READY FOR LAUNCH:
UPDATE ON UPCOMING SWOT MISSION

Jet Propulsion Laboratory
California Institute of Technology

1
00:00:10,009 --> 00:00:00,710
foreign

2
00:00:16,010 --> 00:00:12,709
the international surface water and

3
00:00:18,590 --> 00:00:16,020
ocean topography or SWAT is the first

4
00:00:20,990 --> 00:00:18,600
satellite mission to observe nearly all

5
00:00:22,970 --> 00:00:21,000
water on the Earth's surface it will

6
00:00:24,769 --> 00:00:22,980
help researchers address some of the

7
00:00:28,250 --> 00:00:24,779
most pressing climate change questions

8
00:00:30,650 --> 00:00:28,260
of our time it is now undergoing final

9
00:00:33,470 --> 00:00:30,660
preparations for its December 12th

10
00:00:35,630 --> 00:00:33,480
launch welcome I am Marina jurika with

11
00:00:38,150 --> 00:00:35,640
NASA's jet propulsion laboratory in

12
00:00:40,729 --> 00:00:38,160
Southern California the swap mission is

13
00:00:44,229 --> 00:00:40,739

a collaboration between NASA and the

14
00:00:49,910 --> 00:00:47,030
agencyel or canes with contributions

15
00:00:53,029 --> 00:00:49,920
from the Canadian space agency and the

16
00:00:56,569 --> 00:00:53,039
UK Space Agency SWAT team members from

17
00:00:58,910 --> 00:00:56,579
NASA JPL and kness are here to give you

18
00:01:01,970 --> 00:00:58,920
an update on the satellite and discuss

19
00:01:04,850 --> 00:01:01,980
why we need the data it will collect on

20
00:01:07,310 --> 00:01:04,860
our panel today we have tahini armor

21
00:01:09,530 --> 00:01:07,320
NASA's program executive in the earth

22
00:01:12,890 --> 00:01:09,540
science division of the science Mission

23
00:01:15,649 --> 00:01:12,900
Direct directorate Terry lafon senior

24
00:01:19,969 --> 00:01:15,659
project manager with canes

25
00:01:24,170 --> 00:01:19,979
parag vase project manager at JPL

26
00:01:27,350 --> 00:01:24,180
Lee luang Fu project scientist at JPL

27
00:01:29,929 --> 00:01:27,360
and lastly Ben Hamilton c-level

28
00:01:32,149 --> 00:01:29,939
researcher at JPL

29
00:01:34,670 --> 00:01:32,159
later in the program we will take media

30
00:01:36,890 --> 00:01:34,680
questions remember to press star 1 to

31
00:01:39,370 --> 00:01:36,900
get put in the queue we're also taking

32
00:01:42,530 --> 00:01:39,380
questions through the hashtag

33
00:01:44,810 --> 00:01:42,540
asknasa I'll hand it over to tahini Amer

34
00:01:48,109 --> 00:01:44,820
for more on this Mission and the

35
00:01:51,350 --> 00:01:48,119
international collaboration tahini

36
00:01:55,069 --> 00:01:51,360
thank you Maria we're very excited at

37
00:01:58,550 --> 00:01:55,079
Nasa because we are preparing to launch

38
00:02:02,210 --> 00:01:58,560

SWAT on December 12th and SpaceX Falcon

39
00:02:05,389 --> 00:02:02,220
9 rocket at vanderberg California why

40
00:02:09,410 --> 00:02:05,399
are we excited about SWAT is because it

41
00:02:12,290 --> 00:02:09,420
is a new uh it has will survey nearly

42
00:02:15,470 --> 00:02:12,300
all the water of Earth's surface for the

43
00:02:18,229 --> 00:02:15,480
first time which implies that is the

44
00:02:21,290 --> 00:02:18,239
first satellite to do so and it will

45
00:02:24,290 --> 00:02:21,300
address question that we have around

46
00:02:27,530 --> 00:02:24,300
earth's climate providing day that will

47
00:02:31,309 --> 00:02:27,540
help us inform decision about our

48
00:02:35,229 --> 00:02:31,319
everyday life what this want will do it

49
00:02:39,470 --> 00:02:35,239
will measure the heights of Earth's lake

50
00:02:42,530 --> 00:02:39,480
rivers Reservoir and of course the

51
00:02:44,990 --> 00:02:42,540
oceans and it will help scientists be

52
00:02:48,170 --> 00:02:45,000
able to track the movement of the water

53
00:02:50,869 --> 00:02:48,180
around the world we know that water is

54
00:02:55,009 --> 00:02:50,879
essential and it's very important and it

55
00:02:58,910 --> 00:02:55,019
plays a crucial role to of how the the

56
00:03:01,490 --> 00:02:58,920
store and move Earth's heat and carbon

57
00:03:04,130 --> 00:03:01,500
that influence our planet weather and

58
00:03:06,710 --> 00:03:04,140
climate so what will help us to know

59
00:03:09,830 --> 00:03:06,720
where is the waters today where is

60
00:03:11,869 --> 00:03:09,840
coming from and where it is going it is

61
00:03:14,869 --> 00:03:11,879
critical to the scientists to understand

62
00:03:18,229 --> 00:03:14,879
how the planet what a resources are

63
00:03:20,750 --> 00:03:18,239

changing that impact those changes that

64
00:03:24,170 --> 00:03:20,760
will affect our local environments our

65
00:03:27,830 --> 00:03:24,180
local people and internationally climate

66
00:03:31,430 --> 00:03:27,840
change is also speeds up the water cycle

67
00:03:34,750 --> 00:03:31,440
on Earth that lead to extreme weathers

68
00:03:38,449 --> 00:03:34,760
that if events that like heavy rain

69
00:03:40,910 --> 00:03:38,459
extreme drought that can be very hard to

70
00:03:43,789 --> 00:03:40,920
community and we need to understand that

71
00:03:46,850 --> 00:03:43,799
to be able to uh be able to manage Water

72
00:03:51,130 --> 00:03:46,860
Resources now let's talk about the data

73
00:03:54,949 --> 00:03:51,140
for SWAT SWAT will provide a lot of data

74
00:03:58,070 --> 00:03:54,959
data that will be scientists engineer

75
00:04:01,789 --> 00:03:58,080
water manager will be using to be able

76
00:04:04,610 --> 00:04:01,799
to understand the climate changes now

77
00:04:06,830 --> 00:04:04,620
all this data will be free and will be

78
00:04:09,410 --> 00:04:06,840
available to everybody to use that is

79
00:04:11,089 --> 00:04:09,420
really NASA's policy can I get the next

80
00:04:14,449 --> 00:04:11,099
visual please

81
00:04:16,849 --> 00:04:14,459
now we have been working with our team

82
00:04:19,969 --> 00:04:16,859
at canaso International partnership with

83
00:04:22,790 --> 00:04:19,979
scanners for a long time and it's been a

84
00:04:25,730 --> 00:04:22,800
very fruitful relationship to understand

85
00:04:29,090 --> 00:04:25,740
the earth and its climate Kenneth and

86
00:04:32,150 --> 00:04:29,100
tell us Pioneer the use of space based

87
00:04:36,710 --> 00:04:32,160
instrument like altimetry and we since

88
00:04:40,310 --> 00:04:36,720

Poseidon and since 1992 and we here here

89
00:04:42,409 --> 00:04:40,320
now with SWAT to be able to measure a

90
00:04:45,790 --> 00:04:42,419
new detailed information about the ocean

91
00:04:49,249 --> 00:04:45,800
and understand our Earth's water almost

92
00:04:52,850 --> 00:04:49,259
nearly all Earth surfaces now this

93
00:04:57,170 --> 00:04:52,860
observed the planet NASA NASA observed

94
00:05:00,590 --> 00:04:57,180
the planet Earth from space we have uh

95
00:05:03,469 --> 00:05:00,600
probably uh a couple of dozens of

96
00:05:05,450 --> 00:05:03,479
satellite that orbiting Earth that

97
00:05:07,850 --> 00:05:05,460
measuring all kind of measurement for

98
00:05:10,370 --> 00:05:07,860
for our Earth to understand a plan and

99
00:05:12,770 --> 00:05:10,380
SWAT will be one of them to be added to

100
00:05:15,950 --> 00:05:12,780
this Fleet and will be launching in

101
00:05:18,950 --> 00:05:15,960
December 12 12. now I would like to add

102
00:05:22,490 --> 00:05:18,960
to um I would like I would like to share

103
00:05:25,189 --> 00:05:22,500
this information with you that this SWOT

104
00:05:28,010 --> 00:05:25,199
will be part of the Earth's observing

105
00:05:31,129 --> 00:05:28,020
system that's coming up that will be the

106
00:05:33,170 --> 00:05:31,139
future of uh our uh Earth observing

107
00:05:35,990 --> 00:05:33,180
system that NASA is working on let me

108
00:05:38,270 --> 00:05:36,000
tell you so what is a game changer and

109
00:05:41,689 --> 00:05:38,280
the water connects all of us and we're

110
00:05:44,749 --> 00:05:41,699
very excited to uh share the data for

111
00:05:48,730 --> 00:05:44,759
SWAT therefore go SWAT and I would like

112
00:05:55,090 --> 00:05:51,890
thank you to honey thank you for your

113
00:05:59,270 --> 00:05:55,100

presentation my name is Cherry La phone

114
00:06:02,029 --> 00:05:59,280
I am the lucky SWOT project manager at

115
00:06:04,610 --> 00:06:02,039
the French space agency class

116
00:06:06,770 --> 00:06:04,620
I would like to address a very important

117
00:06:09,409 --> 00:06:06,780
aspect of the mission which is a

118
00:06:10,969 --> 00:06:09,419
cooperation between France and the

119
00:06:13,070 --> 00:06:10,979
United States

120
00:06:16,490 --> 00:06:13,080
have the chance of being part since

121
00:06:19,189 --> 00:06:16,500
almost 30 years ago of this emblematic

122
00:06:21,710 --> 00:06:19,199
cooperation between our two countries

123
00:06:24,050 --> 00:06:21,720
for a better understanding and

124
00:06:26,809 --> 00:06:24,060
monitoring of the earth Waters

125
00:06:28,969 --> 00:06:26,819
NASA and Ness have been continuously

126
00:06:31,189 --> 00:06:28,979
working together since the 80s to

127
00:06:35,029 --> 00:06:31,199
imagine and implement the future of

128
00:06:37,070 --> 00:06:35,039
altimetry the first picture shows uh

129
00:06:39,710 --> 00:06:37,080
NASA and class people in the white room

130
00:06:41,570 --> 00:06:39,720
for SWOT

131
00:06:44,629 --> 00:06:41,580
mission in cooperation was top

132
00:06:47,570 --> 00:06:44,639
exposeidon and lifu will describe that

133
00:06:50,870 --> 00:06:47,580
later on was launched in 92 aboard the

134
00:06:53,570 --> 00:06:50,880
European launcher Ariane he was followed

135
00:06:56,390 --> 00:06:53,580
by Jason 1 in 2001.

136
00:07:00,050 --> 00:06:56,400
um here is a another pick showing uh

137
00:07:02,529 --> 00:07:00,060
myself with guess Emma's NASA science

138
00:07:05,930 --> 00:07:02,539

Deputy associate administrator before

139
00:07:09,129 --> 00:07:05,940
Jason won launch and then we launched

140
00:07:13,070 --> 00:07:09,139
Jason 2 in 2008 there's another picture

141
00:07:14,629 --> 00:07:13,080
of me with paraga vase my colleague on

142
00:07:18,050 --> 00:07:14,639
SWAT

143
00:07:21,589 --> 00:07:18,060
um in in 2008 and then we launched Jason

144
00:07:24,409 --> 00:07:21,599
3 in 2016.

