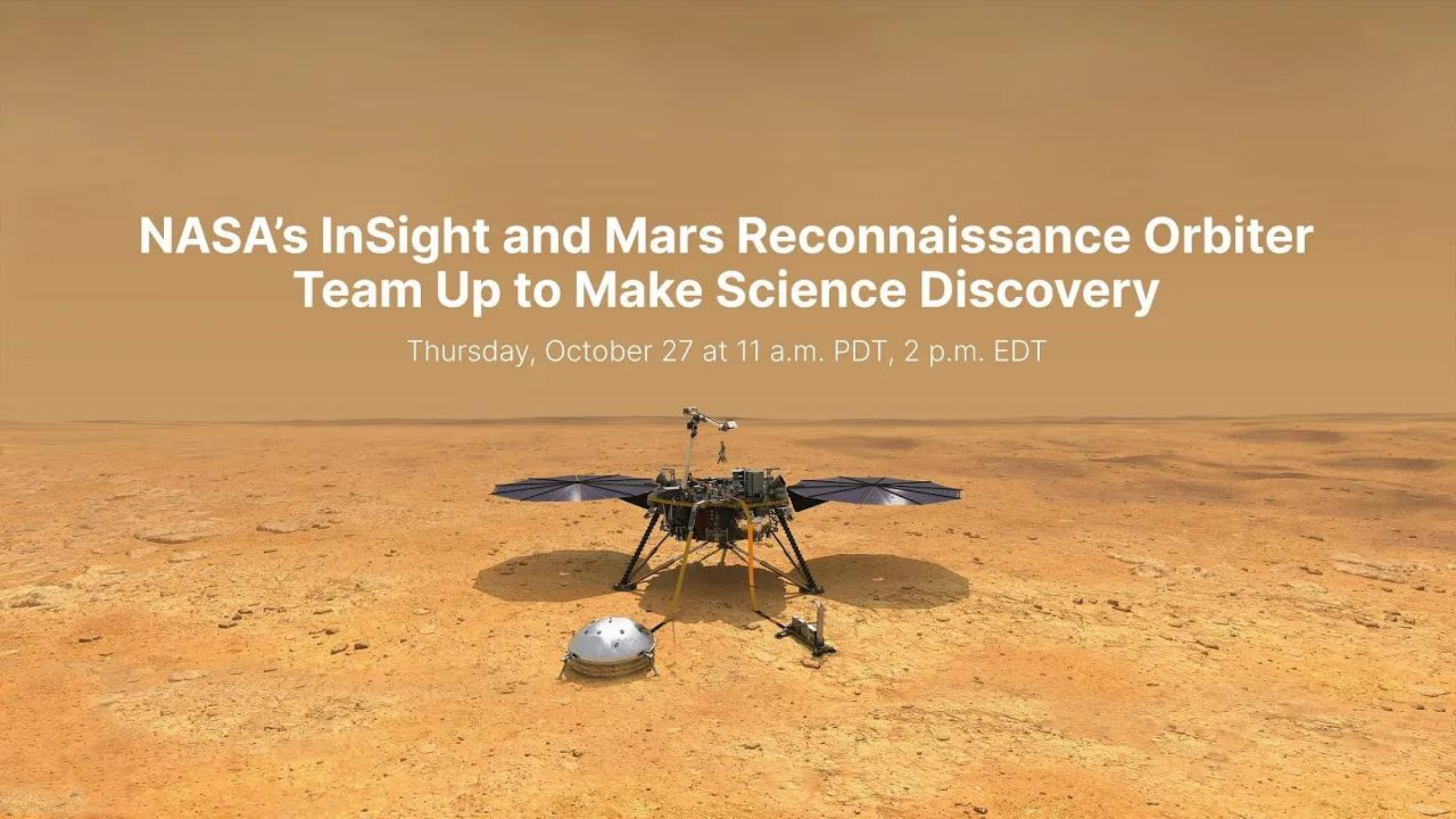
NASA's InSight and Mars Reconnaissance Orbiter Team Up to Make Science Discovery

Thursday, October 27 at 11 a.m. PDT, 2 p.m. EDT



1
00:01:13,070 --> 00:00:01,610
[Music]

2
00:01:48,170 --> 00:01:14,540
foreign

3
00:02:28,070 --> 00:01:48,180
[Music]

