44,320

die and we still haven't quite answered

714
00:26:49,669 --> 00:26:47,440
that question they die by sealing in

715
00:26:52,870 --> 00:26:49,679
the gas sealing in the ices or do they

716
00:26:55,669 --> 00:26:52,880
die by running out of ice this comet

717
00:26:57,990 --> 00:26:55,679
probably loses at least

718
00:27:00,390 --> 00:26:58,000
a meter to a meter and a half of

719
00:27:03,750 --> 00:27:00,400
material on average everywhere on the

720
00:27:05,350 --> 00:27:03,760
surface every time it comes by the sun

721
00:27:08,390 --> 00:27:05,360
so you can

722
00:27:11,110 --> 00:27:08,400
take the narrow dimension of 500 meters

723
00:27:17,909 --> 00:27:13,110
at a meter and a half per perihelion

724
00:27:22,470 --> 00:27:19,590
and then also i'm wondering about the

725
00:27:24,310 --> 00:27:22,480
hri images and what the status on those

726
00:27:26,870 --> 00:27:24,320
is

727
00:27:29,350 --> 00:27:26,880
the hri images are still being processed

728
00:27:31,110 --> 00:27:29,360
we have to deconvolve them because the

729
00:27:34,549 --> 00:27:31,120
that camera is out of focus we know how

730
00:27:36,870 --> 00:27:34,559
to do that preliminary deconvolution uh

731
00:27:38,549 --> 00:27:36,880
still shows some artifacts it's easy to

732
00:27:40,710 --> 00:27:38,559
introduce artifacts when you try to

733
00:27:42,549 --> 00:27:40,720
deconvolve an image that's out of focus

734
00:27:43,669 --> 00:27:42,559
and the preliminary images still show

735
00:27:52,950 --> 00:27:43,679
that

736
00:27:58,310 --> 00:27:53,990
okay we're going to take one over here

737
00:28:07,510 --> 00:27:59,990
stand by one second is that microphone

738
00:28:12,310 --> 00:28:09,750

alicia chang from the associated press

739
00:28:14,310 --> 00:28:12,320
besides the difference in size and jet

740
00:28:16,870 --> 00:28:14,320
activity what other differences have you

741
00:28:18,710 --> 00:28:16,880
been able to glean about hardly two

742
00:28:22,549 --> 00:28:18,720
compared with the other four comets have

743
00:28:26,630 --> 00:28:24,710
well the clumps that i referred to are

744
00:28:27,669 --> 00:28:26,640
something that was quite a surprise that

745
00:28:30,389 --> 00:28:27,679
we

746
00:28:31,830 --> 00:28:30,399
haven't seen them elsewhere even though

747
00:28:33,029 --> 00:28:31,840
we looked for them

748
00:28:36,789 --> 00:28:33,039
on temple

749
00:28:41,029 --> 00:28:39,590
i think the surprises are yet to come on

750
00:28:42,549 --> 00:28:41,039
the compositional side because we

751
00:28:44,870 --> 00:28:42,559
haven't looked at the infrared

752
00:28:47,590 --> 00:28:44,880
spectrometer

753
00:28:49,269 --> 00:28:47,600
the signatures in the

754
00:28:50,870 --> 00:28:49,279
the fact that it was active was known

755
00:28:52,470 --> 00:28:50,880
but i don't think any of us really felt

756
00:28:54,310 --> 00:28:52,480
we were going to see as

757
00:28:55,830 --> 00:28:54,320
much spectral signature as we did to

758
00:28:56,830 --> 00:28:55,840
produce the kinds of maps that mike

759
00:28:58,630 --> 00:28:56,840
showed

760
00:28:59,590 --> 00:28:58,640
you i don't know if you want to add

761
00:29:01,190 --> 00:28:59,600
anything

762
00:29:03,590 --> 00:29:01,200
now the

763
00:29:05,669 --> 00:29:03,600

we already announced a few weeks ago one

764
00:29:07,269 --> 00:29:05,679
way in which this comet's very different

765
00:29:10,470 --> 00:29:07,279
from others and that was that it

766