145
00:07:26,510 --> 00:07:24,419
so we've been discussing about altimetry

146
00:07:29,510 --> 00:07:26,520
what is Ultimate tree altimetry from

147
00:07:32,089 --> 00:07:29,520
space is a technique which Finds Its

148
00:07:33,950 --> 00:07:32,099
origin in the 80s the basic principle of

149
00:07:36,650 --> 00:07:33,960
the classic altimetry mission

150
00:07:38,870 --> 00:07:36,660
is to measure the round trip of a radar

151
00:07:41,270 --> 00:07:38,880
signal sent by the satellite and

152
00:07:43,610 --> 00:07:41,280
reflected by the water surface

153
00:07:46,490 --> 00:07:43,620
of course to achieve and accurate water

154
00:07:49,430 --> 00:07:46,500
eyed measurement we need specific

155
00:07:51,830 --> 00:07:49,440
instruments on board and especially

156
00:07:54,469 --> 00:07:51,840
instrument that help locate the

157
00:07:58,249 --> 00:07:54,479
satellite within one centimeter at

158
00:08:01,430 --> 00:07:58,259
nearly 900 kilometers altitude the sword

159
00:08:04,249 --> 00:08:01,440
measurement will also use a radar signal

160
00:08:06,290 --> 00:08:04,259
and the reflected Echo but in a slightly

161
00:08:08,629 --> 00:08:06,300
different way called the radar

162
00:08:10,070 --> 00:08:08,639
interferometry which will be explained

163
00:08:12,170 --> 00:08:10,080

further on

164
00:08:14,089 --> 00:08:12,180
coming back to SWOT

165
00:08:17,290 --> 00:08:14,099
I am working on SWAT since the beginning

166
00:08:19,790 --> 00:08:17,300
in 2008 when a group of international

167
00:08:21,290 --> 00:08:19,800
scientists propose a new earth water

168
00:08:24,050 --> 00:08:21,300
mapping mission

169
00:08:26,529 --> 00:08:24,060
at a resolution that never been never

170
00:08:30,050 --> 00:08:26,539
seen before

171
00:08:32,389 --> 00:08:30,060
decided to pull substantial resources to

172
00:08:33,949 --> 00:08:32,399
develop together this one billion

173
00:08:36,230 --> 00:08:33,959
dollars mission

174
00:08:39,469 --> 00:08:36,240
as a result of the workshare agreement

175
00:08:42,290 --> 00:08:39,479
between the two countries kness together

176
00:08:45,829 --> 00:08:42,300
with its uh subcontractors would deliver

177
00:08:48,110 --> 00:08:45,839
some Mission instruments to JPL realize

178
00:08:52,490 --> 00:08:48,120
the satellite integration and testing

179
00:08:54,470 --> 00:08:52,500
activities in Telus can France then we

180
00:08:56,449 --> 00:08:54,480
would operate the satellite on orbit and

181
00:08:58,070 --> 00:08:56,459
finally manage the daily production of

182
00:09:02,210 --> 00:08:58,080
process data

183
00:09:04,190 --> 00:09:02,220
as a project manager I I'm really

184
00:09:07,310 --> 00:09:04,200
committed to reduce the animation risk

185
00:09:10,250 --> 00:09:07,320
but sometimes our business has to cope

186
00:09:15,410 --> 00:09:10,260
with unprecedented situation

187
00:09:19,610 --> 00:09:15,420
as we were working at JPL in 2008 2019

188
00:09:21,769 --> 00:09:19,620

the covet pandemics struck and I had to

189
00:09:24,530 --> 00:09:21,779
take rapid decision to get my team back

190
00:09:26,810 --> 00:09:24,540
in France as the international flights

191
00:09:29,990 --> 00:09:26,820
were about to be canceled

192
00:09:31,850 --> 00:09:30,000
then with my colleague rag we were at

193
00:09:34,370 --> 00:09:31,860
the point to ask ourselves shall we wait

194
00:09:36,530 --> 00:09:34,380
until the covet situation improves to

195
00:09:40,070 --> 00:09:36,540
resume activities at JPL

196
00:09:42,350 --> 00:09:40,080
but we didn't have any idea when or

197
00:09:45,050 --> 00:09:42,360
shall we find a solution to be able to

198
00:09:47,690 --> 00:09:45,060
rework remotely from France and proceed

199
00:09:50,690 --> 00:09:47,700
yes so all the teams joined their

200
00:09:53,329 --> 00:09:50,700
efforts to find out practical ways to be

201
00:09:55,550 --> 00:09:53,339
able to protect the schedule and we were

202
00:09:57,769 --> 00:09:55,560
able to successfully complete a complex

203
00:10:01,070 --> 00:09:57,779
integration and testing period at JPL

204
00:10:04,490 --> 00:10:01,080
Then followed by a 14 months of testing

205
00:10:07,670 --> 00:10:04,500
in Telus premises in France before we

206
00:10:08,750 --> 00:10:07,680
shipped to the launch base where swati's

207
00:10:11,690 --> 00:10:08,760
is now

208
00:10:15,050 --> 00:10:11,700
that was really a great demonstration of

209
00:10:17,090 --> 00:10:15,060
resilience and inventiveness of our

210
00:10:20,150 --> 00:10:17,100
teams

211
00:10:23,090 --> 00:10:20,160
it becomes evident that Earth Science

212
00:10:25,190 --> 00:10:23,100
International cooperation is necessary

213
00:10:27,889 --> 00:10:25,200

to improve life on Earth

214
00:10:30,470 --> 00:10:27,899
such an ambitious and challenging

215
00:10:31,670 --> 00:10:30,480
Mission like SWAT could only be made

216
00:10:34,250 --> 00:10:31,680
possible

217
00:10:36,949 --> 00:10:34,260
by bringing together the skills of

218
00:10:40,250 --> 00:10:36,959
scientists and Engineers to mutually

219
00:10:43,070 --> 00:10:40,260
enhance our ability to observe changes

220
00:10:44,530 --> 00:10:43,080
in the earth water

221
00:10:47,509 --> 00:10:44,540
thanks to this International

222
00:10:49,250 --> 00:10:47,519
collaborative effort we will be able

223
00:10:52,069 --> 00:10:49,260
soon to provide accurate weather

224
00:10:54,590 --> 00:10:52,079
forecasting increase understanding of

225
00:10:57,650 --> 00:10:54,600
global climate change as well as

226
00:11:00,050 --> 00:10:57,660
considerable societal benefits

227
00:11:05,810 --> 00:11:00,060
thank you for attention and I'll hand

228
00:11:11,090 --> 00:11:08,210
thank you Terry uh good morning everyone

229
00:11:13,550 --> 00:11:11,100
I'm parag vase I'm the project manager

230
00:11:16,790 --> 00:11:13,560
for NASA at the jet propulsion

231
00:11:19,430 --> 00:11:16,800
laboratory uh and I'm really excited to

232
00:11:22,130 --> 00:11:19,440
tell you more about SWAT

233
00:11:24,410 --> 00:11:22,140
um especially as Terry described our our

234
00:11:27,110 --> 00:11:24,420
many decades of international

235
00:11:29,269 --> 00:11:27,120
cooperation leading into this next

236
00:11:31,490 --> 00:11:29,279
Generation mission

237
00:11:34,009 --> 00:11:31,500
the SWAT satellite features a new

238
00:11:36,530 --> 00:11:34,019

measurement system called Karen which

239
00:11:38,509 --> 00:11:36,540
stands for the KA band radar

240
00:11:41,269 --> 00:11:38,519
interferometer

241
00:11:43,910 --> 00:11:41,279
this new Karen instrument is will enable

242
00:11:46,970 --> 00:11:43,920
us to collect data on the height of the

243
00:11:50,269 --> 00:11:46,980
Earth's fresh and salt water bodies over

244
00:11:53,870 --> 00:11:50,279
a very broad swath of the Earth at one

245
00:11:56,690 --> 00:11:53,880
time at a very high Revolution much

246
00:11:59,090 --> 00:11:56,700
better than any other previous satellite

247
00:12:01,250 --> 00:11:59,100
that is flying now

248
00:12:04,130 --> 00:12:01,260
let me show you illustrate this a bit

249
00:12:06,769 --> 00:12:04,140
more on this next animation

250
00:12:08,750 --> 00:12:06,779
where you can see the SWAT satellite

251
00:12:11,269 --> 00:12:08,760
flying over the State of Florida and

252
00:12:13,550 --> 00:12:11,279
measuring the water height over the

253
00:12:15,949 --> 00:12:13,560
ocean lakes and rivers

254
00:12:17,930 --> 00:12:15,959
you can see the Karen systems two

255
00:12:20,509 --> 00:12:17,940
deployed antennas that are positioned

256
00:12:23,090 --> 00:12:20,519
about 10 meters apart about half the

257
00:12:25,490 --> 00:12:23,100
length of a tennis court these antennas

258
00:12:27,710 --> 00:12:25,500
have to be kept extremely stable and

259
00:12:30,290 --> 00:12:27,720
pointed at the same place on the earth

260
00:12:32,090 --> 00:12:30,300
within a few microns which is smaller

261
00:12:34,550 --> 00:12:32,100
than a human hair

262
00:12:37,430 --> 00:12:34,560