4
00:02:35,089 --> 00:02:32,089
on Christmas Eve in 2021 NASA's Insight

5
00:02:37,910 --> 00:02:35,099
Lander received a gift of sorts a new

6
00:02:40,309 --> 00:02:37,920
discovery Insight recorded a significant

7
00:02:42,830 --> 00:02:40,319
Mars Quake that's what we call Quakes on

8
00:02:45,229 --> 00:02:42,840
Mars but scientists learned only later

9
00:02:47,509 --> 00:02:45,239
the cause of that shaking because the

10
00:02:50,750 --> 00:02:47,519
Mars reconnaissance Orbiter also known

11
00:02:53,030 --> 00:02:50,760
as mro was able to see from space what

12
00:02:55,369 --> 00:02:53,040
the Lander detected I'm Raquel

13
00:02:57,949 --> 00:02:55,379

Villanueva and I'm your host today here

14
00:02:59,509 --> 00:02:57,959
at NASA's jet propulsion laboratory in

15
00:03:01,670 --> 00:02:59,519
Southern California

16
00:03:04,190 --> 00:03:01,680
today's science team members from the

17
00:03:06,410 --> 00:03:04,200
Insight Lander and mro Mission will

18
00:03:09,309 --> 00:03:06,420
explain how data and images from their

19
00:03:13,030 --> 00:03:09,319
spacecraft contributed to the Discovery

20
00:03:16,430 --> 00:03:13,040
joining us virtually are Bruce bannert

21
00:03:18,649 --> 00:03:16,440
Insight principal investigator at NASA's

22
00:03:22,490 --> 00:03:18,659
jet propulsion Laboratory

23
00:03:25,190 --> 00:03:22,500
Lilia posiolova orbital science and

24
00:03:26,869 --> 00:03:25,200
operations lead at malen space science

25
00:03:30,410 --> 00:03:26,879
systems

26
00:03:33,250 --> 00:03:30,420
Ingrid dalbar Insight impact science

27
00:03:37,070 --> 00:03:33,260
lead at Brown University

28
00:03:39,770 --> 00:03:37,080
and Lori glaze director of NASA's

29
00:03:41,149 --> 00:03:39,780
planetary science division from NASA

30
00:03:43,070 --> 00:03:41,159
headquarters

31
00:03:45,410 --> 00:03:43,080
we'll be taking questions after hearing

32
00:03:47,330 --> 00:03:45,420
from our speakers so if you're a member

33
00:03:50,089 --> 00:03:47,340
of the media on the phone lines press

34
00:03:52,309 --> 00:03:50,099
star one to be put in the queue and if

35
00:03:54,470 --> 00:03:52,319
you're on social media use the hashtag

36
00:03:57,589 --> 00:03:54,480
asknasa

37
00:03:59,449 --> 00:03:57,599
I'll now hand it over to Bruce

38
00:04:01,070 --> 00:03:59,459

hi everyone I'm Bruce Banner I'm the

39
00:04:03,410 --> 00:04:01,080
principal investigator of the Insight

40
00:04:06,110 --> 00:04:03,420
Mission I'm speaking to you here today

41
00:04:08,470 --> 00:04:06,120
from Lockheed Martin space where the

42
00:04:11,270 --> 00:04:08,480
spacecraft operations centers is located

43
00:04:13,509 --> 00:04:11,280
insight has been on the surface of Mars

44
00:04:16,550 --> 00:04:13,519
since November of 2018

45
00:04:18,110 --> 00:04:16,560
listening with its seismometer on

46
00:04:19,969 --> 00:04:18,120
various other instruments weather

47
00:04:22,610 --> 00:04:19,979
instruments and so forth to what the

48
00:04:25,249 --> 00:04:22,620
goings on on Mars and we're here today

49
00:04:27,469 --> 00:04:25,259
to talk about some a new discovery that

50
00:04:30,469 --> 00:04:27,479
we're really excited about in terms of

51
00:04:31,930 --> 00:04:30,479
the the first time that uh impact's

52
00:04:34,969 --> 00:04:31,940
actually been

53
00:04:37,610 --> 00:04:34,979
observed as it happened by a seismometer

54
00:04:40,730 --> 00:04:37,620
and then observed also from from space

55
00:04:42,710 --> 00:04:40,740
by the orbital cameras before we get

56
00:04:44,810 --> 00:04:42,720
into that though I'd like to tell you a

57
00:04:46,969 --> 00:04:44,820
little bit about the uh spacecraft

58
00:04:49,189 --> 00:04:46,979
status on Mars can we have the first

59
00:04:50,870 --> 00:04:49,199
image please

60
00:04:52,310 --> 00:04:50,880
um as you probably know as insight's

61
00:04:54,469 --> 00:04:52,320
been sitting on the surface of Mars for

62
00:04:56,689 --> 00:04:54,479
the last four years it's been collecting

63
00:04:59,090 --> 00:04:56,699

a lot of dust on on its solar panels

64
00:05:00,590 --> 00:04:59,100
This is a picture of the solar panels uh

65
00:05:02,390 --> 00:05:00,600
a couple of months ago and you can see

66
00:05:04,189 --> 00:05:02,400
that it's really really dusty and that's

67
00:05:06,050 --> 00:05:04,199
cut down our solar power and we've been

68
00:05:08,270 --> 00:05:06,060
uh sort of cutting back on the

69
00:05:10,790 --> 00:05:08,280
operations of the the spacecraft as as

70
00:05:13,790 --> 00:05:10,800
that's happened in order to squeeze out

71
00:05:15,530 --> 00:05:13,800
as much science state as we can about a

72
00:05:17,570 --> 00:05:15,540
month ago we got a an additional

73
00:05:18,830 --> 00:05:17,580
challenge to the spacecraft if I could

74
00:05:22,430 --> 00:05:18,840
have the next image

75
00:05:24,529 --> 00:05:22,440
uh this is a a global Mosaic of Mars it

76
00:05:26,930 --> 00:05:24,539
was taken over the course of a day and

77
00:05:28,969 --> 00:05:26,940
it shows a large dust storm in the

78
00:05:31,189 --> 00:05:28,979
southern hemisphere that started kicking

79
00:05:33,950 --> 00:05:31,199
up about a month ago if you go to the

80
00:05:36,110 --> 00:05:33,960
next image we can see the dust storm uh

81
00:05:38,870 --> 00:05:36,120
shown in uh the orange so you can see

82
00:05:41,090 --> 00:05:38,880
where it is fortunately that Death Storm

83
00:05:44,029 --> 00:05:41,100
did not move over inside itself

84
00:05:45,890 --> 00:05:44,039
um Insight is over on the right side of

85
00:05:48,110 --> 00:05:45,900
this image one of those little spots on

86
00:05:49,790 --> 00:05:48,120
the right side of the image and so that

87
00:05:51,890 --> 00:05:49,800
was really fortunate because if it had

88
00:05:53,270 --> 00:05:51,900

passed over the spacecraft it would have

89
00:05:56,210 --> 00:05:53,280
darkened the solar panels and we

90
00:05:58,790 --> 00:05:56,220
probably would have lost the spacecraft

91
00:06:00,409 --> 00:05:58,800
um but unfortunately since this is such

92
00:06:02,689 --> 00:06:00,419
a large dust storm it's actually put a

93
00:06:04,610 --> 00:06:02,699
lot of dust up into the atmosphere and

94
00:06:06,650 --> 00:06:04,620
it has cut down the amount of sunlight

95
00:06:09,710 --> 00:06:06,660
reaching the solar panels by quite a bit

96
00:06:11,570 --> 00:06:09,720
we went down we went from about 400 watt

97
00:06:14,270 --> 00:06:11,580
hours per Sol which is the the units

98
00:06:17,090 --> 00:06:14,280
that we measure the spacecraft power in

99
00:06:18,850 --> 00:06:17,100
down to less than 300

100
00:06:21,830 --> 00:06:18,860
um and we were we had to cut shops

101
00:06:24,710 --> 00:06:21,840
seismometer for a few weeks we are now

102
00:06:28,010 --> 00:06:24,720
operating the seismometer again uh only

103
00:06:30,770 --> 00:06:28,020
one day out of four at this point to uh

104
00:06:34,129 --> 00:06:30,780
conserve our power but even in that at

105
00:06:36,710 --> 00:06:34,139
that uh of relatively small amount of of

106
00:06:39,409 --> 00:06:36,720
use of the batteries are still slowly

107
00:06:41,930 --> 00:06:39,419
being depleted and so what we believe is

108
00:06:44,870 --> 00:06:41,940
in the next uh short amount of time

109
00:06:47,510 --> 00:06:44,880
perhaps somewhere between four and eight

110
00:06:50,270 --> 00:06:47,520
weeks as best we can can predict we

111
00:06:52,309 --> 00:06:50,280
expect the Lander to not have enough

112
00:06:54,710 --> 00:06:52,319
power to operate any longer and will

113
00:06:59,510 --> 00:06:54,720

lose contact with the spacecraft

114
00:07:02,210 --> 00:06:59,520
so that's uh uh a sad thing to to to

115
00:07:03,890 --> 00:07:02,220
contemplate but insight has been working

116
00:07:07,010 --> 00:07:03,900
marvelously for the last four years

117
00:07:08,809 --> 00:07:07,020
we've gone well beyond uh the intended

118
00:07:10,430 --> 00:07:08,819
lifetime of this of the uh the mission

119
00:07:13,610 --> 00:07:10,440
which was two years we've been

120
00:07:15,170 --> 00:07:13,620
collecting data and even now as we're

121
00:07:17,870 --> 00:07:15,180
we're winding down we're still getting

122
00:07:20,170 --> 00:07:17,880
these these amazing new results

123
00:07:23,749 --> 00:07:20,180
um if I can have the the next animation

124
00:07:26,330 --> 00:07:23,759
this is uh oh this is a an image showing

125
00:07:28,550 --> 00:07:26,340
that the the relative locations of the

126
00:07:31,490 --> 00:07:28,560
Insight Lander over on the left hand

127
00:07:33,589 --> 00:07:31,500
side of the image and this impact that

128
00:07:35,629 --> 00:07:33,599
uh cause a crater that we were able to

129
00:07:38,150 --> 00:07:35,639
pick up with our seismometer and that

130
00:07:40,129 --> 00:07:38,160
was later imaged um with the Mars

131
00:07:43,790 --> 00:07:40,139
reconnaissance Orbiter

132
00:07:45,110 --> 00:07:43,800
um we I can show you uh the the seismic

133
00:07:47,689 --> 00:07:45,120
data and actually you can hear the

134
00:07:49,850 --> 00:07:47,699
seismic data what we've done here is we

135
00:07:52,430 --> 00:07:49,860
speeded up the vibrations that we

136
00:07:53,930 --> 00:07:52,440
measured with a seismometer up into the

137
00:07:55,730 --> 00:07:53,940
the range that we can actually hear with

138
00:07:58,610 --> 00:07:55,740

the human ear so we fed it up about a

139
00:08:00,469 --> 00:07:58,620
hundred times if you were actually on

140
00:08:01,969 --> 00:08:00,479
Mars you would feel the shaking but you

141
00:08:03,770 --> 00:08:01,979
wouldn't be able to hear it but this way

142
00:08:05,270 --> 00:08:03,780
we can actually you know transmit it

143
00:08:08,450 --> 00:08:05,280
over the internet and you can you can

144
00:08:11,270 --> 00:08:08,460
experience it this is about 45 minutes

145
00:08:12,830 --> 00:08:11,280
of of seismic data and you'll be able to

146
00:08:14,510 --> 00:08:12,840
hear it in a little less than half a

147
00:08:16,790 --> 00:08:14,520
minute so if we can go ahead and roll

148
00:08:20,390 --> 00:08:16,800
that animation now you can listen

149
00:08:22,260 --> 00:08:20,400
closely to the sounds of Mars

150
00:08:26,089 --> 00:08:22,270
foreign

151
00:08:45,790 --> 00:08:26,099
[Music]