00:29:12,870 --> 00:29:10,480
released in september over a period of

767
00:29:14,630 --> 00:29:12,880
two weeks

768
00:29:16,230 --> 00:29:14,640
a few million tons

769
00:29:18,630 --> 00:29:16,240
of

770
00:29:20,630 --> 00:29:18,640
cyanogen radicals we don't know what

771
00:29:23,510 --> 00:29:20,640
those come from probably from hydrogen

772
00:29:26,070 --> 00:29:23,520
cyanide and if water did the same thing

773
00:29:29,269 --> 00:29:26,080
we're talking a thousand times more

774
00:29:30,950 --> 00:29:29,279
material without dragging out any dust i

775
00:29:33,830 --> 00:29:30,960
just showed you pictures that show how

776
00:29:35,990 --> 00:29:33,840
when the dry ice gets active you drag

777
00:29:38,630 --> 00:29:36,000
out dust with it or solid grains they

778
00:29:40,389 --> 00:29:38,640
may be water ice grains for all we know

779
00:29:42,630 --> 00:29:40,399
but you drag out grains and normally

780
00:29:45,430 --> 00:29:42,640
when the gas flows out it drags all the

781
00:29:47,909 --> 00:29:45,440
solid material with it this activity in

782
00:29:50,230 --> 00:29:47,919
september didn't do that that is a

783
00:29:51,750 --> 00:29:50,240
phenomenon we haven't seen before also

784
00:29:53,510 --> 00:29:51,760
so there are phenomena that we haven't

785
00:29:54,470 --> 00:29:53,520
seen before and

786
00:29:56,310 --> 00:29:54,480
just like

787
00:29:59,830 --> 00:29:56,320
the clumps on the nucleus we don't

788
00:30:03,430 --> 00:30:01,510

i should say there are things on the

789
00:30:05,990 --> 00:30:03,440
nucleus that are familiar

790
00:30:07,750 --> 00:30:06,000
we see in different comets little pieces

791
00:30:09,669 --> 00:30:07,760
of things that kind of

792
00:30:11,590 --> 00:30:09,679
are familiar but putting it together is

793
00:30:15,510 --> 00:30:11,600
still something we're struggling with

794
00:30:18,310 --> 00:30:16,710
all right next we're going to go back to

795
00:30:21,430 --> 00:30:18,320
the phone lines we're going to richard

796
00:30:23,029 --> 00:30:21,440
kerr from science magazine go ahead

797
00:30:25,269 --> 00:30:23,039
thank you

798
00:30:27,430 --> 00:30:25,279
i was just wondering about the

799
00:30:28,870 --> 00:30:27,440
co2

800
00:30:31,750 --> 00:30:28,880
dominance

801
00:30:33,110 --> 00:30:31,760
it does co2

802
00:30:34,830 --> 00:30:33,120
dominate

803
00:30:38,630 --> 00:30:34,840
gases coming

804
00:30:40,549 --> 00:30:38,640
off the comet as a whole

805
00:30:42,149 --> 00:30:40,559
what about the water is it the water

806
00:30:45,990 --> 00:30:42,159
normally

807
00:30:47,669 --> 00:30:46,000
the primary driver on other comets

808
00:30:51,750 --> 00:30:47,679
on most comets

809
00:30:52,870 --> 00:30:51,760
the overall outgassing is indeed mostly

810
00:30:53,990 --> 00:30:52,880
water

811
00:30:58,310 --> 00:30:54,000
and

812
00:31:00,470 --> 00:30:58,320
anywhere from one percent to 10 percent

813
00:31:02,470 --> 00:31:00,480

carbon monoxide

814
00:31:04,389 --> 00:31:02,480
there are virtually no measurements of

815
00:31:06,470 --> 00:31:04,399
carbon dioxide except our own

816
00:31:08,870 --> 00:31:06,480
measurements at comet tempo one and one

817
00:31:11,990 --> 00:31:08,880
or two measurements from

818
00:31:14,230 --> 00:31:12,000
infrared spacecraft in earth orbit

819
00:31:15,190 --> 00:31:14,240
but probably it's of order five or ten

820
00:31:16,470 --> 00:31:15,200
percent

821
00:31:19,029 --> 00:31:16,480
typically

822