the radar sends electromagnetic Pulses

263
00:12:40,190 --> 00:12:37,440

from one antenna that reflects off the

264
00:12:43,550 --> 00:12:40,200
surface of the Earth and are received by

265
00:12:46,129 --> 00:12:43,560
both antennas at the same time this

266
00:12:47,150 --> 00:12:46,139
provides a very precise measurement of

267
00:12:50,230 --> 00:12:47,160
the height

268
00:12:53,629 --> 00:12:50,240
using a triangulation technique called

269
00:12:56,030 --> 00:12:53,639
interferometry that lets us create a 2d

270
00:12:59,210 --> 00:12:56,040
map of the surface water

271
00:13:01,370 --> 00:12:59,220
to measure this height we also need very

272
00:13:02,930 --> 00:13:01,380
precise knowledge of the height and

273
00:13:05,810 --> 00:13:02,940
position of the satellite which is

274
00:13:09,590 --> 00:13:05,820
tissotary mentioned is about 500 miles

275
00:13:12,230 --> 00:13:09,600
up or 890 kilometers up and traveling

276
00:13:14,990 --> 00:13:12,240
over 17 000 miles an hour

277
00:13:17,509 --> 00:13:15,000
but to do this measurement Karen isn't

278
00:13:20,810 --> 00:13:17,519
alone and we need a complete satellite

279
00:13:22,129 --> 00:13:20,820
with several supporting instruments so

280
00:13:24,350 --> 00:13:22,139
let's have a closer look at the

281
00:13:27,829 --> 00:13:24,360
satellite which contains many

282
00:13:31,129 --> 00:13:27,839
first-of-a-kind Technologies

283
00:13:33,710 --> 00:13:31,139
you can see in this animation the Nader

284
00:13:36,889 --> 00:13:33,720
module which basically houses all of the

285
00:13:38,329 --> 00:13:36,899
other instruments uh besides the Karen

286
00:13:41,509 --> 00:13:38,339
system

287
00:13:44,150 --> 00:13:41,519
once it's opened up inside you can see

288
00:13:46,430 --> 00:13:44,160

the Doris instrument which is a precise

289
00:13:49,250 --> 00:13:46,440
positioning instrument

290
00:13:51,650 --> 00:13:49,260
to also get all of this data down one

291
00:13:53,750 --> 00:13:51,660
terabyte per day we need a very high

292
00:13:55,670 --> 00:13:53,760
performance x-band telecommunications

293
00:13:58,310 --> 00:13:55,680
system

294
00:14:00,110 --> 00:13:58,320
and we need other instruments like the

295
00:14:02,690 --> 00:14:00,120
microwave radiometer that helps us

296
00:14:05,030 --> 00:14:02,700
correct for water vapor delay in the

297
00:14:08,389 --> 00:14:05,040
main radar signal that we get back along

298
00:14:10,129 --> 00:14:08,399
with a traditional Nader altimeter the

299
00:14:11,870 --> 00:14:10,139
Karen instrument is the rest of the

300
00:14:13,970 --> 00:14:11,880
payload module you can see the high

301
00:14:16,910 --> 00:14:13,980
voltage power supplies first of a Kind

302
00:14:19,970 --> 00:14:16,920
15 kilovolts system

303
00:14:22,790 --> 00:14:19,980
you can also see the uh Karen

304
00:14:24,889 --> 00:14:22,800
Electronics which are include a very

305
00:14:27,350 --> 00:14:24,899
high performance on-board processing

306
00:14:30,410 --> 00:14:27,360
system along with the radio frequency

307
00:14:33,530 --> 00:14:30,420
unit and Gyro all of this together what

308
00:14:35,690 --> 00:14:33,540
you don't see is also a very high

309
00:14:38,269 --> 00:14:35,700
performance thermal management system

310
00:14:41,509 --> 00:14:38,279
that's keeping the whole payload module

311
00:14:44,530 --> 00:14:41,519
very very stable at five home one

312
00:14:47,210 --> 00:14:44,540
hundredths of a of a degree per minute

313
00:14:49,250 --> 00:14:47,220

that's just some of the key technologies

314
00:14:52,069 --> 00:14:49,260
that we have on the on the SWAT

315
00:14:54,350 --> 00:14:52,079
satellite one additional system that you

316
00:14:55,910 --> 00:14:54,360
didn't see there and you will see in the

317
00:15:00,829 --> 00:14:55,920
next animation

318
00:15:02,990 --> 00:15:00,839
is the main antennas for the Karen radar

319
00:15:05,629 --> 00:15:03,000
which are currently what you see here

320
00:15:08,930 --> 00:15:05,639
are an a stowed configuration folded up

321
00:15:11,210 --> 00:15:08,940
for launch inside the rocket and once

322
00:15:14,269 --> 00:15:11,220
we're in orbit within the first few days

323
00:15:17,689 --> 00:15:14,279
of the mission we'll be deploying these

324
00:15:21,889 --> 00:15:17,699
antennas which will be rotating out one

325
00:15:25,250 --> 00:15:21,899
by one over the course of four days

326
00:15:28,310 --> 00:15:25,260
we'll have these arm masks fold out and

327
00:15:30,910 --> 00:15:28,320
then ultimately we'll have the antennas

328
00:15:34,970 --> 00:15:30,920
which will also fold out each of these

329
00:15:37,910 --> 00:15:34,980
antennas are five meters long and then

330
00:15:39,829 --> 00:15:37,920
they're separated by 10 meters as I

331
00:15:42,650 --> 00:15:39,839
mentioned before

332
00:15:44,449 --> 00:15:42,660
after this we'll be starting the

333
00:15:47,509 --> 00:15:44,459
commissioning of the overall satellite

334
00:15:50,329 --> 00:15:47,519
turning on the rest of the instruments

335
00:15:54,410 --> 00:15:50,339
one by one over the course of the next

336
00:15:56,870 --> 00:15:54,420
two months after we launch the mission

337
00:15:59,090 --> 00:15:56,880
we are after that we'll be doing an

338
00:16:01,970 --> 00:15:59,100

extensive checkout in calibration and

339
00:16:03,829 --> 00:16:01,980
validation of the overall satellite and

340
00:16:06,290 --> 00:16:03,839
and in particular the science

341
00:16:09,590 --> 00:16:06,300
instruments and checking their behavior

342
00:16:11,990 --> 00:16:09,600
as we prepare for the science Mission

343
00:16:13,430 --> 00:16:12,000
which will start about six months after

344
00:16:15,949 --> 00:16:13,440
the launch

345
00:16:19,069 --> 00:16:15,959
as mentioned before the satellite is in

346
00:16:21,350 --> 00:16:19,079
good shape we are at uh Vandenberg Air

347
00:16:24,710 --> 00:16:21,360
Force Base doing the final checks on the

348
00:16:28,009 --> 00:16:24,720
satellite the Falcon 9 rocket provided

349
00:16:29,810 --> 00:16:28,019
by SpaceX is also being prepared for

350
00:16:33,350 --> 00:16:29,820
launch and we're all really getting

351
00:16:38,030 --> 00:16:33,360
excited uh for a beautiful launch on the

352
00:16:39,829 --> 00:16:38,040
12th of December at 3 46 a.m now I'm

353
00:16:42,769 --> 00:16:39,839
going to turn it over to my colleague

354
00:16:46,850 --> 00:16:42,779
Lee Fu our project scientist who will

355
00:16:55,430 --> 00:16:51,110
thank you parag for Paving the way for

356
00:16:57,110 --> 00:16:55,440
me to speak about the science of SWAT my

357
00:16:59,030 --> 00:16:57,120
name is Lilo and Foo I'm the small

358
00:17:02,329 --> 00:16:59,040
project scientist

359
00:17:04,429 --> 00:17:02,339
this is an emotional moment for me

360
00:17:06,829 --> 00:17:04,439
as I have been working on this Edition

361
00:17:09,289 --> 00:17:06,839
for nearly 20 years

362
00:17:12,710 --> 00:17:09,299
the road of former and ambitious concept

363
00:17:15,949 --> 00:17:12,720

to this gigantic Observatory ready for

364
00:17:18,770 --> 00:17:15,959
launch has been long and winding

365
00:17:22,789 --> 00:17:18,780
finally reaching the moment of truth and

366
00:17:26,030 --> 00:17:22,799
both excited and anxious somewhat

367
00:17:29,270 --> 00:17:26,040
swad is a Pathfinder Mission addressing

368
00:17:31,970 --> 00:17:29,280
transformative questions on water and

369
00:17:34,130 --> 00:17:31,980
energy of the earth system

370
00:17:37,850 --> 00:17:34,140
by making measurement of the elevation

371
00:17:40,610 --> 00:17:37,860
of water surface of the world

372
00:17:42,950 --> 00:17:40,620
conventional red eye altimeter looks

373
00:17:46,130 --> 00:17:42,960
straight down sampling one-dimensional

374
00:17:49,490 --> 00:17:46,140
profile of water elevation

375
00:17:52,010 --> 00:17:49,500
the thrust of SWAT however is making

376
00:17:55,730 --> 00:17:52,020
two-dimensional measurement of the water

377
00:17:57,710 --> 00:17:55,740
elevation over a swath on each side of

