1
00:00:06,869 --> 00:00:03,990
hello and welcome to nasa headquarters

2
00:00:09,110 --> 00:00:06,879
in washington dc i'm steve cole from the

3
00:00:10,870 --> 00:00:09,120
office of communications we're here

4
00:00:13,110 --> 00:00:10,880
today to tell you about the upcoming

5
00:00:15,910 --> 00:00:13,120
launch of nasa's fifth earth science

6
00:00:18,950 --> 00:00:15,920
mission in less than a year the soil

7
00:00:20,950 --> 00:00:18,960
moisture active passive mission or smap

8
00:00:22,630 --> 00:00:20,960
is set to launch from california three

9
00:00:24,310 --> 00:00:22,640
weeks from today

10
00:00:27,029 --> 00:00:24,320
smap is going to provide the most

11
00:00:29,109 --> 00:00:27,039
accurate high resolution global

12
00:00:31,109 --> 00:00:29,119
measurements of soil moisture made from

13
00:00:32,790 --> 00:00:31,119

space ever

14
00:00:34,150 --> 00:00:32,800
today we have four panelists to tell you

15
00:00:36,069 --> 00:00:34,160
about the mission

16
00:00:38,549 --> 00:00:36,079
let me introduce them to you first will

17
00:00:41,110 --> 00:00:38,559
be christine bonixon

18
00:00:42,709 --> 00:00:41,120
smap program executive and the science

19
00:00:44,470 --> 00:00:42,719
mission directorate

20
00:00:46,790 --> 00:00:44,480
earth science division here at nasa

21
00:00:48,150 --> 00:00:46,800
headquarters

22
00:00:51,110 --> 00:00:48,160
kent kellogg

23
00:00:53,350 --> 00:00:51,120
smap project manager from nasa's jet

24
00:00:55,350 --> 00:00:53,360
propulsion laboratory in pasadena

25
00:00:57,750 --> 00:00:55,360
california

26
00:01:00,709 --> 00:00:57,760
dara and takabi

27
00:01:02,790 --> 00:01:00,719
science team lead from the massachusetts

28
00:01:04,710 --> 00:01:02,800
institute of technology in cambridge

29
00:01:07,510 --> 00:01:04,720
massachusetts

30
00:01:10,310 --> 00:01:07,520
and our first speaker is brad dorn

31
00:01:12,550 --> 00:01:10,320
smap applications lead from the science

32
00:01:15,429 --> 00:01:12,560
mission directorates applied sciences

33
00:01:16,789 --> 00:01:15,439
program at nasa headquarters

34
00:01:18,710 --> 00:01:16,799
after our panelists give their

35
00:01:21,109 --> 00:01:18,720
presentations we'll take questions from

36
00:01:23,429 --> 00:01:21,119
media here in the audience

37
00:01:25,270 --> 00:01:23,439
on the phone lines and for those

38
00:01:28,310 --> 00:01:25,280

watching on

39
00:01:30,310 --> 00:01:28,320
online at nasa.gov if you have a

40
00:01:33,190 --> 00:01:30,320
question during that time and are

41
00:01:34,310 --> 00:01:33,200
watching online please use the twitter

42
00:01:36,230 --> 00:01:34,320
hashtag

43
00:01:38,789 --> 00:01:36,240
ask nasa

44
00:01:40,870 --> 00:01:38,799
if you're a media on the phone lines

45
00:01:43,749 --> 00:01:40,880
when you have a question please

46
00:01:45,830 --> 00:01:43,759
dial star one and you'll be put in the

47
00:01:47,350 --> 00:01:45,840
queue for questions

48
00:01:49,990 --> 00:01:47,360
okay well then we'll get started with

49
00:01:51,429 --> 00:01:50,000
our first panelist chris

50
00:01:52,950 --> 00:01:51,439
thank you steve

51
00:01:55,270 --> 00:01:52,960
good afternoon

52
00:01:57,109 --> 00:01:55,280
the soil moisture active passive program

53
00:02:00,230 --> 00:01:57,119
or smap will be launching from

54
00:02:02,709 --> 00:02:00,240
vandenberg on the 29th of january

55
00:02:05,749 --> 00:02:02,719
and it will focus on on the water that

56
00:02:08,550 --> 00:02:05,759
lives and moves through the soil

57
00:02:10,150 --> 00:02:08,560
this information will improve our

58
00:02:11,190 --> 00:02:10,160
knowledge of

59
00:02:13,910 --> 00:02:11,200
weather

60
00:02:15,510 --> 00:02:13,920
climate over land as well as water

61
00:02:17,430 --> 00:02:15,520
related hazards

62
00:02:20,150 --> 00:02:17,440
if you could put up the first video

63
00:02:23,030 --> 00:02:20,160

slide please

64
00:02:26,150 --> 00:02:23,040