152
00:08:50,090 --> 00:08:47,990
bulge and you can see in the image was

153
00:08:53,210 --> 00:08:50,100
the P wave coming in the first wave that

154
00:08:55,670 --> 00:08:53,220
comes from the from any seismic seismic

155
00:08:58,009 --> 00:08:55,680
event and then the big bulbs there is

156
00:09:00,050 --> 00:08:58,019
the S Wave and then buried in that is

157
00:09:02,329 --> 00:09:00,060
actually the surface wave which is uh

158
00:09:04,310 --> 00:09:02,339
one of the the real interesting findings

159
00:09:06,110 --> 00:09:04,320
from this uh this this new event and

160
00:09:07,670 --> 00:09:06,120
we'll be talking about that a little bit

161
00:09:09,949 --> 00:09:07,680
more later

162
00:09:12,710 --> 00:09:09,959
um so with that I'd like to hand it over

163
00:09:14,930 --> 00:09:12,720

to Lilia pulsilova to talk about how

164
00:09:18,590 --> 00:09:14,940
this uh this really interesting

165
00:09:23,389 --> 00:09:21,230
hello everybody my name is Lilia

166
00:09:25,790 --> 00:09:23,399
postalova

167
00:09:28,370 --> 00:09:25,800
and I work at mail and space science

168
00:09:30,889 --> 00:09:28,380
systems we design build and operate

169
00:09:32,269 --> 00:09:30,899
cameras on spacecraft may I have my

170
00:09:37,850 --> 00:09:32,279
first image please

171
00:09:42,290 --> 00:09:37,860
I oversee operations of CTX context and

172
00:09:46,430 --> 00:09:42,300
Marcy Mars color imager on board of mro

173
00:09:50,329 --> 00:09:46,440
Mars Wisconsin's Orbiter spacecraft

174
00:09:53,449 --> 00:09:50,339
in December of last year a neat heroids

175
00:09:56,930 --> 00:09:53,459
struck Mars and created the largest

176
00:09:59,570 --> 00:09:56,940
fresh impact crater we have observed in

177
00:10:02,449 --> 00:09:59,580
16 years of mro mission

178
00:10:04,970 --> 00:10:02,459
may I have my next image please

179
00:10:07,670 --> 00:10:04,980
when we first saw this image we were

180
00:10:10,790 --> 00:10:07,680
extremely excited this is was nothing

181
00:10:13,310 --> 00:10:10,800
like we've seen before it took entire

182
00:10:16,550 --> 00:10:13,320
view of the CTX image it's a 30

183
00:10:18,650 --> 00:10:16,560
kilometers width and even we needed to

184
00:10:21,470 --> 00:10:18,660
take two more images to this on the

185
00:10:25,430 --> 00:10:21,480
sides to capture the entire perturbance

186
00:10:29,470 --> 00:10:25,440
area we do see regularly small craters

187
00:10:32,750 --> 00:10:29,480
with City in our CTX field of view and

188
00:10:35,690 --> 00:10:32,760

how does it do how do we do it we

189
00:10:38,750 --> 00:10:35,700
acquire CTX images based on our various

190
00:10:41,150 --> 00:10:38,760
scientific objectives and we inspect

191
00:10:43,490 --> 00:10:41,160
them for any changes and typically what

192
00:10:45,710 --> 00:10:43,500
we see it will be like a little smudge

193
00:10:49,190 --> 00:10:45,720
and then we compare to all the available

194
00:10:51,829 --> 00:10:49,200
previously data sets to confirm that it

195
00:10:54,590 --> 00:10:51,839
is fresh or not fresh crater and

196
00:10:58,550 --> 00:10:54,600
typically they own the size of up to 20

197
00:11:01,910 --> 00:10:58,560
feet small craters and time constrained

198
00:11:05,269 --> 00:11:01,920
we can do few years maybe occasionally

199
00:11:11,329 --> 00:11:08,569
the perturbance that this impactor

200
00:11:13,430 --> 00:11:11,339
created was so large then we thought

201
00:11:16,310 --> 00:11:13,440
maybe we could see it in our other

202
00:11:19,970 --> 00:11:16,320
camera view it's our may I have my next

203
00:11:23,569 --> 00:11:19,980
image please it's our lower resolution

204
00:11:26,150 --> 00:11:23,579
weather camera but it takes daily Global

205
00:11:29,630 --> 00:11:26,160
images of Mars on the right you see

206
00:11:33,110 --> 00:11:29,640
feature that created by this impactor

207
00:11:37,310 --> 00:11:33,120
and to see that strong of a signal in

208
00:11:39,829 --> 00:11:37,320
that camera view it's huge very rare we

209
00:11:42,650 --> 00:11:39,839
were able to time constrain this impact

210
00:11:43,790 --> 00:11:42,660
down to about a day slightly over 24

211
00:11:46,970 --> 00:11:43,800
hours

212
00:11:50,750 --> 00:11:46,980
and then I recall that Insight reported

213
00:11:53,509 --> 00:11:50,760

back in December that they recorded this

214
00:11:57,470 --> 00:11:53,519
large seismic event on Christmas Eve

215
00:11:59,569 --> 00:11:57,480
when we compare seismic epicenter with

216
00:12:02,630 --> 00:11:59,579
location that we've been pointed from

217
00:12:06,769 --> 00:12:02,640
the orbit and the time we were able to

218
00:12:09,410 --> 00:12:06,779
match this large seismic event to our

219
00:12:12,889 --> 00:12:09,420
large impact crater

220
00:12:16,970 --> 00:12:12,899
this is by far the largest jointly

221
00:12:19,910 --> 00:12:16,980
observed crater recorded seismically and

222
00:12:23,750 --> 00:12:19,920
observed from the the image from the

223
00:12:26,930 --> 00:12:23,760
orbit may I have my next slide please

224
00:12:30,230 --> 00:12:26,940
as ball light travel through the Mars

225
00:12:33,350 --> 00:12:30,240
atmosphere it creates a mock cone and as

226
00:12:36,889 --> 00:12:33,360
a result of it you see dust perturb on

227
00:12:41,090 --> 00:12:36,899
the left of the crater a lot happens as

228
00:12:44,350 --> 00:12:41,100
the meteoroid strikes Mars Rock gets

229
00:12:48,110 --> 00:12:44,360
fractured there is atmospheric blast

230
00:12:51,470 --> 00:12:48,120
ejecta gets thrown out crater gets

231
00:12:53,750 --> 00:12:51,480
excavated in effect of the dynamic oil

232
00:12:57,710 --> 00:12:53,760
that preserved in the Martian surface

233
00:13:00,710 --> 00:12:57,720
and we captured it in our CTX image we

234
00:13:03,949 --> 00:13:00,720
see the crater itself at about 150 meter

235
00:13:07,250 --> 00:13:03,959
in diameter we see bright patches of ice

236
00:13:09,470 --> 00:13:07,260
this is most equator word eyes we've

237
00:13:13,610 --> 00:13:09,480
seen on Mars

238
00:13:17,150 --> 00:13:13,620

the ability to tell what happened when

239
00:13:19,490 --> 00:13:17,160
and what activity occurred along with

240