378
00:17:59,630 --> 00:17:57,720
the satellite's ground track

379
00:18:02,510 --> 00:17:59,640
the technique is called radar

380
00:18:04,850 --> 00:18:02,520
interferometry as illustrated by the

381
00:18:07,490 --> 00:18:04,860
animation shown by parok

382
00:18:09,529 --> 00:18:07,500
as you have seen the measurement system

383
00:18:12,710 --> 00:18:09,539
is complex

384
00:18:15,529 --> 00:18:12,720
demanding extraordinary stability of the

385
00:18:17,630 --> 00:18:15,539
instrument and the Precision control of

386
00:18:22,430 --> 00:18:17,640
the large spacecraft

387
00:18:25,430 --> 00:18:22,440
making swad a very challenging mission

388
00:18:28,730 --> 00:18:25,440

swad will cover the world between 78

389
00:18:32,510 --> 00:18:28,740
degrees north and 78 degrees south every

390
00:18:34,850 --> 00:18:32,520
21 days providing a high definition view

391
00:18:37,070 --> 00:18:34,860
of the surface water and ocean

392
00:18:39,350 --> 00:18:37,080
topography

393
00:18:41,750 --> 00:18:39,360
the observation of the surface water on

394
00:18:44,210 --> 00:18:41,760
land is what we need to assess the

395
00:18:46,610 --> 00:18:44,220
budget of fresh water

396
00:18:48,890 --> 00:18:46,620
in a warming climate the Earth's water

397
00:18:51,590 --> 00:18:48,900
cycle is accelerating

398
00:18:53,690 --> 00:18:51,600
making Water Resources difficult to

399
00:18:55,490 --> 00:18:53,700
track and manage

400
00:18:58,130 --> 00:18:55,500
where is the water

401
00:18:59,029 --> 00:18:58,140
where does it come from and where does

402
00:19:01,730 --> 00:18:59,039
it go

403
00:19:04,850 --> 00:19:01,740
these are important questions

404
00:19:07,070 --> 00:19:04,860
were not equipped to answer because the

405
00:19:10,669 --> 00:19:07,080
world's rivers and lakes are poorly

406
00:19:13,909 --> 00:19:10,679
sampled in many places

407
00:19:17,270 --> 00:19:13,919
so what will make a Quantum Jump by

408
00:19:21,909 --> 00:19:17,280
making observations from space to create

409
00:19:26,090 --> 00:19:21,919
a global inventory of Water Resources

410
00:19:28,610 --> 00:19:26,100
water is also a source of Hazards if one

411
00:19:30,950 --> 00:19:28,620
budget is out of balance will have

412
00:19:32,990 --> 00:19:30,960
either flood or drought

413
00:19:37,190 --> 00:19:33,000

SWAT data will help us improve

414
00:19:40,970 --> 00:19:37,200
monitoring and forecast of such perils

415
00:19:47,630 --> 00:19:44,750
this image shows all the world Rivers

416
00:19:49,549 --> 00:19:47,640
wider than 100 meters to be surveyed by

417
00:19:52,310 --> 00:19:49,559
SWAT over the world

418
00:19:54,890 --> 00:19:52,320
the amount of data from squad on rivers

419
00:19:56,930 --> 00:19:54,900
and lakes is orders for magnitude more

420
00:19:59,390 --> 00:19:56,940
than current existing

421
00:20:02,270 --> 00:19:59,400
for instance only tens of a thousands of

422
00:20:05,990 --> 00:20:02,280
lakes have been well surveyed but that's

423
00:20:09,169 --> 00:20:06,000
what we're serving millions of lakes at

424
00:20:12,169 --> 00:20:09,179
present its observations only reveal the

425
00:20:15,470 --> 00:20:12,179
two-dimensional extent of water bodies

426
00:20:17,630 --> 00:20:15,480
SWAT will add the third dimension of

427
00:20:20,990 --> 00:20:17,640
water elevation

428
00:20:24,049 --> 00:20:21,000
as my hydrology colleagues like to say

429
00:20:27,529 --> 00:20:24,059
swada will provide them with a pair of

430
00:20:30,950 --> 00:20:27,539
3D glasses to study the dynamic movement

431
00:20:36,770 --> 00:20:34,250
the observation of ocean topography will

432
00:20:38,270 --> 00:20:36,780
allow us to assess the energy balance of

433
00:20:41,090 --> 00:20:38,280
the earth system

434
00:20:43,610 --> 00:20:41,100
this is because the ocean is a giant air

435
00:20:45,950 --> 00:20:43,620
conditioner for the planet

436
00:20:48,409 --> 00:20:45,960
more than 90 percent of heat from global

437
00:20:49,490 --> 00:20:48,419
warming has been absorbed and stored in

438
00:20:53,870 --> 00:20:49,500

the ocean

439
00:20:57,110 --> 00:20:53,880
temperature would be a whopping 67

440
00:20:58,970 --> 00:20:57,120
degrees Celsius or 153 degrees

441
00:21:01,250 --> 00:20:58,980
Fahrenheit

442
00:21:02,870 --> 00:21:01,260
such as scorching Earth is certainly not

443
00:21:05,390 --> 00:21:02,880
inhabitable

444
00:21:08,390 --> 00:21:05,400
the absorption of heat by the ocean

445
00:21:11,330 --> 00:21:08,400
takes place at small scales not

446
00:21:13,909 --> 00:21:11,340
presently observable from space

447
00:21:17,150 --> 00:21:13,919
swad will make a high definition views

448
00:21:19,669 --> 00:21:17,160
of ocean topography revealing the swirls

449
00:21:22,669 --> 00:21:19,679
of ocean currents that are responsible

450
00:21:25,970 --> 00:21:22,679
for heat uptake by the ocean

451
00:21:28,490 --> 00:21:25,980
I will now show you animation of the

452
00:21:32,330 --> 00:21:28,500
evolution of space observations of ocean

453
00:21:35,090 --> 00:21:32,340
topography over the past 40 years

454
00:21:37,270 --> 00:21:35,100
yeah please show the animation yeah it

455
00:21:40,549 --> 00:21:37,280
starts with the seaside 40 years ago

456
00:21:42,169 --> 00:21:40,559
showing a blurry view of the changing

457
00:21:44,690 --> 00:21:42,179
ocean topography

458
00:21:47,090 --> 00:21:44,700
followed by jio said five years later

459
00:21:49,850 --> 00:21:47,100
revealing some details

460
00:21:52,010 --> 00:21:49,860
but until topics Poseidon and Json

461
00:21:54,529 --> 00:21:52,020
Series in combination with other

462
00:21:57,770 --> 00:21:54,539
satellites We Begin seeing the

463
00:21:59,810 --> 00:21:57,780

ubiquitous ocean Eddies or the storm of

464
00:22:02,450 --> 00:21:59,820
ocean currents

465
00:22:04,490 --> 00:22:02,460
but only a squad will be able to see the

466
00:22:06,770 --> 00:22:04,500
small Eddies in the fronts that are

467
00:22:08,810 --> 00:22:06,780
responsible for taking heat from the

468
00:22:11,210 --> 00:22:08,820
atmosphere

469
00:22:14,330 --> 00:22:11,220
these are the oceanic analog of

470
00:22:15,590 --> 00:22:14,340
thunderstorms creating intense vertical

471
00:22:17,930 --> 00:22:15,600
motions

472
00:22:20,570 --> 00:22:17,940
join down the heat from the atmosphere

473
00:22:23,029 --> 00:22:20,580
and stored in the deep ocean

474
00:22:25,970 --> 00:22:23,039
this new information will help improve

475
00:22:28,070 --> 00:22:25,980
Ocean Models for predicting the ocean's

476
00:22:30,470 --> 00:22:28,080
capacity in the future to continue

477
00:22:32,390 --> 00:22:30,480
absorbing heat to regulate climate

478
00:22:34,010 --> 00:22:32,400
change

479
00:22:36,590 --> 00:22:34,020
in summary

480
00:22:39,230 --> 00:22:36,600
SWA data will provide researchers better

481
00:22:42,230 --> 00:22:39,240
understand the ocean's role in climate

482
00:22:44,930 --> 00:22:42,240
change and how the warming climate is

483
00:22:47,990 --> 00:22:44,940
affecting Earth's lakes rivers and the

484
00:22:51,169 --> 00:22:48,000
reservoirs IT addresses the energy

485
00:22:53,630 --> 00:22:51,179
driving climate change and its impact on

486
00:22:56,390 --> 00:22:53,640
Fresh Water Resources

487
00:22:59,049 --> 00:22:56,400
I would not like to turn to my colleague

488
00:23:04,250 --> 00:22:59,059

Ben to talk to him about the societal

489
00:23:07,850 --> 00:23:05,930
thanks Lee that was great

490
00:23:09,110 --> 00:23:07,860
my name is Ben Hamilton I'm a research

491
00:23:11,450 --> 00:23:09,120
scientist here at the NASA jet

492
00:23:13,250 --> 00:23:11,460
propulsion laboratory and I want to go

493
00:23:14,870 --> 00:23:13,260
one step further and talk to you about

494
00:23:16,430 --> 00:23:14,880
some of the potential societal benefits

495
00:23:17,690 --> 00:23:16,440
and application of the data from SWAT

496
00:23:19,430 --> 00:23:17,700
which you've already heard a little bit

497
00:23:21,289 --> 00:23:19,440