00:31:22,230 --> 00:31:19,039
we do not yet have a proper absolute

823
00:31:24,549 --> 00:31:22,240
calibration of our infrared spectra we

824
00:31:27,029 --> 00:31:24,559
see the water there but the water does

825
00:31:29,190 --> 00:31:27,039
not go up and down nearly as much as the

826
00:31:31,269 --> 00:31:29,200
carbon dioxide does when the when the

827
00:31:33,029 --> 00:31:31,279
nucleus rotates around

828
00:31:35,029 --> 00:31:33,039
and you get this big burst of carbon

829
00:31:37,350 --> 00:31:35,039
dioxide you may get a very small

830
00:31:38,149 --> 00:31:37,360
increase in water

831
00:31:39,990 --> 00:31:38,159
so

832
00:31:42,789 --> 00:31:40,000
in this case we think this carbon

833
00:31:45,269 --> 00:31:42,799
dioxide the dry ice is driving it but we

834
00:31:50,310 --> 00:31:45,279
don't have an absolute number even in

835
00:31:50,320 --> 00:31:53,110
okay thank you

836
00:31:58,070 --> 00:31:55,350
all right the next call is from jim roop

837
00:32:01,430 --> 00:31:58,080
of cnn radio please go ahead hi thank

838
00:32:02,950 --> 00:32:01,440

you and congratulations everybody uh for

839
00:32:05,029 --> 00:32:02,960
if you could help me here from the

840
00:32:05,990 --> 00:32:05,039
perspective of a regular member of the

841
00:32:08,470 --> 00:32:06,000
public

842
00:32:09,990 --> 00:32:08,480
what specifically is the reason or was

843
00:32:12,710 --> 00:32:10,000
the reason for this mission is it

844
00:32:15,750 --> 00:32:12,720
because hartley 2 presented itself as a

845
00:32:17,830 --> 00:32:15,760
for an exploratory mission or is there

846
00:32:19,990 --> 00:32:17,840
more something specific about this

847
00:32:22,149 --> 00:32:20,000
mission and number two

848
00:32:24,710 --> 00:32:22,159
why why should i care as a member of the

849
00:32:26,789 --> 00:32:24,720
public what what impact what impact does

850
00:32:28,950 --> 00:32:26,799
this have for me

851
00:32:31,350 --> 00:32:28,960
let me try to answer the second one

852
00:32:33,990 --> 00:32:31,360
first

853
00:32:41,029 --> 00:32:36,310
what specifically is the reason or what

854
00:32:46,950 --> 00:32:42,950
can i go ahead and answer it i think i

855
00:32:51,909 --> 00:32:49,029
the reason we wanted to go to hartley 2

856
00:32:54,470 --> 00:32:51,919
specifically is because it was a very

857
00:32:57,190 --> 00:32:54,480
small very active comet

858
00:32:59,269 --> 00:32:57,200
and was therefore different from

859
00:33:00,389 --> 00:32:59,279
the other comets we had studied in

860
00:33:02,470 --> 00:33:00,399
detail

861
00:33:06,149 --> 00:33:02,480
so that was the driver for choosing

862
00:33:08,549 --> 00:33:06,159
comet hartley 2 versus some other comet

863
00:33:11,590 --> 00:33:08,559

what we hoped to do

864
00:33:13,909 --> 00:33:11,600
was to

865
00:33:16,310 --> 00:33:13,919
use the difference between a small

866
00:33:18,710 --> 00:33:16,320
active comet and a large

867
00:33:21,029 --> 00:33:18,720
relatively inactive comet like temple

868
00:33:24,470 --> 00:33:21,039
one or borreli

869
00:33:26,549 --> 00:33:24,480
and to address the question of

870
00:33:29,269 --> 00:33:26,559
what parts of comets

871
00:33:31,750 --> 00:33:29,279
are due to the recent processing and

872
00:33:33,430 --> 00:33:31,760
what parts tell us about the formation

873
00:33:34,870 --> 00:33:33,440
of the solar system four and a half

874
00:33:37,029 --> 00:33:34,880
billion years ago

875
00:33:39,509 --> 00:33:37,039