smap will be joining our 18 operational

65
00:02:27,589 --> 00:02:26,160
missions that study the earth's systems

66
00:02:32,390 --> 00:02:27,599
these issues

67
00:02:34,949 --> 00:02:32,400
are climate change things like sea level

68
00:02:37,190 --> 00:02:34,959
and fresh water resources

69
00:02:39,830 --> 00:02:37,200
our on-orbit satellites along with the

70
00:02:42,470 --> 00:02:39,840
air and ground observations monitor the

71
00:02:45,030 --> 00:02:42,480
earth's vital signs

72
00:02:47,670 --> 00:02:45,040
the timing of this launch is really

73
00:02:49,990 --> 00:02:47,680
fortuitous since this is the un's

74
00:02:52,790 --> 00:02:50,000
national year of soil and it was kicked

75
00:02:54,949 --> 00:02:52,800
off on the 5th of december

76
00:02:57,750 --> 00:02:54,959
organizations in countries around the

77
00:02:59,830 --> 00:02:57,760
world have volunteered to participate

78
00:03:01,509 --> 00:02:59,840
in the smap program

79
00:03:05,030 --> 00:03:01,519
countries that are involved

80
00:03:08,790 --> 00:03:05,040
like in kenya

81
00:03:11,990 --> 00:03:08,800
australia argentina and canada

82
00:03:14,309 --> 00:03:12,000
and they are voluntarily supporting our

83
00:03:16,630 --> 00:03:14,319
data collection

84
00:03:17,509 --> 00:03:16,640
algorithm verification

85
00:03:20,869 --> 00:03:17,519
and

86
00:03:23,430 --> 00:03:20,879
data that will be coming from this

87
00:03:28,070 --> 00:03:26,070
with the launch of this project decision

88
00:03:30,309 --> 00:03:28,080

makers will better be able to understand

89
00:03:34,710 --> 00:03:30,319
the water cycle

90
00:03:37,110 --> 00:03:34,720
and how soil moisture fits into that

91
00:03:39,589 --> 00:03:37,120
the soil actually gathers the

92
00:03:42,869 --> 00:03:39,599
precipitation

93
00:03:44,789 --> 00:03:42,879
prior to it entering the rivers

94
00:03:46,789 --> 00:03:44,799
and then evaporating back into the

95
00:03:50,470 --> 00:03:46,799
atmosphere

96
00:03:52,949 --> 00:03:50,480
as a result soil moisture impacts

97
00:03:53,990 --> 00:03:52,959
many areas of human interest including

98
00:03:55,030 --> 00:03:54,000
flood

99
00:03:56,710 --> 00:03:55,040
drought

100
00:03:58,830 --> 00:03:56,720
disease control

101
00:04:01,350 --> 00:03:58,840
and

102
00:04:03,830 --> 00:04:01,360
weather if you could run the video

103
00:04:07,830 --> 00:04:05,750
this is a first look at the amazing

104
00:04:11,110 --> 00:04:07,840
satellite that we've built

105
00:04:13,750 --> 00:04:11,120
it has two instruments on it the active

106
00:04:15,750 --> 00:04:13,760
from our name is a radar and we have the

107
00:04:17,030 --> 00:04:15,760
passive instrument which is a radi

108
00:04:18,710 --> 00:04:17,040
radiometer

109
00:04:21,110 --> 00:04:18,720
the radar will be providing our high

110
00:04:23,909 --> 00:04:21,120
resolution data and the radiometer

111
00:04:25,830 --> 00:04:23,919
provides the high accuracy data

112
00:04:28,070 --> 00:04:25,840
when you put these together it's very

113
00:04:31,270 --> 00:04:28,080

similar to looking through both lenses

114
00:04:33,670 --> 00:04:31,280
on a pair of bifocals at the same time

115
00:04:35,830 --> 00:04:33,680
as a result we will have a high

116
00:04:39,590 --> 00:04:35,840
highly accurate global map of soil

117
00:04:42,310 --> 00:04:39,600
moisture for our scientists to use

118
00:04:44,710 --> 00:04:42,320
this dual instrument was key to the

119
00:04:47,749 --> 00:04:44,720
national academies of science

120
00:04:49,749 --> 00:04:47,759
earth science 2007 decadal survey

121
00:04:51,110 --> 00:04:49,759
ranking of this as a high tier one

122
00:04:53,270 --> 00:04:51,120
mission

123
00:04:54,710 --> 00:04:53,280
and nasa is very excited on with the

124
00:04:56,390 --> 00:04:54,720
fact that we are able to launch this

125
00:04:58,950 --> 00:04:56,400
within 10 years of receiving that

126
00:05:01,670 --> 00:04:58,960
recommendation

127
00:05:03,670 --> 00:05:01,680