00:13:23,030 --> 00:13:19,500
the largest impact crater

241
00:13:26,569 --> 00:13:23,040
of two huge Discovery and demonstrates

242
00:13:29,870 --> 00:13:26,579
the value increased value that joint

243
00:13:32,690 --> 00:13:29,880
work of two Mission brings and I will

244
00:13:35,750 --> 00:13:32,700
turn to Ingrid to look at more details

245
00:13:38,870 --> 00:13:35,760
of the impact itself

246
00:13:40,550 --> 00:13:38,880
thanks Lilia my name is Ingrid doubar

247
00:13:42,769 --> 00:13:40,560
I'm on the team for the high-rise camera

248
00:13:46,310 --> 00:13:42,779
which is another camera orbiting Mars on

249
00:13:49,190 --> 00:13:46,320
mro I can have the first visual please

250
00:13:50,930 --> 00:13:49,200
jerez is a high resolution color stereo

251
00:13:52,610 --> 00:13:50,940
camera that lets us see things as small

252
00:13:54,590 --> 00:13:52,620
as a desk on Mars

253
00:13:56,509 --> 00:13:54,600
I also help lead the impacts working

254
00:13:58,370 --> 00:13:56,519
group on the Insight mission

255
00:14:00,470 --> 00:13:58,380
high-rise and CTX have been showing us

256
00:14:02,629 --> 00:14:00,480
new creators as Lilia said forming on

257
00:14:04,129 --> 00:14:02,639
Mars for a while now so we were hopeful

258
00:14:05,329 --> 00:14:04,139
we could detect some of these with the

259
00:14:07,129 --> 00:14:05,339
Insight mission

260
00:14:08,449 --> 00:14:07,139
we want to study impacts with Insight

261
00:14:10,430 --> 00:14:08,459
because they can tell us not just about

262
00:14:12,650 --> 00:14:10,440
the craters themselves and the cratering

263
00:14:14,569 --> 00:14:12,660

process but also about the interior and

264
00:14:16,610 --> 00:14:14,579
the atmosphere of Mars

265
00:14:18,410 --> 00:14:16,620
sources with a known location in size

266
00:14:19,970 --> 00:14:18,420
can help calibrate all of the other data

267
00:14:21,410 --> 00:14:19,980
we've gotten from Insight all those

268
00:14:22,790 --> 00:14:21,420
Quakes where we don't know the exact

269
00:14:24,410 --> 00:14:22,800
epicenter

270
00:14:25,850 --> 00:14:24,420
after three years of listening we

271
00:14:27,889 --> 00:14:25,860
thought impacts probably have to be

272
00:14:30,110 --> 00:14:27,899
either very close to the Lander or very

273
00:14:32,389 --> 00:14:30,120
large to be detected seismically

274
00:14:34,310 --> 00:14:32,399
we recently found four small impacts

275
00:14:36,230 --> 00:14:34,320
close to Insight but we never thought

276
00:14:38,090 --> 00:14:36,240
we'd see anything this big

277
00:14:40,129 --> 00:14:38,100
so we were super excited to hear about

278
00:14:41,389 --> 00:14:40,139
this discovery by Lilia and her team and

279
00:14:42,889 --> 00:14:41,399
have the chance to study it in more

280
00:14:45,710 --> 00:14:42,899
detail with high-rise

281
00:14:47,090 --> 00:14:45,720
can I have the next image please

282
00:14:48,470 --> 00:14:47,100
from this high-rise image it was

283
00:14:50,629 --> 00:14:48,480
immediately clear that this is the

284
00:14:52,550 --> 00:14:50,639
biggest new crater we'd ever seen it's

285
00:14:54,230 --> 00:14:52,560
about 500 feet wide or about two city

286
00:14:56,030 --> 00:14:54,240
blocks across

287
00:14:57,530 --> 00:14:56,040
and even though meteorites are hitting

288
00:14:59,090 --> 00:14:57,540

the planet all the time this crater is

289
00:15:00,710 --> 00:14:59,100
more than 10 times larger than the

290
00:15:03,050 --> 00:15:00,720
typical new craters we see forming on

291
00:15:04,910 --> 00:15:03,060
Mars we thought a crater this size might

292
00:15:07,310 --> 00:15:04,920
form somewhere on the planet once every

293
00:15:08,750 --> 00:15:07,320
few decades maybe once a generation so

294
00:15:10,490 --> 00:15:08,760
it was very exciting to be able to

295
00:15:12,889 --> 00:15:10,500
witness this event and to be lucky

296
00:15:14,810 --> 00:15:12,899
enough to it happened while Insight was

297
00:15:16,970 --> 00:15:14,820
recording seismic data that was a real

298
00:15:18,710 --> 00:15:16,980
scientific gift

299
00:15:20,810 --> 00:15:18,720
for comparison the Mars Quake this

300
00:15:22,490 --> 00:15:20,820
crater caused was a magnitude for Quake

301
00:15:24,110 --> 00:15:22,500
which on Earth is big enough to be felt

302
00:15:26,509 --> 00:15:24,120
but not big enough to cause a ton of

303
00:15:28,310 --> 00:15:26,519
damage about a thousand or so Quakes of

304
00:15:30,590 --> 00:15:28,320
this size happen on the Earth every year

305
00:15:33,110 --> 00:15:30,600
but Mars is less tectonically active

306
00:15:34,910 --> 00:15:33,120
than the than the earth so for Mars This

307
00:15:37,550 --> 00:15:34,920
was a pretty big one

308
00:15:40,069 --> 00:15:37,560
can I have the video please

309
00:15:41,810 --> 00:15:40,079
most exciting of all we saw clearly in

310
00:15:43,670 --> 00:15:41,820
the high resolution images that a whole

311
00:15:44,750 --> 00:15:43,680
lot of water ice had been exposed by

312
00:15:47,210 --> 00:15:44,760
this impact

313
00:15:49,970 --> 00:15:47,220

you can see in this flyover video of the

314
00:15:51,949 --> 00:15:49,980
3D data Boulder sized chunks of ice in

315
00:15:53,569 --> 00:15:51,959
the crater's ejecta as well as splotches

316
00:15:55,069 --> 00:15:53,579
of ice thrown across the landscape

317
00:15:56,810 --> 00:15:55,079
outside the crater

318
00:15:58,730 --> 00:15:56,820
this was surprising because this is the

319
00:16:00,949 --> 00:15:58,740
warmest spot on Mars the closest to the

320
00:16:02,629 --> 00:16:00,959
equator we've ever seen Water Ice

321
00:16:04,490 --> 00:16:02,639
so scientists are going to be able to

322
00:16:06,949 --> 00:16:04,500
use this to constrain the past climate

323
00:16:09,470 --> 00:16:06,959
conditions on Mars when and how this ice

324
00:16:10,670 --> 00:16:09,480
was deposited buried and preserved up

325
00:16:12,769 --> 00:16:10,680
until now

326
00:16:14,449 --> 00:16:12,779
this is a huge opportunity to study a

327
00:16:16,610 --> 00:16:14,459
really large impact event from both the

328
00:16:17,930 --> 00:16:16,620
orbit and the ground a reminder of how

329
00:16:19,670 --> 00:16:17,940
privileged we are to have multiple