and ultimately what we want to

876
00:33:41,909 --> 00:33:39,519
use this for is to figure out how did we

877
00:33:42,950 --> 00:33:41,919
get here

878
00:33:45,750 --> 00:33:42,960
what

879
00:33:47,990 --> 00:33:45,760
materials came to earth four and a half

880
00:33:50,070 --> 00:33:48,000
billion years ago that enabled life to

881
00:33:51,590 --> 00:33:50,080
exist here

882
00:33:55,029 --> 00:33:51,600
what were the conditions when the

883
00:33:57,590 --> 00:33:55,039
planets were forming the comets are

884
00:33:59,750 --> 00:33:57,600
the cores of jupiter saturn uranus and

885
00:34:02,549 --> 00:33:59,760
neptune they have large cores that are

886
00:34:04,310 --> 00:34:02,559
made up of comets and the comets that

887
00:34:05,990 --> 00:34:04,320
didn't get captured into those planets

888
00:34:08,710 --> 00:34:06,000

are what are what are left over for us

889
00:34:10,869 --> 00:34:08,720
to see so that's the ultimate goal in

890
00:34:13,589 --> 00:34:10,879
studying any comets and

891
00:34:15,750 --> 00:34:13,599
the specific goal was to find one that

892
00:34:21,909 --> 00:34:15,760
is very different in its aspects than

893
00:34:27,829 --> 00:34:24,869
okay next call is uh stephen clark from

894
00:34:30,310 --> 00:34:27,839
space flight now

895
00:34:32,629 --> 00:34:30,320
hi thanks for taking my call um two

896
00:34:35,190 --> 00:34:32,639
questions first uh what does the shape

897
00:34:37,589 --> 00:34:35,200
of of this comet the elongated peanut

898
00:34:39,829 --> 00:34:37,599
shape what could that tell you about its

899
00:34:41,909 --> 00:34:39,839
history i mean could it be like a rubble

900
00:34:44,629 --> 00:34:41,919
pile type comment like we see in

901
00:34:47,669 --> 00:34:44,639
asteroids and secondly

902
00:34:48,710 --> 00:34:47,679
when does the epoxy project money run

903
00:34:52,710 --> 00:34:48,720
out and do you have any plans for

904
00:34:52,720 --> 00:34:58,870
you get the first half

905
00:35:02,470 --> 00:35:00,790
well i hope you do the second one give

906
00:35:03,750 --> 00:35:02,480
me a chance to see

907
00:35:05,510 --> 00:35:03,760
well i'll go ahead and address the

908
00:35:06,630 --> 00:35:05,520
second one there you go

909
00:35:09,030 --> 00:35:06,640
we um

910
00:35:09,829 --> 00:35:09,040
we're currently slated to conclude our

911
00:35:11,430 --> 00:35:09,839
our

912
00:35:12,550 --> 00:35:11,440
current phase of operations at the end

913
00:35:14,630 --> 00:35:12,560

of this year

914
00:35:17,430 --> 00:35:14,640
and uh so that's that's the current set

915
00:35:19,670 --> 00:35:17,440
of plans with the with the spacecraft

916
00:35:21,750 --> 00:35:19,680
and like ed mentioned a little while ago

917
00:35:25,829 --> 00:35:21,760
nasa is looking at future uses but that

918
00:35:30,630 --> 00:35:27,990
so spuds in space is always a good

919
00:35:31,589 --> 00:35:30,640
analogy to small bodies we've got potato

920
00:35:33,349 --> 00:35:31,599
shapes

921
00:35:34,630 --> 00:35:33,359
and all sorts of things

922
00:35:35,829 --> 00:35:34,640
both in the asteroid and comet

923
00:35:37,270 --> 00:35:35,839
communities but i think they're very

924
00:35:38,069 --> 00:35:37,280
different

925
00:35:40,470 --> 00:35:38,079
the

926
00:35:43,349 --> 00:35:40,480
rubble piles are probably a lot stronger

927
00:35:44,790 --> 00:35:43,359
than anything we see inside comets

928
00:35:47,589 --> 00:35:44,800
um

929
00:35:49,349 --> 00:35:47,599
so uh the shape is telling us something