about if you can pull up my first

498
00:23:23,930 --> 00:23:21,299
animation so this is one that Prague

499
00:23:25,789 --> 00:23:23,940
already showed but as you heard from Lee

500
00:23:28,010 --> 00:23:25,799
SWAT will provide nearly complete view

501
00:23:30,169 --> 00:23:28,020
of the surface water on Earth data

502
00:23:31,909 --> 00:23:30,179
collected by SWAT over the land over the

503
00:23:34,310 --> 00:23:31,919
ocean and where the land and ocean meet

504
00:23:35,930 --> 00:23:34,320
along our coastlines is going to play a

505
00:23:37,850 --> 00:23:35,940
really important role in informing us

506
00:23:39,230 --> 00:23:37,860
about our daily lives and livelihoods

507
00:23:40,730 --> 00:23:39,240
and I want to walk through each of these

508
00:23:42,409 --> 00:23:40,740
briefly so we can pull up the next

509
00:23:44,510 --> 00:23:42,419
visual

510
00:23:46,789 --> 00:23:44,520
SWAT is going to provide high definition

511
00:23:48,950 --> 00:23:46,799
Clarity for lakes rivers and wet

512
00:23:50,330 --> 00:23:48,960
reservoirs across the globe this is

513
00:23:51,770 --> 00:23:50,340

going to allow us to track changes in

514
00:23:53,750 --> 00:23:51,780
our water resources that are occurring

515
00:23:55,430 --> 00:23:53,760
over time as we've heard we know that

516
00:23:57,409 --> 00:23:55,440
climate change is accelerating Earth's

517
00:23:59,029 --> 00:23:57,419
water cycle and what this means is there

518
00:24:00,950 --> 00:23:59,039
are shifting precipitation patterns

519
00:24:02,990 --> 00:24:00,960
where we might have torrential downpours

520
00:24:05,270 --> 00:24:03,000
in some locations and extreme droughts

521
00:24:06,770 --> 00:24:05,280
in others as these changes continue in

522
00:24:07,970 --> 00:24:06,780
the future more communities around the

523
00:24:09,710 --> 00:24:07,980
world are going to be inundated with

524
00:24:10,970 --> 00:24:09,720
water while in other areas some

525
00:24:11,930 --> 00:24:10,980
communities may just not have enough

526
00:24:13,909 --> 00:24:11,940
water

527
00:24:15,649 --> 00:24:13,919
SWAT data is going to be used to monitor

528
00:24:17,750 --> 00:24:15,659
drought conditions improve flood

529
00:24:19,909 --> 00:24:17,760
forecasts monitor Reservoir volume and

530
00:24:21,470 --> 00:24:19,919
assess River flow and in doing so it's

531
00:24:24,230 --> 00:24:21,480
going to provide essential information

532
00:24:26,510 --> 00:24:24,240
to Water Management agencies disaster

533
00:24:28,370 --> 00:24:26,520
preparedness agencies civil engineers

534
00:24:30,230 --> 00:24:28,380
and other stakeholders who need to track

535
00:24:31,490 --> 00:24:30,240
water in their local areas and I think

536
00:24:32,870 --> 00:24:31,500
really importantly this is going to be

537
00:24:34,730 --> 00:24:32,880
done on global scales we're going to

538
00:24:36,470 --> 00:24:34,740

provide data in regions where monitoring

539
00:24:38,810 --> 00:24:36,480
is a real challenge today

540
00:24:40,310 --> 00:24:38,820
now shifting over the ocean swat's going

541
00:24:41,510 --> 00:24:40,320
to provide detailed information on the

542
00:24:43,789 --> 00:24:41,520
smaller features that Lee was talking

543
00:24:45,590 --> 00:24:43,799
about these fronts in these Eddies the

544
00:24:47,870 --> 00:24:45,600
unprecedented unprecedented high

545
00:24:49,190 --> 00:24:47,880
resolution information can then be used

546
00:24:51,409 --> 00:24:49,200
to improve our understanding of ocean

547
00:24:52,789 --> 00:24:51,419
circulation and this then has the

548
00:24:55,370 --> 00:24:52,799
potential to yield important information

549
00:24:57,049 --> 00:24:55,380
for a wide range of Industries like the

550
00:24:59,149 --> 00:24:57,059
shipping industry the fishing industry

551
00:25:01,190 --> 00:24:59,159
and even for recreation

552
00:25:02,630 --> 00:25:01,200
we also know that these small-scale

553
00:25:04,070 --> 00:25:02,640
ocean features are responsible for

554
00:25:06,350 --> 00:25:04,080
transporting pollutants around the ocean

555
00:25:08,330 --> 00:25:06,360
and then to our coasts examples of this

556
00:25:09,770 --> 00:25:08,340
would be oil spills or ocean debris

557
00:25:12,230 --> 00:25:09,780
following tsunamis which we've seen some

558
00:25:14,149 --> 00:25:12,240
recent examples of precisely tracking

559
00:25:16,430 --> 00:25:14,159
the location speed and direction of

560
00:25:18,110 --> 00:25:16,440
potentially harmful materials will Aid

561
00:25:20,390 --> 00:25:18,120
in natural hazard assessment prediction

562
00:25:21,590 --> 00:25:20,400
and ultimately a response to these these

563
00:25:23,210 --> 00:25:21,600

hazards

564
00:25:25,190 --> 00:25:23,220
and then finally swad is going to give

565
00:25:26,330 --> 00:25:25,200
us data on changing sea levels closer to

566
00:25:28,789 --> 00:25:26,340
the coast than any of our previous

567
00:25:30,409 --> 00:25:28,799
satellites sea level around the world is

568
00:25:32,510 --> 00:25:30,419
rising a little bit faster every year we

569
00:25:34,370 --> 00:25:32,520
know that from the data gaps in our

570
00:25:36,169 --> 00:25:34,380
available observations make it difficult

571
00:25:37,610 --> 00:25:36,179
to understand exactly how sea level is

572
00:25:38,690 --> 00:25:37,620
changing directly at the coast where

573
00:25:40,970 --> 00:25:38,700
it's really the most important to

574
00:25:42,529 --> 00:25:40,980
understand it may sound surprising but

575
00:25:43,789 --> 00:25:42,539
along many coastlines of the world we

576
00:25:45,590 --> 00:25:43,799
really don't have a good view of sea

577
00:25:46,970 --> 00:25:45,600
level change that is taking place and

578
00:25:48,470 --> 00:25:46,980
this makes it challenging to determine

579
00:25:50,930 --> 00:25:48,480
what sort of future impacts these

580
00:25:52,070 --> 00:25:50,940
coastal areas will experience swat's

581
00:25:53,690 --> 00:25:52,080
going to help us fill in some of these

582
00:25:55,370 --> 00:25:53,700
blank spots it's going to give us

583
00:25:56,990 --> 00:25:55,380
insight into Coastal sea levels that we

584
00:25:58,730 --> 00:25:57,000
can then put into computer models that

585
00:26:00,950 --> 00:25:58,740
allow us to improve our projections and

586
00:26:02,630 --> 00:26:00,960
flood forecasts this improved

587
00:26:04,490 --> 00:26:02,640
information is extremely important for a

588
00:26:06,049 --> 00:26:04,500

number of different reasons including

589
00:26:07,310 --> 00:26:06,059
supporting the adaptation efforts that

590
00:26:09,649 --> 00:26:07,320
are underway both here in the United

591
00:26:10,789 --> 00:26:09,659
States but also on global scales and it

592
00:26:13,070 --> 00:26:10,799
is also very important for National

593
00:26:15,649 --> 00:26:13,080
Security since our military has so much

594
00:26:17,269 --> 00:26:15,659
infrastructure in these coastal areas

595
00:26:18,890 --> 00:26:17,279
so in order to ensure that these

596
00:26:21,470 --> 00:26:18,900
benefits are realized a couple things

597
00:26:22,549 --> 00:26:21,480
are happening already first swats data

598
00:26:24,350 --> 00:26:22,559
is going to be free and easily

599
00:26:26,390 --> 00:26:24,360
accessible as you already heard

600
00:26:28,789 --> 00:26:26,400
but in addition to making this data easy

601
00:26:30,830 --> 00:26:28,799
to access for users we're also building

602
00:26:32,930 --> 00:26:30,840
tools to help support users working with

603
00:26:35,090 --> 00:26:32,940
the data once it becomes available

604
00:26:36,890 --> 00:26:35,100
and if you could pull my last visual

605
00:26:38,090 --> 00:26:36,900
So within the swap project we also have

606
00:26:40,010 --> 00:26:38,100
something called an early adopters

607
00:26:41,810 --> 00:26:40,020
program which I think is really cool a

608
00:26:43,730 --> 00:26:41,820
community of potential users from across

609
00:26:45,289 --> 00:26:43,740
the globe that continues to grow has

610
00:26:46,669 --> 00:26:45,299