330
00:16:21,710 --> 00:16:19,680
missions studying Mars at the same time

331
00:16:23,150 --> 00:16:21,720
it's been really exciting and fruitful

332
00:16:25,009 --> 00:16:23,160
to be part of these two projects working

333
00:16:27,050 --> 00:16:25,019
together and now I'll hand it over to

334
00:16:29,329 --> 00:16:27,060
Lori glaze

335
00:16:32,090 --> 00:16:29,339
thank you so much Ingrid

336
00:16:34,310 --> 00:16:32,100
uh so Insight what an amazingly

337
00:16:37,249 --> 00:16:34,320
successful mission where we've learned

338
00:16:38,829 --> 00:16:37,259

so much about Mars's crust the interior

339
00:16:41,810 --> 00:16:38,839
and more

340
00:16:43,970 --> 00:16:41,820
as you heard from Bruce sadly we're

341
00:16:46,730 --> 00:16:43,980
likely nearing the end of the Insight

342
00:16:48,710 --> 00:16:46,740
Mission but what an awesome Capstone

343
00:16:51,410 --> 00:16:48,720
science result to end on I mean

344
00:16:53,030 --> 00:16:51,420
literally going out with a bang

345
00:16:55,370 --> 00:16:53,040
uh you know the observation of the

346
00:16:57,470 --> 00:16:55,380
December 24 impact uh by the insight

347
00:17:00,530 --> 00:16:57,480
seismometer as well as the orbital

348
00:17:02,569 --> 00:17:00,540
Imaging is really exciting not just for

349
00:17:04,189 --> 00:17:02,579
Gathering important new information that

350
00:17:06,590 --> 00:17:04,199
will refine our understanding of the

351
00:17:08,689 --> 00:17:06,600
crustal structure but for other really

352
00:17:10,429 --> 00:17:08,699
important science as well

353
00:17:12,049 --> 00:17:10,439
as you heard it's the largest impact

354
00:17:14,270 --> 00:17:12,059
crater seen on Mars since we've been

355
00:17:16,130 --> 00:17:14,280
observing and watching

356
00:17:17,510 --> 00:17:16,140
um you know asteroids are found

357
00:17:18,949 --> 00:17:17,520
throughout the solar system and they

358
00:17:21,350 --> 00:17:18,959
play a really important role in

359
00:17:22,429 --> 00:17:21,360
planetary surface processes so these

360
00:17:25,010 --> 00:17:22,439
observations are going to help

361
00:17:27,049 --> 00:17:25,020
contribute to to that knowledge

362
00:17:29,270 --> 00:17:27,059
to give a little context on this

363
00:17:31,310 --> 00:17:29,280

particular asteroid the expected size

364
00:17:32,990 --> 00:17:31,320
range of the object that created the

365
00:17:35,210 --> 00:17:33,000
Creator the crater

366
00:17:37,370 --> 00:17:35,220
I was likely between about 5 and 12

367
00:17:39,289 --> 00:17:37,380
meters across and you know asteroids of

368
00:17:41,750 --> 00:17:39,299
that size actually enter Earth's

369
00:17:43,789 --> 00:17:41,760
atmosphere on the order about once a

370
00:17:46,669 --> 00:17:43,799
year we see those real pretty regularly

371
00:17:48,890 --> 00:17:46,679
but because Earth has a thicker

372
00:17:52,070 --> 00:17:48,900
atmosphere asteroids of this size burn

373
00:17:55,549 --> 00:17:52,080
up and are generally pretty harmless

374
00:17:57,350 --> 00:17:55,559
if I could have the first graphic please

375
00:17:59,570 --> 00:17:57,360
just want to speak for a moment about

376
00:18:02,450 --> 00:17:59,580
the importance of the discovery of ice

377
00:18:05,330 --> 00:18:02,460
you know just below the surface this is

378
00:18:06,710 --> 00:18:05,340
really an exciting result we know of

379
00:18:09,950 --> 00:18:06,720
course that there's water ice near the

380
00:18:12,650 --> 00:18:09,960
poles on Mars but in planning for future

381
00:18:14,270 --> 00:18:12,660
human exploration of Mars we'd want to

382
00:18:17,090 --> 00:18:14,280
land the astronauts as near to the

383
00:18:20,150 --> 00:18:17,100
equator as possible and having access to

384
00:18:21,950 --> 00:18:20,160
ice these lower latitudes that that

385
00:18:24,529 --> 00:18:21,960
water that ice could be converted into

386
00:18:26,570 --> 00:18:24,539
water oxygen or hydrogen that could be

387
00:18:28,010 --> 00:18:26,580
really useful

388
00:18:30,289 --> 00:18:28,020

um if I could have the second graphic

389
00:18:34,370 --> 00:18:32,930
so let's just go back to where Bruce

390
00:18:35,750 --> 00:18:34,380
started

391
00:18:38,450 --> 00:18:35,760
um you've heard that the power

392
00:18:40,070 --> 00:18:38,460
production on insight has been dropping

393
00:18:42,650 --> 00:18:40,080
um at the mission will likely end

394
00:18:44,870 --> 00:18:42,660
sometime in the coming you know four to

395
00:18:48,289 --> 00:18:44,880
eight weeks in the next couple of months

396
00:18:50,450 --> 00:18:48,299
this Mission has been a really big

397
00:18:53,029 --> 00:18:50,460
success in the four years it's been

398
00:18:56,630 --> 00:18:53,039
operating I want to take a moment to

399
00:18:57,909 --> 00:18:56,640
acknowledge this incredible team that

400
00:19:00,950 --> 00:18:57,919
has met

401
00:19:03,409 --> 00:19:00,960
many challenges along the way they've

402
00:19:05,450 --> 00:19:03,419
met the challenges of the soil of Mars

403
00:19:07,070 --> 00:19:05,460
not cooperating and the challenges of

404
00:19:10,490 --> 00:19:07,080
trying to deploy the mole with the heat

405
00:19:13,010 --> 00:19:10,500
probe challenges of waiting waiting for

406
00:19:15,230 --> 00:19:13,020
those Quakes those first Quakes and

407
00:19:17,210 --> 00:19:15,240
waiting for the data to to really start

408
00:19:18,890 --> 00:19:17,220
delivering what we were looking for and

409
00:19:21,470 --> 00:19:18,900
of course the dust accumulation and the

410
00:19:23,630 --> 00:19:21,480
Valiant attempts by the team to extend

411
00:19:25,970 --> 00:19:23,640
the lifetime of the mission by cleaning

412
00:19:27,950 --> 00:19:25,980
some of that dust off the solar erase

413
00:19:29,750 --> 00:19:27,960

I've known Bruce and several of the

414
00:19:32,930 --> 00:19:29,760
science team members for for many many

415
00:19:37,130 --> 00:19:32,940
years and I know how much emotional

416
00:19:40,310 --> 00:19:37,140
energy goes into those years of planning

417
00:19:42,890 --> 00:19:40,320
and execution of a mission like insight

418
00:19:45,230 --> 00:19:42,900
and I know it's going to be hard for the

419