930
00:35:50,790 --> 00:35:49,359
i don't think we have a clue yet what it

931
00:35:53,990 --> 00:35:50,800
is and in fact we probably have some

932
00:35:56,150 --> 00:35:54,000
arguments as to what it might be today

933
00:36:06,310 --> 00:35:56,160
and we'll be working that over the next

934
00:36:12,390 --> 00:36:07,829
okay we're going to go to wayne friedman

935
00:36:16,790 --> 00:36:14,950
congratulations on your work simple

936
00:36:19,109 --> 00:36:16,800
question for an average viewer out here

937
00:36:21,270 --> 00:36:19,119
can you give us an indication of the

938
00:36:23,750 --> 00:36:21,280

size the temperature maybe the pressures

939
00:36:27,910 --> 00:36:23,760
of those jets if a person were to stand

940
00:36:32,470 --> 00:36:30,230
uh it would definitely be less than a

941
00:36:34,150 --> 00:36:32,480
fire hose

942
00:36:36,230 --> 00:36:34,160
even though it even though the jets

943
00:36:37,750 --> 00:36:36,240
behave much like the water coming out of

944
00:36:39,190 --> 00:36:37,760
a fire hose

945
00:36:42,069 --> 00:36:39,200
you would feel it

946
00:36:43,829 --> 00:36:42,079
it probably would not be enough to lift

947
00:36:45,990 --> 00:36:43,839
you off the surface but it might it's

948
00:36:48,710 --> 00:36:46,000
sort of on the borderline of be of being

949
00:36:50,150 --> 00:36:48,720
able to lift you off the surface

950
00:36:52,310 --> 00:36:50,160
but it doesn't take much to lift off the

951
00:37:04,230 --> 00:36:52,320
surface yeah you have to remember that

952
00:37:08,310 --> 00:37:06,470
we're going to go again back to amina

953
00:37:09,670 --> 00:37:08,320
khan from the los angeles times please

954
00:37:12,950 --> 00:37:09,680
go ahead

955
00:37:15,190 --> 00:37:12,960
hi i just wanted to see if the uh the

956
00:37:16,950 --> 00:37:15,200
jets of this anigen um i think called

957
00:37:18,950 --> 00:37:16,960
standards and radicals um

958
00:37:22,950 --> 00:37:18,960
is that common i mean are did those

959
00:37:24,710 --> 00:37:22,960
materials tell us anything about um

960
00:37:26,069 --> 00:37:24,720
anything unique about this particular

961
00:37:28,950 --> 00:37:26,079
comment and i know it's a little bit

962
00:37:31,109 --> 00:37:28,960
early to say but has what we've learned

963
00:37:34,390 --> 00:37:31,119

thus far over the past several weeks

964
00:37:39,270 --> 00:37:34,400
told us anything new about the origins

965
00:37:43,510 --> 00:37:40,550
trying to

966
00:37:45,190 --> 00:37:43,520
interpret any of the data from a fast

967
00:37:47,270 --> 00:37:45,200
flyby

968
00:37:48,470 --> 00:37:47,280
in terms of the ultimate origins

969
00:37:50,870 --> 00:37:48,480
question

970
00:37:52,390 --> 00:37:50,880
will invariably takes a lot longer than

971
00:37:54,550 --> 00:37:52,400
the flyby

972
00:37:57,349 --> 00:37:54,560
the engineers come along and they give

973
00:38:00,310 --> 00:37:57,359
us this these wonderful data

974
00:38:02,150 --> 00:38:00,320
and they dump a ton of information on us

975
00:38:04,790 --> 00:38:02,160
and sorting it all out in terms of

976
00:38:10,470 --> 00:38:04,800
origins will take

977
00:38:14,230 --> 00:38:12,870
oh i'm sorry the the cyanogen jets in

978
00:38:16,390 --> 00:38:14,240
particular

979
00:38:19,190 --> 00:38:16,400
the most useful thing

980
00:38:21,349 --> 00:38:19,200
uh we think at the moment will be in

981
00:38:23,670 --> 00:38:21,359
relating them to the jets we see here

982