been working with the SWAT team to learn

611
00:26:48,890 --> 00:26:46,679
how to quickly and effectively

612
00:26:51,110 --> 00:26:48,900
incorporate future SWAT data into their

613
00:26:52,970 --> 00:26:51,120

activities and this is a real dedicated

614
00:26:54,769 --> 00:26:52,980
effort to help users understand what

615
00:26:56,750 --> 00:26:54,779
SWAT will provide and how it can be

616
00:26:57,769 --> 00:26:56,760
useful in their applications and all

617
00:26:59,149 --> 00:26:57,779
this effort is designed to help

618
00:27:00,529 --> 00:26:59,159
communities that need the data to hit

619
00:27:02,149 --> 00:27:00,539
the ground running once that data from

620
00:27:03,890 --> 00:27:02,159
SWAT becomes available which it was

621
00:27:05,330 --> 00:27:03,900
really important to us to continue to

622
00:27:07,130 --> 00:27:05,340
Foster

623
00:27:08,690 --> 00:27:07,140
so while SWAT is going to answer many

624
00:27:10,430 --> 00:27:08,700
important science questions about water

625
00:27:12,169 --> 00:27:10,440
here on Earth that Lee and others have

626
00:27:13,669 --> 00:27:12,179
talked about it also has the potential

627
00:27:15,350 --> 00:27:13,679
to be really transformative in its

628
00:27:16,850 --> 00:27:15,360
ability to support those reliant on

629
00:27:18,470 --> 00:27:16,860
water for their daily lives and

630
00:27:20,210 --> 00:27:18,480
livelihoods and this includes

631
00:27:21,830 --> 00:27:20,220
applications across Land Ocean or

632
00:27:22,909 --> 00:27:21,840
coastal regions and it's going to

633
00:27:24,529 --> 00:27:22,919
produce relevant and important

634
00:27:25,430 --> 00:27:24,539
information for almost everyone here on

635
00:27:28,070 --> 00:27:25,440
Earth

636
00:27:29,990 --> 00:27:28,080
thanks and then back to you Marina

637
00:27:32,090 --> 00:27:30,000
thank you so much Ben and thank you to

638
00:27:34,909 --> 00:27:32,100

our speakers we are now ready to take

639
00:27:37,310 --> 00:27:34,919
media questions remember to press star

640
00:27:39,169 --> 00:27:37,320
one to get put in the queue and please

641
00:27:41,269 --> 00:27:39,179
direct your questions to one of the

642
00:27:44,750 --> 00:27:41,279
panelists we're also taking questions

643
00:27:46,970 --> 00:27:44,760
through the hashtag asknasa and we'll

644
00:27:51,049 --> 00:27:46,980
start with social media questions right

645
00:28:02,990 --> 00:27:51,059
now D on Twitter asks will SWAT be

646
00:28:03,000 --> 00:28:06,950
would you like to take that Ben

647
00:28:11,210 --> 00:28:09,230
uh sure yeah so swat's going to see the

648
00:28:12,710 --> 00:28:11,220
surface water here on Earth right so it

649
00:28:14,690 --> 00:28:12,720
gives us almost complete survey of

650
00:28:16,549 --> 00:28:14,700
surface water we're not going to see

651
00:28:18,470 --> 00:28:16,559
these underwater features uh at least

652
00:28:20,390 --> 00:28:18,480
not not directly maybe we can infer some

653
00:28:21,950 --> 00:28:20,400
of them from the data but uh really the

654
00:28:24,230 --> 00:28:21,960
benefit of SWAT is being able to see the

655
00:28:25,490 --> 00:28:24,240
surface water

656
00:28:29,870 --> 00:28:25,500
thank you

657
00:28:32,269 --> 00:28:29,880
grav on YouTube asks will we be able to

658
00:28:35,990 --> 00:28:32,279
determine the accelerated rate of

659
00:28:39,409 --> 00:28:36,000
warming of oceans and or the increasing

660
00:28:43,070 --> 00:28:39,419
melting of glaciers and polar regions

661
00:28:45,230 --> 00:28:43,080
due to global warming via SWAT

662
00:28:48,789 --> 00:28:45,240
Lee would you like to take that

663
00:28:54,190 --> 00:28:48,799

yes absolutely uh swad will make

664
00:28:57,169 --> 00:28:54,200
observations surface water and also ice

665
00:28:59,810 --> 00:28:57,179
including sea ice and land ice

666
00:29:02,810 --> 00:28:59,820
and the but most important contribution

667
00:29:05,750 --> 00:29:02,820
of SWAT is to understand the ocean's

668
00:29:08,390 --> 00:29:05,760
role in climate change by absorbing most

669
00:29:11,149 --> 00:29:08,400
of the heat dumped To Us by global

670
00:29:13,909 --> 00:29:11,159
warming so it really helped us to

671
00:29:16,390 --> 00:29:13,919
understand the mechanism of climate

672
00:29:20,930 --> 00:29:16,400
change and its Evolution into the future

673
00:29:23,330 --> 00:29:20,940
and of course it also measures the the

674
00:29:26,870 --> 00:29:23,340
stress of what the climate change

675
00:29:29,750 --> 00:29:26,880
imposes on Water Resources so it's not

676
00:29:32,570 --> 00:29:29,760
to monitor climate change for you know

677
00:29:35,210 --> 00:29:32,580
because it's a three years Mission the

678
00:29:37,610 --> 00:29:35,220
primary Mission but the most important

679
00:29:40,549 --> 00:29:37,620
thing is to provide a high definition

680
00:29:43,490 --> 00:29:40,559
view of both those three in circulation

681
00:29:46,010 --> 00:29:43,500
and the surface water so that we can

682
00:29:49,010 --> 00:29:46,020
understand how climate change will

683
00:29:51,470 --> 00:29:49,020
evolve and how we are going to deal with

684
00:29:53,389 --> 00:29:51,480
these common changes

685
00:29:59,029 --> 00:29:53,399
thank you

686
00:30:03,169 --> 00:29:59,039
now caller number one Gino Harrell from

687
00:30:05,389 --> 00:30:03,179
Radio Canada good morning Geno

688
00:30:08,090 --> 00:30:05,399

can you hear me yes

689
00:30:11,029 --> 00:30:08,100
good uh yeah I wanted to know how

690
00:30:13,190 --> 00:30:11,039
essential uh Canada's role was and

691
00:30:15,470 --> 00:30:13,200
Kenyan space agency's role was in

692
00:30:17,750 --> 00:30:15,480
building this Mission I understand there

693
00:30:19,850 --> 00:30:17,760
were a characterization having to take

694
00:30:22,310 --> 00:30:19,860
place uh but also in the Canadian

695
00:30:29,990 --> 00:30:22,320
instrument content on the satellite to

696
00:30:34,850 --> 00:30:32,450
Prague

697
00:30:36,289 --> 00:30:34,860
yeah really great question thanks for uh

698
00:30:40,010 --> 00:30:36,299
for bringing that up

699
00:30:41,870 --> 00:30:40,020
um so uh on SWAT NASA has a bilateral

700
00:30:45,950 --> 00:30:41,880
cooperation with the Canadian space

701
00:30:47,870 --> 00:30:45,960
agency and uh CSA is providing a very

702
00:30:51,110 --> 00:30:47,880
important piece of the Karen instrument

703
00:30:53,630 --> 00:30:51,120
which is uh the uh what's called the

704
00:30:56,630 --> 00:30:53,640
extended interaction Klystron it's the

705
00:30:59,950 --> 00:30:56,640
high power transmitter uh that Karen

706
00:31:03,730 --> 00:30:59,960
uses to actually transmits its signal

707
00:31:07,250 --> 00:31:03,740
and this has been an extremely important

708
00:31:10,070 --> 00:31:07,260
contribution on SWAT this is a piece of

709
00:31:13,630 --> 00:31:10,080
equipment that really doesn't exist

710
00:31:17,049 --> 00:31:13,640
anywhere except actually from one of the

711
00:31:20,570 --> 00:31:17,059
partners companies in in Canada

712
00:31:22,549 --> 00:31:20,580
we've worked very closely with Canadian

713
00:31:26,029 --> 00:31:22,559

scientists as well who are participating

714
00:31:29,510 --> 00:31:26,039
in many science activities particularly

715
00:31:33,110 --> 00:31:29,520
looking at of course the the millions of

716
00:31:36,250 --> 00:31:33,120
of water bodies and lakes and rivers in

717
00:31:39,169 --> 00:31:36,260
the in the Canadian Northern continent

718
00:31:41,810 --> 00:31:39,179
and and so on the instrument we have a

719
00:31:43,610 --> 00:31:41,820
very close collaboration it's a very

720
00:31:44,990 --> 00:31:43,620
important piece of equipment

721
00:31:46,430 --> 00:31:45,000
um particularly for the Karen instrument

722
00:31:50,990 --> 00:31:46,440
and we're looking forward to working

723
00:31:59,810 --> 00:31:54,230
thank you Prague our next caller is

724
00:32:02,690 --> 00:31:59,820
Megan Bartels from space.com hello Megan

725
00:32:05,450 --> 00:32:02,700
hi thanks so much for taking my question