the global soil moisture freeze thaw map

128
00:05:05,909 --> 00:05:03,680
will be available to scientists every

129
00:05:08,070 --> 00:05:05,919
two to three years

130
00:05:11,110 --> 00:05:08,080
and after the

131
00:05:13,029 --> 00:05:11,120
cats launch uh the cloud aerosol

132
00:05:15,830 --> 00:05:13,039
transportation system that is being

133
00:05:18,629 --> 00:05:15,840
launched this coming saturday we will be

134
00:05:19,909 --> 00:05:18,639
focusing in on the smap launch

135
00:05:22,070 --> 00:05:19,919
and the knowledge that we will be

136
00:05:24,710 --> 00:05:22,080
getting from its data if you could put

137
00:05:27,830 --> 00:05:24,720
up the next slide

138
00:05:30,950 --> 00:05:27,840

this map launch as steve said complete

139
00:05:32,710 --> 00:05:30,960
an 11-month period that started with the

140
00:05:36,070 --> 00:05:32,720
launch of the global precipitation

141
00:05:37,830 --> 00:05:36,080
measurement system in february in japan

142
00:05:40,310 --> 00:05:37,840
and nasa is looking

143
00:05:41,909 --> 00:05:40,320
forward to the synergistic measurements

144
00:05:45,110 --> 00:05:41,919
that we are going to be getting and the

145
00:05:46,710 --> 00:05:45,120
scientific advancements that will result

146
00:05:48,870 --> 00:05:46,720
with the with with all these new

147
00:05:50,950 --> 00:05:48,880
instruments that we will have launched

148
00:05:53,590 --> 00:05:50,960
i will now turn the floor over to our

149
00:05:55,909 --> 00:05:53,600
smap project manager kent kellogg

150
00:05:58,870 --> 00:05:55,919
thank you chris good afternoon

151
00:06:01,270 --> 00:05:58,880
smap is jointly developed by nasa's jet

152
00:06:03,830 --> 00:06:01,280
propulsion laboratory in pasadena

153
00:06:04,790 --> 00:06:03,840
california and the goddard space flight

154
00:06:06,629 --> 00:06:04,800
center

155
00:06:07,909 --> 00:06:06,639
in greenbelt

156
00:06:09,189 --> 00:06:07,919
maryland

157
00:06:11,270 --> 00:06:09,199
jpl

158
00:06:12,710 --> 00:06:11,280
is the lead center has project

159
00:06:15,029 --> 00:06:12,720
management and system engineering

160
00:06:16,390 --> 00:06:15,039
responsibility uh developed the

161
00:06:18,309 --> 00:06:16,400
spacecraft

162
00:06:20,710 --> 00:06:18,319
developed the overall instrument and the

163
00:06:22,070 --> 00:06:20,720

large spinning antenna subsystem that

164
00:06:25,270 --> 00:06:22,080
you see

165
00:06:26,950 --> 00:06:25,280
on smap as well as the radar instrument

166
00:06:27,990 --> 00:06:26,960
goddard provided the radiometer

167
00:06:30,390 --> 00:06:28,000
instrument

168
00:06:32,150 --> 00:06:30,400
and both centers participate in science

169
00:06:34,469 --> 00:06:32,160
data processing

170
00:06:35,670 --> 00:06:34,479
so if we could roll the launch sequence

171
00:06:38,710 --> 00:06:35,680
video

172
00:06:41,909 --> 00:06:38,720
smap will launch into a polar

173
00:06:45,590 --> 00:06:41,919
sun synchronous orbit a 685 kilometer

174
00:06:48,870 --> 00:06:45,600
altitude 6 a.m equator crossing time

175
00:06:53,270 --> 00:06:48,880
on january 29th from vandenberg the

176
00:06:55,189 --> 00:06:53,280
space launch complex 2 facility

177
00:06:59,350 --> 00:06:55,199
we will

178
00:07:01,189 --> 00:06:59,360
separate from the first stage transition

179
00:07:04,070 --> 00:07:01,199
to the second stage

180
00:07:07,110 --> 00:07:04,080
and deploy the fairing

181
00:07:08,390 --> 00:07:07,120
we have a fairly long unpowered coast

182
00:07:10,150 --> 00:07:08,400
period

183
00:07:11,029 --> 00:07:10,160
followed by a brief

184
00:07:15,430 --> 00:07:11,039
second

185
00:07:17,350 --> 00:07:15,440
which will deposit us very close to our

186
00:07:20,629 --> 00:07:17,360
final science orbit

187
00:07:22,390 --> 00:07:20,639
the the delta ii should leave us in a

188
00:07:24,950 --> 00:07:22,400

attitude that's optimized for

189
00:07:28,150 --> 00:07:24,960
communication with tdrs and for having