00:38:25,990 --> 00:38:23,680
and using the combination of the two to

983
00:38:30,069 --> 00:38:26,000
figure out exactly how the

984
00:38:34,230 --> 00:38:30,079
nucleus is rotating because the nucleus

985
00:38:37,109 --> 00:38:34,240
rotates over something like 18 hours and

986
00:38:38,950 --> 00:38:37,119
the spacecraft flies by and all our

987
00:38:40,069 --> 00:38:38,960
images of the nucleus

988
00:38:42,790 --> 00:38:40,079

that

989
00:38:45,510 --> 00:38:42,800
you have seen were taken in a period of

990
00:38:47,109 --> 00:38:45,520
roughly 200 seconds so the nucleus

991
00:38:48,630 --> 00:38:47,119
doesn't move enough for us to see the

992
00:38:52,310 --> 00:38:48,640
rotation

993
00:38:53,670 --> 00:38:52,320
so combining the data on the jets from

994
00:38:55,990 --> 00:38:53,680
two different directions from the

995
00:38:57,910 --> 00:38:56,000
spacecraft and from the earth is the

996
00:39:02,310 --> 00:38:57,920
only way we'll be able to sort out what

997
00:39:06,630 --> 00:39:04,790
all right we have two callers at kennedy

998
00:39:07,910 --> 00:39:06,640
space center would one of you please go

999
00:39:11,910 --> 00:39:07,920
ahead and please give us your name and

1000
00:39:17,510 --> 00:39:15,510
uh tk monet timber daily news

1001
00:39:18,950 --> 00:39:17,520
uh back to the hambone

1002
00:39:20,069 --> 00:39:18,960
structure

1003
00:39:22,470 --> 00:39:20,079
um

1004
00:39:26,230 --> 00:39:22,480
i guess i'm asking for speculation could

1005
00:39:27,109 --> 00:39:26,240
centrifugal or centrifugal force cause

1006
00:39:29,430 --> 00:39:27,119
your

1007
00:39:32,069 --> 00:39:29,440
idea that that's fine grain in the

1008
00:39:33,829 --> 00:39:32,079
valley areas or the center area and

1009
00:39:35,589 --> 00:39:33,839
would that be more

1010
00:39:38,950 --> 00:39:35,599
prone to fracture

1011
00:39:40,950 --> 00:39:38,960
and break the comet into two or

1012
00:39:43,270 --> 00:39:40,960
would the fine grain make it even more

1013
00:39:46,310 --> 00:39:43,280

stable so that it would out gas only on

1014
00:39:49,990 --> 00:39:47,670
well there's a lot of speculation in

1015
00:39:51,430 --> 00:39:50,000
there i i think if if the centripetal

1016
00:39:53,349 --> 00:39:51,440
force was an issue the thing would have

1017
00:39:54,710 --> 00:39:53,359
broken apart a long time ago

1018
00:39:58,230 --> 00:39:54,720
because we don't think the comets are

1019
00:40:01,190 --> 00:39:59,589
and the rest i think

1020
00:40:03,109 --> 00:40:01,200
we'll put it in the list of things we're

1021
00:40:05,270 --> 00:40:03,119
all thinking about

1022
00:40:07,910 --> 00:40:05,280
those ideas i don't honestly we just

1023
00:40:11,430 --> 00:40:07,920
don't know at this point

1024
00:40:13,670 --> 00:40:11,440
i i'll speculate that

1025
00:40:15,670 --> 00:40:13,680
if the torque from the jets were to spin

1026
00:40:17,589 --> 00:40:15,680
up the rotation

1027
00:40:19,430 --> 00:40:17,599
uh and the rotation does seem to be

1028
00:40:21,510 --> 00:40:19,440
changing although it seems to be slowing

1029
00:40:23,190 --> 00:40:21,520
down if you were if it were to spin up

1030
00:40:27,510 --> 00:40:23,200
the rotation so that it were going

1031
00:40:29,270 --> 00:40:27,520
around in a uh in a few hours then i'm

1032
00:40:31,109 --> 00:40:29,280
almost certain that in fact the two

1033
00:40:36,309 --> 00:40:31,119
pieces would fly apart

1034
00:40:39,990 --> 00:40:38,470
all right let's go john

1035