00:19:46,850 --> 00:19:45,240
team and for all of us to say goodbye

420
00:19:48,590 --> 00:19:46,860
but I just want to say I couldn't be

421
00:19:49,909 --> 00:19:48,600
prouder of all this team has

422
00:19:52,310 --> 00:19:49,919
accomplished

423
00:19:54,529 --> 00:19:52,320
I want to close by saying thank you to

424
00:19:56,690 --> 00:19:54,539
Bruce and the entire team for all

425
00:19:58,850 --> 00:19:56,700
they've done to advance our under sorry

426
00:20:01,310 --> 00:19:58,860
our understanding of Mars and with that

427
00:20:04,370 --> 00:20:01,320
we'll go back to Raquel great thank you

428
00:20:06,770 --> 00:20:04,380
so much Lori now we'll move it on to q a

429
00:20:09,230 --> 00:20:06,780
so if you're a member of the media on

430
00:20:11,390 --> 00:20:09,240
the phone lines you can press star one

431
00:20:14,450 --> 00:20:11,400
to get put in the queue and for social

432
00:20:15,830 --> 00:20:14,460
media you can use the hashtag asknasa

433
00:20:18,230 --> 00:20:15,840
and we do have some social media

434
00:20:21,470 --> 00:20:18,240
questions coming in first off Mrs

435
00:20:23,690 --> 00:20:21,480
whiskers1 on Twitter asks has there been

436
00:20:25,610 --> 00:20:23,700
anything that surprised you and Bruce I

437
00:20:29,630 --> 00:20:25,620
think she is talking about

438
00:20:32,510 --> 00:20:30,950

um well there's been a lot of things

439
00:20:34,010 --> 00:20:32,520
that surprised us actually it would have

440
00:20:36,470 --> 00:20:34,020
been a pretty boring Mission if we

441
00:20:39,529 --> 00:20:36,480
didn't get surprised we were surprised

442
00:20:41,630 --> 00:20:39,539
at first by how quiet Mars seemed to be

443
00:20:43,669 --> 00:20:41,640
in terms of of seismic activity it was

444
00:20:46,250 --> 00:20:43,679
three months before we actually even saw

445
00:20:47,870 --> 00:20:46,260
an earthquake and that was uh my

446
00:20:49,970 --> 00:20:47,880
fingernails were getting pretty short by

447
00:20:51,950 --> 00:20:49,980
the end of those three months because we

448
00:20:52,970 --> 00:20:51,960
were really depending on getting Mars

449
00:20:55,010 --> 00:20:52,980
Quakes

450
00:20:57,169 --> 00:20:55,020
um once we got that started getting Mars

451
00:21:00,409 --> 00:20:57,179
Quakes we realized that what we've done

452
00:21:02,270 --> 00:21:00,419
is we've landed in the um windy part of

453
00:21:04,070 --> 00:21:02,280
the year and so all the Mars Place were

454
00:21:06,770 --> 00:21:04,080
getting covered up by the wind and so

455
00:21:09,830 --> 00:21:06,780
that was that was a big relief

456
00:21:11,870 --> 00:21:09,840
um the next big surprise was the the

457
00:21:14,750 --> 00:21:11,880
issues with the mole uh we were

458
00:21:17,390 --> 00:21:14,760
surprised by the the properties of the

459
00:21:19,190 --> 00:21:17,400
the Martian soil it was unlike the the

460
00:21:21,169 --> 00:21:19,200
properties of the soil that we had seen

461
00:21:24,890 --> 00:21:21,179
previously at the Viking Landing sites

462
00:21:27,409 --> 00:21:24,900
at Spirit and opportunity and curiosity

463
00:21:28,730 --> 00:21:27,419

um Insight landed in a in a spot where

464
00:21:31,850 --> 00:21:28,740
the soil was a little bit different than

465
00:21:33,950 --> 00:21:31,860
what we expected and uh that made it

466
00:21:36,830 --> 00:21:33,960
impossible for our mole to to penetrate

467
00:21:38,870 --> 00:21:36,840
so that was uh an unpleasant surprise

468
00:21:40,370 --> 00:21:38,880
but scientifically it was actually uh

469
00:21:42,830 --> 00:21:40,380
very interesting because that showed

470
00:21:44,450 --> 00:21:42,840
that Mars was a lot more varied than we

471
00:21:46,789 --> 00:21:44,460
had thought before

472
00:21:47,649 --> 00:21:46,799
um and finally some of the the some of

473
00:21:56,510 --> 00:21:47,659
the

474
00:21:58,549 --> 00:21:56,520
larger than we had imagined we thought

475
00:22:00,770 --> 00:21:58,559
it was going to be about 1700 kilometers

476
00:22:05,210 --> 00:22:00,780
or so and was actually over 1800

477
00:22:07,669 --> 00:22:05,220
kilometers in in in radius and that has

478
00:22:10,190 --> 00:22:07,679
some really important implications for

479
00:22:11,690 --> 00:22:10,200
the evolution of of the planet Mars

480
00:22:12,950 --> 00:22:11,700
itself and so

481
00:22:14,810 --> 00:22:12,960
um that's a big surprise one that we

482
00:22:17,870 --> 00:22:14,820
haven't actually been able to to uh

483
00:22:20,390 --> 00:22:17,880
incorporate into our theories yet and so

484
00:22:22,669 --> 00:22:20,400
um this uh this impact was sort of the

485
00:22:23,990 --> 00:22:22,679
latest in in in a long series of

486
00:22:25,250 --> 00:22:24,000
surprises that we've had over the

487
00:22:27,770 --> 00:22:25,260
mission

488
00:22:30,230 --> 00:22:27,780

thanks you summed it up well Mars is

489
00:22:32,210 --> 00:22:30,240
full of surprises thank you Bruce now we

490
00:22:33,770 --> 00:22:32,220
do have a caller on the line and if you

491
00:22:36,110 --> 00:22:33,780
could please direct your question to one

492
00:22:39,049 --> 00:22:36,120
of the speakers we have Megan Bartels

493
00:22:41,390 --> 00:22:39,059
from space.com

494
00:22:43,789 --> 00:22:41,400
hey there can you hear me okay yes we

495
00:22:46,010 --> 00:22:43,799
can perfect

496
00:22:48,110 --> 00:22:46,020
um thanks for taking my question

497
00:22:50,930 --> 00:22:48,120
um I was hoping Bruce if you could go

498
00:22:53,270 --> 00:22:50,940
into a little more detail about the

499
00:22:55,190 --> 00:22:53,280
significance of detecting surface waves

500
00:22:57,049 --> 00:22:55,200
for the first time and then sort of how

501
00:22:59,289 --> 00:22:57,059
to use that information to better

502
00:23:01,909 --> 00:22:59,299
understand the crust

503
00:23:03,710 --> 00:23:01,919
yeah I would I would love to do that I

504
00:23:05,930 --> 00:23:03,720
mean this is uh the surface waves were

505
00:23:09,830 --> 00:23:05,940
something that we had uh anticipated

506
00:23:12,830 --> 00:23:09,840
using uh in in our data analysis uh from

507
00:23:14,390 --> 00:23:12,840
the very beginning of our planning uh we

508