726
00:32:07,130 --> 00:32:05,460
um I'm not sure exactly who this is best

727
00:32:09,950 --> 00:32:07,140
suited for but

728
00:32:12,529 --> 00:32:09,960
a few of you have mentioned what will be

729
00:32:14,690 --> 00:32:12,539
the first satellites that can see all of

730
00:32:18,110 --> 00:32:14,700
the water on Earth could you talk about

731
00:32:19,850 --> 00:32:18,120
why none of the satellites that are

732
00:32:21,950 --> 00:32:19,860
currently in orbit or have been in orbit

733
00:32:23,570 --> 00:32:21,960
can do that and sort of what makes that

734
00:32:30,769 --> 00:32:23,580
possible for SWAT where it's not

735
00:32:37,789 --> 00:32:33,169
yeah I I think I can take on this

736
00:32:41,810 --> 00:32:37,799
question it's a great one and uh before

737
00:32:44,810 --> 00:32:41,820
uh SWAT or even out imagery the primary

738
00:32:48,230 --> 00:32:44,820

way to observe the Earth's water from

739
00:32:49,610 --> 00:32:48,240
space is Optical instrument so there is

740
00:32:52,190 --> 00:32:49,620
a high definition view of the

741
00:32:54,409 --> 00:32:52,200
two-dimensional extent of waters but we

742
00:32:57,289 --> 00:32:54,419
don't know how much water is there how

743
00:33:00,049 --> 00:32:57,299
the water is Flowing so without imagery

744
00:33:02,630 --> 00:33:00,059
40 years ago actually revolutionized by

745
00:33:04,310 --> 00:33:02,640
adding the third dimension of what the

746
00:33:06,409 --> 00:33:04,320
elevation so that we do ocean

747
00:33:08,870 --> 00:33:06,419
circulation and the land water

748
00:33:10,970 --> 00:33:08,880
monitoring however all these neither

749
00:33:12,950 --> 00:33:10,980
looking or the the radar looking

750
00:33:15,769 --> 00:33:12,960
straight down taking only one

751
00:33:19,130 --> 00:33:15,779
dimensional profile so it takes months

752
00:33:22,370 --> 00:33:19,140
to piecemeal the Earth SWAT you know

753
00:33:25,549 --> 00:33:22,380
every 21 days will sample the entire

754
00:33:28,789 --> 00:33:25,559
Earth without the gaps the elevation

755
00:33:31,070 --> 00:33:28,799
under this high definition view will

756
00:33:33,350 --> 00:33:31,080
review ocean Circle Edition never

757
00:33:36,230 --> 00:33:33,360
observed before thus responsible for

758
00:33:39,590 --> 00:33:36,240
absorbing heat to protect us from

759
00:33:42,110 --> 00:33:39,600
excessive warming but also provide

760
00:33:44,389 --> 00:33:42,120
detailed information for water managers

761
00:33:48,110 --> 00:33:44,399
there's a third dimension as I mentioned

762
00:33:50,630 --> 00:33:48,120
earlier is like a 3D glasses you know in

763
00:33:53,690 --> 00:33:50,640

the past you don't have this perspective

764
00:33:56,750 --> 00:33:53,700
of the elevation but for the first time

765
00:33:59,029 --> 00:33:56,760
it's what we provide this third

766
00:34:02,570 --> 00:33:59,039
dimensional information therefore we can

767
00:34:05,330 --> 00:34:02,580
study hydrology in a quantitative manner

768
00:34:08,869 --> 00:34:05,340
tracking the flow calculating the rate

769
00:34:11,930 --> 00:34:08,879
so do the water budget management and

770
00:34:18,050 --> 00:34:14,750
thank you so much Lee we'll go back to

771
00:34:21,349 --> 00:34:18,060
social media Paul Smith on Facebook asks

772
00:34:24,530 --> 00:34:21,359
what effect is the draining of the

773
00:34:27,290 --> 00:34:24,540
world's aquifiers on climate change and

774
00:34:28,609 --> 00:34:27,300
Rising internal temperatures of the

775
00:34:31,010 --> 00:34:28,619
Earth

776
00:34:33,109 --> 00:34:31,020
Lee

777
00:34:36,169 --> 00:34:33,119
yeah the um

778
00:34:38,750 --> 00:34:36,179
swad basically observes surface water

779
00:34:40,970 --> 00:34:38,760
but the aquifer the groundwater of

780
00:34:44,149 --> 00:34:40,980
course you know is the the biggest

781
00:34:48,050 --> 00:34:44,159
reservoir of first water on Earth

782
00:34:49,730 --> 00:34:48,060
and that so the water usage primarily

783
00:34:51,950 --> 00:34:49,740
you know you go through groundwater

784
00:34:54,889 --> 00:34:51,960
which is measured by other satellites

785
00:34:57,650 --> 00:34:54,899
but the surface waters is directly

786
00:35:00,589 --> 00:34:57,660
available to us for water usage and also

787
00:35:03,829 --> 00:35:00,599
create a hazards and as far as the

788
00:35:06,770 --> 00:35:03,839

draining groundwater and the the global

789
00:35:12,290 --> 00:35:06,780
warming uh I'm not quite sure the

790
00:35:17,569 --> 00:35:14,990
is the draining of the world's aquifiers

791
00:35:22,370 --> 00:35:17,579
on climate change and Rising internal

792
00:35:27,589 --> 00:35:25,790
that's really not my expertise but I

793
00:35:30,650 --> 00:35:27,599
don't think so

794
00:35:34,069 --> 00:35:30,660
thank you Lee next question from Karen

795
00:35:39,829 --> 00:35:34,079
on Facebook asking is sea level rising

796
00:35:46,490 --> 00:35:43,130
take that one um yep

797
00:35:48,050 --> 00:35:46,500
well it's both right so and and a lot of

798
00:35:50,270 --> 00:35:48,060
our Coastal reasons we see subsidence

799
00:35:51,890 --> 00:35:50,280
which contributes to sea level change we

800
00:35:54,349 --> 00:35:51,900
call it relative sea level change so

801
00:35:56,210 --> 00:35:54,359
it's the movement of the ocean relative

802
00:35:58,190 --> 00:35:56,220
to land so subsidence is certainly a

803
00:35:59,690 --> 00:35:58,200
factor we see that along the gulf coast

804
00:36:00,950 --> 00:35:59,700
of the United States it's particularly

805
00:36:02,750 --> 00:36:00,960
important there

806
00:36:05,210 --> 00:36:02,760
but on global scale is pretty much

807
00:36:06,950 --> 00:36:05,220
everywhere the ocean is indeed Rising as

808
00:36:09,109 --> 00:36:06,960
a result a result of global warming so

809
00:36:11,750 --> 00:36:09,119
we know the contributors that lead to

810
00:36:13,490 --> 00:36:11,760
this increase in sea level

811
00:36:15,710 --> 00:36:13,500
um both the the main ones and Global

812
00:36:17,390 --> 00:36:15,720
scales are melting ice that's located on

813
00:36:19,370 --> 00:36:17,400

land and then thermal expansion of the

814
00:36:23,390 --> 00:36:19,380
ocean as it continues to absorb heat and

815
00:36:25,490 --> 00:36:23,400
expand so yes the ocean is certainly

816
00:36:27,710 --> 00:36:25,500
rising and causing sea levels to go up

817
00:36:30,230 --> 00:36:27,720
along our coastlines subsidence kind of

818
00:36:32,510 --> 00:36:30,240
exacerbates that that signal that we see

819
00:36:35,690 --> 00:36:32,520
from the ocean

820
00:36:38,690 --> 00:36:35,700
thank you so much ben next is stop

821
00:36:41,870 --> 00:36:38,700
listen think on YouTube congratulations

822
00:36:45,890 --> 00:36:41,880
to be able to see this through after 20

823
00:36:49,970 --> 00:36:45,900
years I know it's difficult to do who is

824
00:36:56,150 --> 00:36:53,630
Prague or Terry I think Terry Terry

825
00:37:00,530 --> 00:36:56,160
should take that second question

826
00:37:02,990 --> 00:37:00,540
as I mentioned before when we uh set up

827
00:37:06,530 --> 00:37:03,000
the workshop between the US and France

828
00:37:10,250 --> 00:37:06,540
France propose to build up the the

829
00:37:14,109 --> 00:37:10,260
spacecraft bus based on the Talis alinea

830
00:37:17,990 --> 00:37:14,119
space experience so they build up

831
00:37:21,109 --> 00:37:18,000
high performance bus to cope with the

832
00:37:23,510 --> 00:37:21,119
demanding requirements from especially

833
00:37:25,370 --> 00:37:23,520
the caring instruments or the the

834
00:37:28,730 --> 00:37:25,380
effectively the spacecraft has been

835
00:37:32,030 --> 00:37:28,740
built by France and tales industry and

836
00:37:34,190 --> 00:37:32,040
Thailand also did the integration and

837
00:37:35,690 --> 00:37:34,200
the testing of the wool satellite in

838
00:37:38,810 --> 00:37:35,700

talescan

839
00:37:40,609 --> 00:37:38,820
foreign thank you Terry we're going to

840
00:37:42,290 --> 00:37:40,619