00:40:42,069 --> 00:40:40,000
i saw the graph of the brightness

1036
00:40:43,910 --> 00:40:42,079
variation during the approach uh is that

1037
00:40:45,430 --> 00:40:43,920
directional like a service feature or

1038
00:40:47,030 --> 00:40:45,440

would that be seen from all directions

1039
00:40:49,190 --> 00:40:47,040
like a dust cloud and what was the

1040
00:40:53,270 --> 00:40:49,200
phasing of the encounter uh relative to

1041
00:41:02,069 --> 00:40:56,870
the

1042
00:41:04,150 --> 00:41:02,079
associated almost entirely with jets

1043
00:41:06,390 --> 00:41:04,160
that start out pointing very nearly

1044
00:41:08,069 --> 00:41:06,400
towards the sun at least as seen in

1045
00:41:09,910 --> 00:41:08,079
projection on the sky

1046
00:41:12,150 --> 00:41:09,920
from the spacecraft now they may be

1047
00:41:14,470 --> 00:41:12,160
tilted behind the plane of the sky or

1048
00:41:17,190 --> 00:41:14,480
before out from the plane of the sky but

1049
00:41:19,510 --> 00:41:17,200
pointing more or less towards the sun

1050
00:41:21,270 --> 00:41:19,520
and then they rotate around

1051
00:41:23,430 --> 00:41:21,280
so it's almost certainly

1052
00:41:25,510 --> 00:41:23,440
a relatively small fraction of the

1053
00:41:27,670 --> 00:41:25,520
surface that's producing them just to

1054
00:41:30,870 --> 00:41:27,680
keep all of the material going in one

1055
00:41:35,990 --> 00:41:33,670
working out the details of where it is

1056
00:41:37,670 --> 00:41:36,000
uh jessica showed you where roughly

1057
00:41:39,750 --> 00:41:37,680
where on the nucleus we think all that

1058
00:41:41,910 --> 00:41:39,760
activity is happening it's on

1059
00:41:44,309 --> 00:41:41,920
on the end where you see the jets

1060
00:41:46,470 --> 00:41:44,319
uh in the picture that's up at right at

1061
00:41:48,870 --> 00:41:46,480
the moment

1062
00:41:51,349 --> 00:41:48,880
but exactly beyond that i think we'd be

1063
00:41:55,910 --> 00:41:51,359

speculating beyond the ability of our

1064
00:42:00,630 --> 00:41:57,349
okay on the line right now we have mike

1065
00:42:03,109 --> 00:42:00,640
wahl from space.com go ahead please

1066
00:42:04,390 --> 00:42:03,119
sure yeah i would just like to just to

1067
00:42:05,750 --> 00:42:04,400
know um

1068
00:42:08,069 --> 00:42:05,760
could you guys give us just a sense of

1069
00:42:09,670 --> 00:42:08,079
actually how much data has been pouring

1070
00:42:11,109 --> 00:42:09,680
in and will continue to pour in and

1071
00:42:13,430 --> 00:42:11,119
exactly how long it's going to take you

1072
00:42:15,750 --> 00:42:13,440
guys to go through all this to actually

1073
00:42:17,349 --> 00:42:15,760
figure out what exactly you've and

1074
00:42:20,309 --> 00:42:17,359
kind of what you can learn from it i'll

1075
00:42:22,390 --> 00:42:20,319
give you one number

1076
00:42:24,710 --> 00:42:22,400
we've been observing

1077
00:42:29,349 --> 00:42:24,720
since the 5th of september and we will

1078
00:42:36,230 --> 00:42:33,190
from the first of october

1079
00:42:38,390 --> 00:42:36,240
until we did our last maneuver a couple

1080
00:42:40,790 --> 00:42:38,400
of days ago

1081
00:42:43,910 --> 00:42:40,800
one of the three instruments

1082
00:42:46,950 --> 00:42:43,920
has delivered 23 000 images to the

1083
00:42:51,270 --> 00:42:48,870
uh the other

1084
00:42:53,109 --> 00:42:51,280
the other camera has delivered fewer the

1085
00:42:55,349 --> 00:42:53,119
the spectrometer has delivered a

1086
00:42:56,390 --> 00:42:55,359