00:23:17,510 --> 00:23:14,400
uh thought we were going to use surface

509
00:23:20,090 --> 00:23:17,520
wave to to locate Quakes use the surface

510
00:23:22,909 --> 00:23:20,100
waves to to probe the structure of the

511
00:23:25,430 --> 00:23:22,919
the crust the upper a few tens of

512
00:23:27,710 --> 00:23:25,440
kilometers of the planet but for the

513
00:23:30,110 --> 00:23:27,720

first three years of the mission we saw

514
00:23:31,909 --> 00:23:30,120
no surface waves and we believe that

515
00:23:32,990 --> 00:23:31,919
that's because the Mars Quakes are a

516
00:23:35,390 --> 00:23:33,000
little bit deeper than we had

517
00:23:37,730 --> 00:23:35,400
anticipated and so the surface waves

518
00:23:40,190 --> 00:23:37,740
aren't really developed uh large enough

519
00:23:43,130 --> 00:23:40,200
to be able to uh to detect with with our

520
00:23:45,169 --> 00:23:43,140
seismometer so now that we do have

521
00:23:47,149 --> 00:23:45,179
surface waves um it's already telling us

522
00:23:49,250 --> 00:23:47,159
a lot of really interesting stuff about

523
00:23:51,529 --> 00:23:49,260
Mars uh the nice thing about surface

524
00:23:54,110 --> 00:23:51,539
waves is they tell you about the crust

525
00:23:56,870 --> 00:23:54,120
not just where the Lander is sitting but

526
00:23:58,669 --> 00:23:56,880
they they look at the crust as they're

527
00:24:01,970 --> 00:23:58,679
moving across the planet so the whole

528
00:24:05,630 --> 00:24:01,980
path between the event in this case the

529
00:24:07,250 --> 00:24:05,640
the impact and insight is sampled by

530
00:24:09,289 --> 00:24:07,260
these surface waves as they move across

531
00:24:12,230 --> 00:24:09,299
the planet and so we have an idea of

532
00:24:14,930 --> 00:24:12,240
what the crust is over this uh fairly

533
00:24:17,149 --> 00:24:14,940
long path it's about uh 3 500 kilometers

534
00:24:20,270 --> 00:24:17,159
for for one of these uh one of these

535
00:24:22,490 --> 00:24:20,280
events in almost uh 7 500 kilometers for

536
00:24:25,010 --> 00:24:22,500
the other one and we find that the crust

537
00:24:27,289 --> 00:24:25,020
is different again the Insight Landing

538
00:24:30,110 --> 00:24:27,299

site is a little bit unusual or at least

539
00:24:32,630 --> 00:24:30,120
different than the uh pathway that this

540
00:24:36,289 --> 00:24:32,640
these search slaves took and so we found

541
00:24:39,110 --> 00:24:36,299
that the crust under insight has uh

542
00:24:41,510 --> 00:24:39,120
layer about 10 kilometers deep that is a

543
00:24:43,549 --> 00:24:41,520
little bit lower velocity lower density

544
00:24:45,529 --> 00:24:43,559
than what's indicated by the surface

545
00:24:47,570 --> 00:24:45,539
waves so surface waves are telling us

546
00:24:51,710 --> 00:24:47,580
about the crust not just at our one

547
00:24:54,110 --> 00:24:51,720
point but over a wide area on Mars the

548
00:24:57,590 --> 00:24:54,120
other thing that uh that is is great

549
00:25:00,409 --> 00:24:57,600
about the surface ways is that they help

550
00:25:03,470 --> 00:25:00,419
us to refine our location refine our

551
00:25:06,110 --> 00:25:03,480
seismically determined location and we

552
00:25:08,090 --> 00:25:06,120
find that by incorporating that with the

553
00:25:11,750 --> 00:25:08,100
The Body Waves the p and the S waves

554
00:25:14,270 --> 00:25:11,760
that helps us again to to uh zero in on

555
00:25:19,909 --> 00:25:14,280
the location which the uh which in which

556
00:25:23,270 --> 00:25:21,830
and so Bruce now remember if you're a

557
00:25:25,310 --> 00:25:23,280
member of the media on the phone lines

558
00:25:27,850 --> 00:25:25,320
you can press star one to get put in the

559
00:25:30,169 --> 00:25:27,860
queue and social media use the hashtag

560
00:25:32,990 --> 00:25:30,179
asknasa and we do have some more social

561
00:25:37,310 --> 00:25:33,000
media questions coming in we have Andrew

562
00:25:40,850 --> 00:25:37,320
on Facebook who asks how often do you

563
00:25:45,110 --> 00:25:40,860

discover a new impact crater uh Lilia

564
00:25:50,570 --> 00:25:47,690
sure I can take that

565
00:25:52,850 --> 00:25:50,580
um so cgxm has been looking for these

566
00:25:54,590 --> 00:25:52,860
ever since mro went into orbit about 16

567
00:25:57,169 --> 00:25:54,600
years ago

568
00:25:59,810 --> 00:25:57,179
um and the um Lily can tell you more

569
00:26:03,049 --> 00:25:59,820
about the CTX process to find them but

570
00:26:04,430 --> 00:26:03,059
um since then we found about 1200 new

571
00:26:06,110 --> 00:26:04,440
impacts

572
00:26:07,970 --> 00:26:06,120
um sometimes there's a couple craters

573
00:26:09,529 --> 00:26:07,980
there sometimes there's just one but

574
00:26:12,350 --> 00:26:09,539
again they're much much smaller than

575
00:26:18,529 --> 00:26:15,529
yeah thank you for the question so

576
00:26:21,830 --> 00:26:18,539
um yeah indeed we are relatively

577
00:26:24,649 --> 00:26:21,840
regularly do find them but again they

578
00:26:26,870 --> 00:26:24,659
are much much smaller and they on our

579
00:26:29,630 --> 00:26:26,880
CTX field of view they look like a

580
00:26:31,909 --> 00:26:29,640
little smudger so when we compare to all

581
00:26:34,370 --> 00:26:31,919
the previous data sets we're looking for

582
00:26:36,409 --> 00:26:34,380
that change and sometimes we see what my

583
00:26:37,870 --> 00:26:36,419
deal looks like a fresh grader but then

584
00:26:40,490 --> 00:26:37,880
if we

585
00:26:42,230 --> 00:26:40,500
look at all the previous data sets and

586
00:26:44,269 --> 00:26:42,240
we find that say previous image was

587
00:26:47,029 --> 00:26:44,279
taken three years ago oh it's still

588
00:26:49,070 --> 00:26:47,039

there and then five years ago and if

589
00:26:52,310 --> 00:26:49,080
that's all the previous images we have

590
00:26:55,610 --> 00:26:52,320
we can call them a fresh crater

591
00:27:01,610 --> 00:26:55,620
but yeah we we find that many first

592
00:27:07,610 --> 00:27:04,310
and we have another caller caller line

593
00:27:09,830 --> 00:27:07,620
Mark Caro from Aviation week and space

594
00:27:12,110 --> 00:27:09,840
technology

595
00:27:14,390 --> 00:27:12,120