go back to the phone lines to Megan

841
00:37:45,290 --> 00:37:42,300
Bartels who has a follow-up question

842
00:37:47,089 --> 00:37:45,300
from space.com hello Megan

843
00:37:48,170 --> 00:37:47,099
hi thanks so much for taking a second

844
00:37:49,609 --> 00:37:48,180
question

845
00:37:52,130 --> 00:37:49,619
um I'd like to hear from each of you

846
00:37:55,730 --> 00:37:52,140
sort of with one month to go before

847
00:38:01,190 --> 00:37:55,740
launch what is left to tick off and how

848
00:38:04,130 --> 00:38:03,290
I can go first it's Prague

849
00:38:07,430 --> 00:38:04,140
um

850
00:38:09,770 --> 00:38:07,440
so we are we're doing as I said the last

851
00:38:12,950 --> 00:38:09,780
checks of course with uh with the

852
00:38:17,270 --> 00:38:12,960
satellite we're nearly done with that

853
00:38:19,790 --> 00:38:17,280
um and and we have to basically mate the

854
00:38:22,069 --> 00:38:19,800
satellite with the rocket and prepare

855
00:38:25,609 --> 00:38:22,079
that it's it's a fairly straightforward

856
00:38:28,250 --> 00:38:25,619
operation but one that requires again

857
00:38:31,310 --> 00:38:28,260
multiple organizations and teams of

858
00:38:33,530 --> 00:38:31,320
people uh working together they're

859
00:38:36,770 --> 00:38:33,540
really motivated excited because it's

860
00:38:38,630 --> 00:38:36,780
again a culmination of many years of

861
00:38:41,690 --> 00:38:38,640
work towards the the launch but we have

862
00:38:44,930 --> 00:38:41,700
a big team of people also preparing for

863
00:38:47,089 --> 00:38:44,940

the operations of the satellite and

864
00:38:51,170 --> 00:38:47,099
they've been working hard for many years

865
00:38:52,849 --> 00:38:51,180
as well preparing for this moment uh and

866
00:38:56,030 --> 00:38:52,859
uh they have been they're basically

867
00:38:58,609 --> 00:38:56,040
going through rehearsals uh to to get

868
00:39:00,530 --> 00:38:58,619
trained and ready for the big moment

869
00:39:03,710 --> 00:39:00,540
um just after the launch where they

870
00:39:06,550 --> 00:39:03,720
where they take over and uh so the the

871
00:39:09,050 --> 00:39:06,560
team was very excited I think they are

872
00:39:11,150 --> 00:39:09,060
they've invested many years of their

873
00:39:13,310 --> 00:39:11,160
personal career and and sacrificed for

874
00:39:15,770 --> 00:39:13,320
this moment and and have a personal

875
00:39:18,530 --> 00:39:15,780
connection with uh with the mission and

876
00:39:21,050 --> 00:39:18,540
of course uh with Earth Science because

877
00:39:23,450 --> 00:39:21,060
this is something very important to the

878
00:39:26,870 --> 00:39:23,460
people uh not only working as Engineers

879
00:39:29,329 --> 00:39:26,880
but really working as uh as people who

880
00:39:31,849 --> 00:39:29,339
care about uh about the Earth and and

881
00:39:37,250 --> 00:39:31,859
what this Mission might mean for that

882
00:39:42,950 --> 00:39:40,970
so I can go next so um we are at NASA

883
00:39:45,230 --> 00:39:42,960
headquarters we're very very excited

884
00:39:48,650 --> 00:39:45,240
about these missions because we're going

885
00:39:51,349 --> 00:39:48,660
to add another satellite to our Fleet to

886
00:39:53,270 --> 00:39:51,359
make sure we observe the Earth's in all

887
00:39:55,250 --> 00:39:53,280
different direction to understand what

888
00:39:59,930 --> 00:39:55,260

all the system was the earth to be able

889
00:40:05,569 --> 00:40:03,170
Terry hello yeah on the French side of

890
00:40:08,270 --> 00:40:05,579
course we are also excited with

891
00:40:10,550 --> 00:40:08,280
preparing for the launch because France

892
00:40:12,589 --> 00:40:10,560
has invested a lot of efforts and

893
00:40:15,290 --> 00:40:12,599
resources in this Mission this is

894
00:40:18,589 --> 00:40:15,300
actually the biggest uh cooperation

895
00:40:20,750 --> 00:40:18,599
mission of our country and of course

896
00:40:23,870 --> 00:40:20,760
because we've been involved either in

897
00:40:26,270 --> 00:40:23,880
the space for the flight system uh

898
00:40:28,730 --> 00:40:26,280
building up the the bus spacecraft bus

899
00:40:31,910 --> 00:40:28,740
and doing the integration of the

900
00:40:35,810 --> 00:40:31,920
satellite but also we are doing the

901
00:40:39,230 --> 00:40:35,820
operations in Toulouse France we have a

902
00:40:42,230 --> 00:40:39,240
big team there currently preparing for

903
00:40:45,950 --> 00:40:42,240
uh being ready for the launch and the

904
00:40:47,870 --> 00:40:45,960
early orbit operations everyone is of

905
00:40:50,569 --> 00:40:47,880
course today concentrated on their

906
00:40:57,470 --> 00:40:50,579
objective is to make that mission work

907
00:41:03,710 --> 00:41:00,349
you know as I said earlier that this

908
00:41:08,930 --> 00:41:03,720
mission's 20 years in making this long

909
00:41:12,109 --> 00:41:08,940
Endeavor is the one and winding and as

910
00:41:16,970 --> 00:41:12,119
you have heard this satellite is huge

911
00:41:20,510 --> 00:41:16,980
the complex system of measurement is the

912
00:41:23,750 --> 00:41:20,520
first of its kind unprecedented so at

913
00:41:27,770 --> 00:41:23,760

this moment you know my emotion is a

914
00:41:34,490 --> 00:41:27,780
mixture of uh you know excitement thrill

915
00:41:39,710 --> 00:41:37,310
Ben that I can go last year

916
00:41:41,810 --> 00:41:39,720
um yeah I mean so I sit firmly on the

917
00:41:44,270 --> 00:41:41,820
science side and uh unsurprisingly I'm

918
00:41:46,130 --> 00:41:44,280
also excited about uh the potential for

919
00:41:48,410 --> 00:41:46,140
for what comes after launch when SWAT

920
00:41:50,270 --> 00:41:48,420
starts uh sending down some data I mean

921
00:41:53,210 --> 00:41:50,280
we heard words in this panel like Game

922
00:41:54,410 --> 00:41:53,220
Changer Pathfinder transformative and I

923
00:41:55,430 --> 00:41:54,420
don't think these are just buzzwords I

924
00:41:57,470 --> 00:41:55,440
think there's the real potential for

925
00:41:59,329 --> 00:41:57,480
SWAT to provide information both for

926
00:42:01,550 --> 00:41:59,339
Science and application that's

927
00:42:02,870 --> 00:42:01,560
it's really just going to provide an

928
00:42:05,630 --> 00:42:02,880
enormous amount of potential an

929
00:42:07,670 --> 00:42:05,640
opportunity for for us to to understand

930
00:42:10,069 --> 00:42:07,680
this data and how it can can be useful

931
00:42:11,390 --> 00:42:10,079
both for Science and applications so

932
00:42:15,770 --> 00:42:11,400
um similar to the other panelists I'm

933
00:42:19,730 --> 00:42:17,630
well thank you so much for your

934
00:42:21,530 --> 00:42:19,740
questions and thank you to our panelists

935
00:42:23,510 --> 00:42:21,540
for joining us today I can really feel

936
00:42:25,790 --> 00:42:23,520
your excitement and I'm very happy for

937
00:42:27,950 --> 00:42:25,800
you swat is scheduled to launch from

938
00:42:31,010 --> 00:42:27,960

Vandenberg space force base in central

939
00:42:35,230 --> 00:42:31,020
California on December 12th for more

940
00:42:40,370 --> 00:42:37,910
swat.jpl.nasa.gov on that site you can

941
00:42:43,010 --> 00:42:40,380
find a list of early adopters to find

942
00:42:46,250 --> 00:42:43,020
out if groups in your area are going to

943
00:42:48,589 --> 00:42:46,260
be using SWOT data in local projects you

944
00:42:51,650 --> 00:42:48,599
can also follow at Nasa Earth and at

945
00:42:55,250 --> 00:42:51,660
NASA JPL on social media and use the

946
00:42:57,650 --> 00:42:55,260
hashtag tracking World water we're also

947
00:43:01,250 --> 00:42:57,660
going to be doing a live social media q

948
00:43:04,730 --> 00:43:01,260
a about SWOT this Thursday November 17th

949
00:43:07,609 --> 00:43:04,740
at 9 30 a.m Pacific with mission team

950
00:43:11,690 --> 00:43:07,619
members you can tune in by following our

951
00:43:14,569 --> 00:43:11,700
JPL YouTube Twitter or Facebook accounts

952
00:43:17,569 --> 00:43:14,579
thanks so much for joining us today at