comparable amount of data and that's

1087
00:42:57,829 --> 00:42:56,400
just

1088
00:43:00,150 --> 00:42:57,839

over uh

1089
00:43:02,150 --> 00:43:00,160
approximately one month of the entire

1090
00:43:04,069 --> 00:43:02,160
encounter that lasts two and two thirds

1091
00:43:06,390 --> 00:43:04,079
months

1092
00:43:07,990 --> 00:43:06,400
the total the total number of images

1093
00:43:09,589 --> 00:43:08,000
that we plan to bring down to the ground

1094
00:43:11,430 --> 00:43:09,599
by the time we finish

1095
00:43:17,349 --> 00:43:11,440
all the observations is approximately

1096
00:43:19,910 --> 00:43:18,390
all right i'm going to check one more

1097
00:43:22,950 --> 00:43:19,920
time here in van carmen yes we do have a

1098
00:43:27,750 --> 00:43:22,960
question wait for a microphone

1099
00:43:31,270 --> 00:43:29,510
all right one quick question where is

1100
00:43:34,710 --> 00:43:31,280
the rotational pole in the image that

1101
00:43:42,230 --> 00:43:36,630
great question when you figure it out

1102
00:43:45,349 --> 00:43:43,990
it almost certainly goes through the

1103
00:43:48,069 --> 00:43:45,359
short axis

1104
00:43:51,109 --> 00:43:48,079
but but whether it's uh

1105
00:43:53,349 --> 00:43:51,119
you know going this way or this way we

1106
00:43:55,190 --> 00:43:53,359
don't really know yet

1107
00:43:57,109 --> 00:43:55,200
okay and then a more detailed question

1108
00:43:58,309 --> 00:43:57,119
i'm really really struck by the boldery

1109
00:44:00,470 --> 00:43:58,319
nature of this thing and how similar

1110
00:44:02,309 --> 00:44:00,480
that looks to itokawa the tiny asteroid

1111
00:44:03,829 --> 00:44:02,319
visited by hayabusa and i'm wondering if

1112
00:44:06,230 --> 00:44:03,839
people think that

1113
00:44:07,829 --> 00:44:06,240

really tiny solar system objects are

1114
00:44:09,030 --> 00:44:07,839
more bouldery or if it's just a

1115
00:44:11,109 --> 00:44:09,040
coincidence

1116
00:44:13,030 --> 00:44:11,119
well i wouldn't use the word boulder yet

1117
00:44:15,510 --> 00:44:13,040
because boulder implies rocks

1118
00:44:18,230 --> 00:44:15,520
and itakawa is probably rocks and it's

1119
00:44:20,870 --> 00:44:18,240
got dominated by ejecta processes from

1120
00:44:23,349 --> 00:44:20,880
impacts this is very different

1121
00:44:24,870 --> 00:44:23,359
and i honestly can't say exactly what we

1122
00:44:27,190 --> 00:44:24,880
called clumps where there's a reason we

1123
00:44:31,190 --> 00:44:27,200
chose a nice vague word but it's not

1124
00:44:32,950 --> 00:44:31,990
so

1125
00:44:35,670 --> 00:44:32,960
you know

1126
00:44:39,990 --> 00:44:35,680
putting them together well yeah

1127
00:44:43,589 --> 00:44:41,750
but they all have very little gravity

1128
00:44:45,349 --> 00:44:43,599
and that's something that's in common is

1129
00:44:49,030 --> 00:44:45,359
probably telling us

1130
00:44:52,309 --> 00:44:50,790
all right i think that takes care of all

1131
00:44:53,910 --> 00:44:52,319
the questions here in the von carmen

1132
00:44:55,589 --> 00:44:53,920
auditorium and on the phone lines we

1133
00:44:58,069 --> 00:44:55,599
want to thank you so much for joining us

1134
00:44:59,589 --> 00:44:58,079
it's been a wonderful day here at nasa's

1135
00:45:02,150 --> 00:44:59,599
jet propulsion laboratory we're going to

1136
00:45:04,150 --> 00:45:02,160
end the briefing with the replay of all

1137
00:45:05,829 --> 00:45:04,160
the videos and images that you've seen