190
00:07:30,790 --> 00:07:28,160
our solar arrays pointed at the sun

191
00:07:33,430 --> 00:07:30,800
we should uh as soon as we separate

192
00:07:34,790 --> 00:07:33,440
onboard sequences we'll uh release the

193
00:07:37,990 --> 00:07:34,800
solar array

194
00:07:40,710 --> 00:07:38,000
uh stabilize the spacecraft and initiate

195
00:07:42,390 --> 00:07:40,720
communication with the ground through uh

196
00:07:45,749 --> 00:07:42,400
through tdrs

197
00:07:48,550 --> 00:07:45,759
we should achieve a power positive

198
00:07:50,790 --> 00:07:48,560
condition on the observatory as early as

199
00:07:52,390 --> 00:07:50,800
eight minutes after separation or it

200
00:07:54,309 --> 00:07:52,400
could take as long as 50 minutes

201
00:07:56,550 --> 00:07:54,319
depending on the the configuration and

202
00:07:58,629 --> 00:07:56,560
orientation of the spacecraft after

203
00:08:01,589 --> 00:07:58,639
uh after separation

204
00:08:03,270 --> 00:08:01,599
we'll spend our first two weeks in space

205
00:08:05,510 --> 00:08:03,280
checking out all the

206
00:08:08,390 --> 00:08:05,520
spacecraft systems

207
00:08:11,270 --> 00:08:08,400
and at that point we will begin the

208
00:08:13,029 --> 00:08:11,280
deployment sequence for the large

209
00:08:15,270 --> 00:08:13,039
reflector boom antenna so if we could

210
00:08:17,110 --> 00:08:15,280
roll that

211
00:08:20,309 --> 00:08:17,120
deployment animation

212
00:08:22,950 --> 00:08:20,319
the reflector boom assembly

213
00:08:26,469 --> 00:08:22,960

deploys in two steps

214
00:08:27,990 --> 00:08:26,479
starting 16 days after launch we will

215
00:08:31,749 --> 00:08:28,000
deploy the boom

216
00:08:34,230 --> 00:08:31,759
that process takes about 16 minutes

217
00:08:36,149 --> 00:08:34,240
once that's done we will spend several

218
00:08:38,550 --> 00:08:36,159
days confirming that we've had a

219
00:08:40,389 --> 00:08:38,560
successful deployment and making sure

220
00:08:42,310 --> 00:08:40,399
that the spacecraft attitude

221
00:08:44,550 --> 00:08:42,320
is behaving as we expect with this new

222
00:08:45,829 --> 00:08:44,560
configuration now you'll notice that the

223
00:08:47,750 --> 00:08:45,839
spacecraft

224
00:08:50,389 --> 00:08:47,760
looks somewhat like the tail wagging the

225
00:08:53,430 --> 00:08:50,399
dog with this very large antenna

226
00:08:55,030 --> 00:08:53,440
deployed with a very small spacecraft so

227
00:08:56,310 --> 00:08:55,040
we want to make sure that the spacecraft

228
00:08:58,949 --> 00:08:56,320
is behaving

229
00:09:01,509 --> 00:08:58,959
with this new mass distribution

230
00:09:04,790 --> 00:09:01,519
20 days after launch we will unfurl the

231
00:09:06,230 --> 00:09:04,800
large antenna it starts at 12 inches in

232
00:09:08,630 --> 00:09:06,240
diameter

233
00:09:10,949 --> 00:09:08,640
it's initially bloomed this is passive

234
00:09:12,870 --> 00:09:10,959
release of the strain energy

235
00:09:15,750 --> 00:09:12,880
that'll bloom the antenna out to about

236
00:09:18,790 --> 00:09:15,760
seven feet in diameter and then we will

237
00:09:21,430 --> 00:09:18,800
do the power deployment uh which will

238
00:09:24,230 --> 00:09:21,440

deploy the antenna out to its final

239
00:09:25,509 --> 00:09:24,240
20 foot in diameter

240
00:09:28,150 --> 00:09:25,519
size

241
00:09:30,710 --> 00:09:28,160
that process takes about 30 minutes to

242
00:09:32,389 --> 00:09:30,720
complete from start to finish

243
00:09:33,829 --> 00:09:32,399
and following that again we'll spend

244
00:09:35,509 --> 00:09:33,839
several days

245
00:09:37,430 --> 00:09:35,519
making sure that the reflector is

246
00:09:40,230 --> 00:09:37,440
properly deployed and that the

247
00:09:41,269 --> 00:09:40,240
spacecraft attitude is behaving as we we

248
00:09:44,150 --> 00:09:41,279
expect

249
00:09:46,550 --> 00:09:44,160
once we have the antenna deployed

250
00:09:48,630 --> 00:09:46,560
we will check out the instruments