thank you and I apologize if you already

596
00:27:16,970 --> 00:27:14,400
answered this but what was the distance

597
00:27:21,110 --> 00:27:16,980
or what is the distance between insight

598
00:27:27,430 --> 00:27:23,750
that's about uh so the uh yeah thanks

599
00:27:31,010 --> 00:27:27,440
for your question it's about 3500

600
00:27:37,789 --> 00:27:31,020
kilometers between there where inside is

601
00:27:46,669 --> 00:27:40,669
thank you Mark and also on the line we

602
00:27:50,990 --> 00:27:49,070
for doing this very exciting results and

603
00:27:53,149 --> 00:27:51,000
thanks for taking my question I want to

604
00:27:54,710 --> 00:27:53,159
ask you about uh about the ice that you

605
00:27:57,769 --> 00:27:54,720
found

606
00:27:59,510 --> 00:27:57,779
um I'd like to know how surprising was

607
00:28:03,289 --> 00:27:59,520
it to find ice at that particular

608
00:28:05,330 --> 00:28:03,299
location how how long did it remain on

609
00:28:08,149 --> 00:28:05,340
the surface because I know ice no

610
00:28:10,190 --> 00:28:08,159
evaporates pretty rapidly there and I'm

611
00:28:11,870 --> 00:28:10,200
wondering you have radar instruments

612
00:28:13,789 --> 00:28:11,880
there too what what are the radar

613
00:28:18,350 --> 00:28:13,799

instruments tell you about subsurface

614
00:28:23,450 --> 00:28:20,750
I can take that

615
00:28:25,010 --> 00:28:23,460
um so yeah so the um this was a big

616
00:28:27,230 --> 00:28:25,020
surprise because this is the closest to

617
00:28:28,669 --> 00:28:27,240
the equator that we've seen ice exposed

618
00:28:29,930 --> 00:28:28,679
in an impact

619
00:28:31,669 --> 00:28:29,940
um however there have been a number of

620
00:28:33,950 --> 00:28:31,679
other these all these other impacts that

621
00:28:37,370 --> 00:28:33,960
we found much smaller and closer to the

622
00:28:39,710 --> 00:28:37,380
poles that have also exposed water ice

623
00:28:41,690 --> 00:28:39,720
um before this I think the closest one

624
00:28:43,430 --> 00:28:41,700
was a few degrees north of this so it

625
00:28:44,990 --> 00:28:43,440
wasn't totally out of range of what

626
00:28:46,370 --> 00:28:45,000
might be expected but it was still very

627
00:28:47,570 --> 00:28:46,380
surprising

628
00:28:48,890 --> 00:28:47,580
um of course this crater is so much

629
00:28:51,289 --> 00:28:48,900
bigger than all the other ones we've

630
00:28:53,450 --> 00:28:51,299
seen and it excavated so much deeper

631
00:28:55,669 --> 00:28:53,460
that we're getting down deeper in the

632
00:28:56,930 --> 00:28:55,679
the shallow subsurface

633
00:28:59,149 --> 00:28:56,940
um and then your other question was

634
00:29:02,029 --> 00:28:59,159
about um oh how long the ice lasts yeah

635
00:29:04,010 --> 00:29:02,039
so we do see evidence of sublimation of

636
00:29:07,130 --> 00:29:04,020
ice that's been exposed in this way when

637
00:29:09,470 --> 00:29:07,140
we we use high rise to take images over

638
00:29:11,210 --> 00:29:09,480

and over again to monitor the sites and

639
00:29:14,330 --> 00:29:11,220
we can actually see the ice disappearing

640
00:29:15,890 --> 00:29:14,340
in most cases and it doesn't last long

641
00:29:18,950 --> 00:29:15,900
um it's not actually stable at the

642
00:29:21,350 --> 00:29:18,960
surface at these locations this this one

643
00:29:22,850 --> 00:29:21,360
again it's fairly new but we have seen

644
00:29:24,590 --> 00:29:22,860
some evidence of that happening but I

645
00:29:27,169 --> 00:29:24,600
don't think it's really been studied in

646
00:29:29,389 --> 00:29:27,179
detail yet

647
00:29:32,510 --> 00:29:29,399
anything about the radar results from

648
00:29:32,520 --> 00:29:39,649
um not to my knowledge

649
00:29:43,430 --> 00:29:41,389
thank you and we also have another

650
00:29:46,909 --> 00:29:43,440
question coming in on social media that

651
00:29:48,169 --> 00:29:46,919
is related Bart on Twitter asks how

652
00:29:55,370 --> 00:29:48,179
would you know if the ice wasn't

653
00:29:58,669 --> 00:29:56,690
um yeah that's a really good question we

654
00:30:00,470 --> 00:29:58,679
thought about that like maybe this was a

655
00:30:03,169 --> 00:30:00,480
commentary impactor that was just made

656
00:30:05,149 --> 00:30:03,179
of ice and um and what we're seeing on

657
00:30:07,850 --> 00:30:05,159
the surface is just splashed out from

658
00:30:10,850 --> 00:30:07,860
the impactor itself but um an impact of

659
00:30:12,830 --> 00:30:10,860
this size would actually destroy the

660
00:30:14,029 --> 00:30:12,840
meteorite that came in to to hit the

661
00:30:15,409 --> 00:30:14,039
surface

662
00:30:18,169 --> 00:30:15,419
um we wouldn't expect

663
00:30:20,630 --> 00:30:18,179

much if any of the original impact are

664
00:30:24,289 --> 00:30:20,640
to survive this High energetic it's

665
00:30:26,570 --> 00:30:24,299
about a it's a high energy explosion

666
00:30:28,730 --> 00:30:26,580
um so we can look at that and we can

667
00:30:32,450 --> 00:30:28,740
also look at the locations where the ice

668
00:30:33,889 --> 00:30:32,460
is found and um and that also shows us

669
00:30:35,810 --> 00:30:33,899
evidence that it's probably not from the

670
00:30:38,690 --> 00:30:35,820
impactor itself but rather was excavated

671
00:30:43,669 --> 00:30:38,700
from below the surface

672
00:30:47,090 --> 00:30:43,679
great thanks Ingrid we have one more oh

673
00:30:48,889 --> 00:30:47,100
okay we actually are out of questions

674
00:30:51,110 --> 00:30:48,899
for today so that is all the time we

675
00:30:53,269 --> 00:30:51,120
have today thank you and I'd like to

676
00:30:55,850 --> 00:30:53,279
speak all the speakers for their time

677
00:30:57,010 --> 00:30:55,860
today so to stay up to date with Insight

678
00:31:00,889 --> 00:30:57,020
visit

679
00:31:03,889 --> 00:31:00,899
mars.nasa.gov insight and follow at Nasa

680
00:31:04,970 --> 00:31:03,899
Insight on Twitter and Facebook and for

681
00:31:07,630 --> 00:31:04,980
more information on the Mars

682
00:31:10,549 --> 00:31:07,640
reconnaissance Orbiter visit

683
00:31:12,649 --> 00:31:10,559
mars.nasa.gov mro

684
00:31:21,990 --> 00:31:12,659
like to thank everyone for watching