251
00:09:51,030 --> 00:09:48,640
we will do our final adjustments to the

252
00:09:53,350 --> 00:09:51,040
science orbit and then

253
00:09:54,470 --> 00:09:53,360
50 days after

254
00:09:56,070 --> 00:09:54,480
launch

255
00:09:57,430 --> 00:09:56,080
we will begin the process of spinning

256
00:09:58,230 --> 00:09:57,440
this antenna

257
00:10:02,949 --> 00:09:58,240
up

258
00:10:05,190 --> 00:10:02,959
we initially

259
00:10:07,829 --> 00:10:05,200
want to spin up to just about four and a

260
00:10:10,150 --> 00:10:07,839
half rpm this is a low rate

261
00:10:11,990 --> 00:10:10,160
spin rate you'll notice as we begin to

262
00:10:14,069 --> 00:10:12,000
spin up that the spacecraft actually

263
00:10:15,269 --> 00:10:14,079

counter rotates in the opposite

264
00:10:17,910 --> 00:10:15,279
direction

265
00:10:19,509 --> 00:10:17,920
this is by design and is a feature of

266
00:10:21,990 --> 00:10:19,519
the fact that we're trying to spin up a

267
00:10:25,030 --> 00:10:22,000
very large structure with a relatively

268
00:10:27,509 --> 00:10:25,040
small spacecraft once the antenna has

269
00:10:29,350 --> 00:10:27,519
reached a stable spin rate

270
00:10:32,389 --> 00:10:29,360
the spacecraft attitude system will

271
00:10:34,550 --> 00:10:32,399
regain sun pointing very quickly

272
00:10:37,590 --> 00:10:34,560
and and we continue on

273
00:10:40,389 --> 00:10:37,600
uh we will stay at about four and a half

274
00:10:42,230 --> 00:10:40,399
rpm uh for a couple days again making

275
00:10:44,230 --> 00:10:42,240
sure that the spacecraft attitude is

276
00:10:46,389 --> 00:10:44,240
behaving as we expect

277
00:10:48,230 --> 00:10:46,399
and then we'll gradually

278
00:10:51,269 --> 00:10:48,240
increase the spin rate up to the full

279
00:10:53,829 --> 00:10:51,279
science spin rate of 14.6

280
00:10:56,389 --> 00:10:53,839
rpm all that should be completed

281
00:10:57,590 --> 00:10:56,399
by 60 days after launch

282
00:10:59,829 --> 00:10:57,600
then we'll go through the full

283
00:11:02,630 --> 00:10:59,839
instrument checkout we'll have both the

284
00:11:04,949 --> 00:11:02,640
radiometer and the radar sharing the the

285
00:11:08,069 --> 00:11:04,959
antenna aperture at the same time

286
00:11:09,910 --> 00:11:08,079
the beam is pointed about 40 degrees

287
00:11:12,230 --> 00:11:09,920
off to the side of the spacecraft so

288
00:11:15,110 --> 00:11:12,240

that as we spin the antenna

289
00:11:17,829 --> 00:11:15,120
a spot on the ground rotates under the

290
00:11:19,829 --> 00:11:17,839
spacecraft mapping out a swath that's a

291
00:11:23,110 --> 00:11:19,839
thousand kilometers wide

292
00:11:25,509 --> 00:11:23,120
this allows the smap uh observatory to

293
00:11:28,470 --> 00:11:25,519
map the entire earth in two to three

294
00:11:29,990 --> 00:11:28,480
days uh based on

295
00:11:32,069 --> 00:11:30,000
latitude

296
00:11:34,310 --> 00:11:32,079
so it's a very efficient

297
00:11:36,550 --> 00:11:34,320
mapping system

298
00:11:37,750 --> 00:11:36,560
the commissioning time frame will be

299
00:11:40,949 --> 00:11:37,760
completed

300
00:11:42,870 --> 00:11:40,959
about 90 days after after launch at

301
00:11:45,030 --> 00:11:42,880
which time we'll begin the

302
00:11:46,230 --> 00:11:45,040
science caliber calibration validation

303
00:11:49,269 --> 00:11:46,240
process

304
00:11:51,350 --> 00:11:49,279
now we've spent a lot of time doing a

305
00:11:53,269 --> 00:11:51,360
lot of testing

306
00:11:55,269 --> 00:11:53,279
on the system starting at the component

307
00:11:57,750 --> 00:11:55,279
level the assembly level the subsystem

308
00:11:59,829 --> 00:11:57,760
and then the eventually the system level

309
00:12:01,190 --> 00:11:59,839
if we can roll the build up and test

310
00:12:03,590 --> 00:12:01,200
sequence

311
00:12:07,030 --> 00:12:03,600
the spacecraft was assembled

312
00:12:09,030 --> 00:12:07,040
a year ago last fall the fall of 2013.

313
00:12:10,550 --> 00:12:09,040

this shows the solar array in one of its

314
00:12:12,790 --> 00:12:10,560
deployment tests

315
00:12:16,150 --> 00:12:12,800
uh the video that you're seeing now is

316
00:12:18,790 --> 00:12:16,160
the radar system uh the radar bounce

317
00:12:20,470 --> 00:12:18,800
on one of the spacecraft panels it's not

318
00:12:22,389 --> 00:12:20,480
part of the spinning

319
00:12:25,750 --> 00:12:22,399
complement and you see it being

320
00:12:27,990 --> 00:12:25,760
installed on the anti-sun panel this is

321
00:12:30,150 --> 00:12:28,000
the radiometer in a spin test that was

322
00:12:31,990 --> 00:12:30,160
completed right before we installed the

323
00:12:33,670 --> 00:12:32,000
radiometer and feed

324
00:12:37,590 --> 00:12:33,680
onto the spacecraft

325
00:12:39,590 --> 00:12:37,600
last january a year ago

326
00:12:41,910 --> 00:12:39,600
the last piece of the instrument that

327
00:12:43,030 --> 00:12:41,920
came together with the observatory is

328
00:12:45,670 --> 00:12:43,040
the large

329
00:12:47,910 --> 00:12:45,680
uh reflector antenna you see it in one

330
00:12:49,350 --> 00:12:47,920
of its many deployment tests that

331
00:12:51,269 --> 00:12:49,360
that we did

332
00:12:52,389 --> 00:12:51,279
it was installed on the observatory for

333
00:12:55,509 --> 00:12:52,399
the first time

334
00:12:57,509 --> 00:12:55,519
in january as well so that completed the

335
00:12:59,030 --> 00:12:57,519
the observatory assembly

336
00:13:00,870 --> 00:12:59,040
we've done a lot of testing over the

337
00:13:03,350 --> 00:13:00,880
last year including electromagnetic

338
00:13:05,269 --> 00:13:03,360

compatibility testing that you see here

339
00:13:06,550 --> 00:13:05,279
that's very important for an l-band

340
00:13:09,430 --> 00:13:06,560
microwave

341
00:13:11,430 --> 00:13:09,440
instrument we did dynamic testing which

342
00:13:13,110 --> 00:13:11,440
simulates the launch vehicle

343
00:13:14,949 --> 00:13:13,120
environments

344
00:13:17,430 --> 00:13:14,959
we did thermal vacuum testing which

345
00:13:19,110 --> 00:13:17,440
simulates the temperature and vacuum

346
00:13:21,190 --> 00:13:19,120
conditions in space

347
00:13:23,030 --> 00:13:21,200
all of our system level testing went

348
00:13:25,509 --> 00:13:23,040
extraordinarily well

349
00:13:27,829 --> 00:13:25,519
we had no major issues

350
00:13:29,110 --> 00:13:27,839
we completed our last mission scenario

351
00:13:31,910 --> 00:13:29,120
testing

352
00:13:33,829 --> 00:13:31,920
over the summer and early fall you see a

353
00:13:36,150 --> 00:13:33,839
spin test here

354
00:13:37,750 --> 00:13:36,160
that we did over the summer

355
00:13:40,870 --> 00:13:37,760
the observatory was shipped to

356
00:13:43,590 --> 00:13:40,880
vandenberg on october 15th it's now

357
00:13:45,509 --> 00:13:43,600
completed all the planned observatory

358
00:13:48,550 --> 00:13:45,519
level activities that we had planned for

359
00:13:51,750 --> 00:13:48,560
vandenberg the observatory is fueled and

360
00:13:53,189 --> 00:13:51,760
we began integrated operations with

361
00:13:55,590 --> 00:13:53,199
the united launch alliance in

362
00:13:57,829 --> 00:13:55,600
preparation for uh mating to the rocket

363
00:14:00,550 --> 00:13:57,839

uh this week and we'll actually mate to

364
00:14:02,389 --> 00:14:00,560
the rocket uh early next week

365
00:14:03,829 --> 00:14:02,399
so with all the testing and work that's

366
00:14:05,430 --> 00:14:03,839
going on behind this we have a lot of

367
00:14:08,069 --> 00:14:05,440
confidence that this mission will meet

368
00:14:11,750 --> 00:14:08,079
both its technical and scientific

369
00:14:14,389 --> 00:14:11,760
objectives and will enjoy a long and

370
00:14:15,990 --> 00:14:14,399
productive life in space and with that

371
00:14:18,949 --> 00:14:16,000
i'd like to turn it over to our science

372
00:14:20,550 --> 00:14:18,959
team leader professor dara entocabi of

373
00:14:22,150 --> 00:14:20,560
the massachusetts institute of

374
00:14:24,310 --> 00:14:22,160
technology

375
00:14:27,269 --> 00:14:24,320
thanks ken good afternoon

376
00:14:30,310 --> 00:14:27,279
the smap observatory carries two science

377
00:14:32,230 --> 00:14:30,320
packages a microwave radiometer and a

378
00:14:34,870 --> 00:14:32,240
microwave radar

379
00:14:37,189 --> 00:14:34,880
these two science instruments packages

380
00:14:39,350 --> 00:14:37,199
and the mission operations concepts are

381
00:14:41,750 --> 00:14:39,360
specifically optimized to provide high

382
00:14:44,790 --> 00:14:41,760
quality soil moisture data

383
00:14:45,990 --> 00:14:44,800
the radiometer instrument acts much like

384
00:14:47,750 --> 00:14:46,000
a camera

385
00:14:50,470 --> 00:14:47,760
it uh it

386
00:14:51,590 --> 00:14:50,480
sees the ambient light environment in

387
00:14:53,030 --> 00:14:51,600
this case

388
00:14:55,110 --> 00:14:53,040

beyond the visible range in the

389
00:14:57,269 --> 00:14:55,120
microwave range

390
00:15:00,150 --> 00:14:57,279
and the specific advantage of the

391
00:15:02,150 --> 00:15:00,160
microwave range is that you can see in

392
00:15:04,790 --> 00:15:02,160
daylight and at night

393
00:15:06,150 --> 00:15:04,800
you can unlike a conventional camera see

394
00:15:09,189 --> 00:15:06,160
through clouds

395
00:15:11,750 --> 00:15:09,199
you can penetrate moderate vegetation

396
00:15:13,829 --> 00:15:11,760
and in fact peer into the soil for a few

397
00:15:16,230 --> 00:15:13,839
inches to actually measure the volume of

398
00:15:19,030 --> 00:15:16,240
water in the soil that's the basis for

399
00:15:21,670 --> 00:15:19,040
using the radiometer to make the soil

400
00:15:22,949 --> 00:15:21,680
moisture measurements that map does

401
00:15:25,509 --> 00:15:22,959
now the

402
00:15:27,189 --> 00:15:25,519
resolution the feature size of the

403
00:15:29,590 --> 00:15:27,199
features on the ground that you can see

404
00:15:31,829 --> 00:15:29,600
with the radiometer is limited by the

405
00:15:32,870 --> 00:15:31,839
size of the antenna the reflector in

406
00:15:34,470 --> 00:15:32,880
this case

407
00:15:36,949 --> 00:15:34,480
and that's about

408
00:15:38,470 --> 00:15:36,959
40 kilometers for this map radiometer

409
00:15:40,389 --> 00:15:38,480
and antenna

410
00:15:41,189 --> 00:15:40,399
in order to augment

411
00:15:44,069 --> 00:15:41,199
that

412
00:15:46,389 --> 00:15:44,079
smap carries another instrument package

413
00:15:50,150 --> 00:15:46,399

which is the radar and that one acts

414
00:15:52,949 --> 00:15:50,160
like a flash camera it actually emits

415
00:15:55,110 --> 00:15:52,959
light or in this case a microwave pulse

416
00:15:56,790 --> 00:15:55,120
and looks at the reflection of that of

417
00:15:59,189 --> 00:15:56,800
the surface and much like the flash

418
00:16:01,990 --> 00:15:59,199
camera you can see a lot more detailed

419
00:16:04,790 --> 00:16:02,000
features on the surface but you're

420
00:16:07,030 --> 00:16:04,800
susceptible to scattering of the

421
00:16:08,790 --> 00:16:07,040
surface vegetation and surface roughness

422
00:16:11,189 --> 00:16:08,800
so it's less sensitive than the

423
00:16:12,949 --> 00:16:11,199
radiometer to solve moisture but it's at

424
00:16:14,949 --> 00:16:12,959
much higher resolution in fact on the

425
00:16:16,870 --> 00:16:14,959
order of three kilometers the

426
00:16:18,949 --> 00:16:16,880
combination of these two is what

427
00:16:20,949 --> 00:16:18,959
produces this map high quality soil

428
00:16:22,870 --> 00:16:20,959
moisture retrievals the mission

429
00:16:25,829 --> 00:16:22,880
operations concept is demonstrated in

430
00:16:28,629 --> 00:16:25,839
the video if you would run that please

431
00:16:31,509 --> 00:16:28,639
the um the observatory orbits the earth

432
00:16:34,790 --> 00:16:31,519
pole to pole at about 680

433
00:16:36,949 --> 00:16:34,800
kilometers and it rotates about itself

434
00:16:38,550 --> 00:16:36,959
as it's orbiting the earth in order to

435
00:16:42,150 --> 00:16:38,560
cover a white swat

436
00:16:44,949 --> 00:16:42,160
that is necessary in order to

437
00:16:47,269 --> 00:16:44,959
revisit the same spot on earth every two

438
00:16:49,509 --> 00:16:47,279

to three days depending on latitude here

439
00:16:51,269 --> 00:16:49,519
you see the radar making measurements

440
00:16:53,269 --> 00:16:51,279
highest resolution at the edges and

441
00:16:55,670 --> 00:16:53,279
here's the radiometer making its

442
00:16:58,629 --> 00:16:55,680
measurements throughout the

443
00:17:01,350 --> 00:16:58,639
swat using the same shared antenna and

444
00:17:03,990 --> 00:17:01,360
here is the slow motion retrieval based

445
00:17:06,949 --> 00:17:04,000
upon the combined radar radiometer

446
00:17:08,789 --> 00:17:06,959
measurements this strip gets

447
00:17:11,110 --> 00:17:08,799
is the result of one orbit around the

448
00:17:12,630 --> 00:17:11,120
earth here you see two orbits

449
00:17:14,949 --> 00:17:12,640
adjacent orbits

450
00:17:17,429 --> 00:17:14,959
that are about three hours apart and

451
00:17:19,270 --> 00:17:17,439
after two to three days the jigsaw

452
00:17:23,350 --> 00:17:19,280
puzzle gets filled and you get a global

453
00:17:24,150 --> 00:17:23,360
map of surface soil moisture

454
00:17:26,789 --> 00:17:24,160
now

455
00:17:28,710 --> 00:17:26,799
what's unique about smap science returns

456
00:17:30,870 --> 00:17:28,720
is that it has returns in two very

457
00:17:34,390 --> 00:17:30,880
distinct areas

458
00:17:36,070 --> 00:17:34,400
next slide please one of them is in

459
00:17:37,669 --> 00:17:36,080
fundamental understanding of how the

460
00:17:40,390 --> 00:17:37,679
environment works so it's addressing

461
00:17:42,630 --> 00:17:40,400
some fundamental earth science questions

462
00:17:46,470 --> 00:17:42,640
the second is in the arena of

463
00:17:49,510 --> 00:17:46,480

applications uh smap also provides data

464
00:17:50,390 --> 00:17:49,520
that affect our everyday lives in um in

465
00:17:52,630 --> 00:17:50,400
terms of

466
00:17:53,750 --> 00:17:52,640
dealing with some really serious natural

467
00:17:56,230 --> 00:17:53,760
hazards

468
00:17:59,990 --> 00:17:56,240
in terms of earth science

469
00:18:03,590 --> 00:18:00,000
the three fundamental cycles that make

470
00:18:06,230 --> 00:18:03,600
life possible on earth the water cycle

471
00:18:08,710 --> 00:18:06,240
the energy cycle and the carbon cycle

472
00:18:10,549 --> 00:18:08,720
over land are linked through the soil

473
00:18:12,710 --> 00:18:10,559
moisture variable if it wasn't for the

474
00:18:15,190 --> 00:18:12,720
solution variable these three processes

475
00:18:17,990 --> 00:18:15,200
over land would vary independently but

476
00:18:20,310 --> 00:18:18,000
they don't they work in concert like

477
00:18:22,150 --> 00:18:20,320
gears in a clock they are linked

478
00:18:24,230 --> 00:18:22,160
together through the

479
00:18:27,590 --> 00:18:24,240
soil moisture variable

480
00:18:30,789 --> 00:18:27,600
now if you're making um

481
00:18:32,870 --> 00:18:30,799
a projections of weather on a short-term

482
00:18:34,870 --> 00:18:32,880
basis numerical weather prediction zero

483
00:18:36,870 --> 00:18:34,880
to ten days or if you're making

484
00:18:38,789 --> 00:18:36,880
longer-term

485
00:18:41,110 --> 00:18:38,799
projections of climate for instance

486
00:18:44,230 --> 00:18:41,120
water availability under a changing

487
00:18:46,230 --> 00:18:44,240
climate variable variability in climate

488
00:18:47,110 --> 00:18:46,240

and global warming

489
00:18:50,710 --> 00:18:47,120
the

490
00:18:52,630 --> 00:18:50,720
regional

491
00:18:54,789 --> 00:18:52,640
water availability response are a

492
00:18:58,390 --> 00:18:54,799
function of how we link these three

493
00:19:00,870 --> 00:18:58,400
cycles together as water evaporates from

494
00:19:02,310 --> 00:19:00,880
soil water to vapor in the atmosphere it

495
00:19:04,230 --> 00:19:02,320
feeds the

496
00:19:07,669 --> 00:19:04,240
the water cycle

497
00:19:10,549 --> 00:19:07,679
it takes energy to vaporize water and it

498
00:19:12,230 --> 00:19:10,559
water vaporizing cools the surface and

499
00:19:15,270 --> 00:19:12,240
maintains the temperature much like

500
00:19:16,789 --> 00:19:15,280
humans have evolved through sweating to

501
00:19:18,310 --> 00:19:16,799
maintain and regulate the body

502
00:19:19,510 --> 00:19:18,320
temperature the same thing happens with

503
00:19:23,190 --> 00:19:19,520
the earth system

504
00:19:25,510 --> 00:19:23,200
and as plants transpire and pick up a

505
00:19:27,190 --> 00:19:25,520
biomass through

506
00:19:29,270 --> 00:19:27,200
absorbing carbon dioxide from the

507
00:19:31,590 --> 00:19:29,280
atmosphere and releasing water vapor

508
00:19:33,590 --> 00:19:31,600
they're engaged in the water and

509
00:19:35,590 --> 00:19:33,600
energy cycles as well so these three

510
00:19:37,510 --> 00:19:35,600
cycles are intimately linked through the

511
00:19:40,230 --> 00:19:37,520
water variable and through

512
00:19:43,029 --> 00:19:40,240
measurements that smap can make we can

513
00:19:44,870 --> 00:19:43,039

test and improve models that we use for

514
00:19:47,029 --> 00:19:44,880
atmospheric weather prediction and

515
00:19:50,549 --> 00:19:47,039
climate change projections

516
00:19:52,470 --> 00:19:50,559
now in terms of applications next slide

517
00:19:55,430 --> 00:19:52,480
there are some natural hazards which

518
00:19:57,110 --> 00:19:55,440
actually very much relate to the surface

519
00:19:59,669 --> 00:19:57,120
soil moisture and soil moisture

520
00:20:02,470 --> 00:19:59,679
measurements made my smap will directly

521
00:20:04,149 --> 00:20:02,480
feed into those i have here an example

522
00:20:05,830 --> 00:20:04,159
of a map

523
00:20:08,390 --> 00:20:05,840
put out by the national weather service

524
00:20:11,350 --> 00:20:08,400
this is updated every day it's produced

525
00:20:13,909 --> 00:20:11,360
at the 13 or so river forecast centers

526
00:20:17,029 --> 00:20:13,919
and basically this is a map county by

527
00:20:18,870 --> 00:20:17,039
county over the united states of

528
00:20:20,950 --> 00:20:18,880
the deficit in surface soil moisture

529
00:20:23,430 --> 00:20:20,960
that's the capacity of the soil to hold

530
00:20:25,909 --> 00:20:23,440
water minus the actual soil moisture

531
00:20:27,669 --> 00:20:25,919
it's in units of inches

532
00:20:29,909 --> 00:20:27,679
and what this map is used for is that

533
00:20:33,350 --> 00:20:29,919
river forecast centers produced this and

534
00:20:35,350 --> 00:20:33,360
then transmitted to about 122 weather

535
00:20:37,830 --> 00:20:35,360
forecast offices these are located

536
00:20:39,990 --> 00:20:37,840
around the country and what forecasters

537
00:20:41,590 --> 00:20:40,000
at weather forecast offices do is to

538
00:20:43,430 --> 00:20:41,600

look at this map the soil moisture

539
00:20:44,950 --> 00:20:43,440
deficit they look at the precipitation

540
00:20:46,710 --> 00:20:44,960
map that's

541
00:20:48,630 --> 00:20:46,720
incident at the moment

542
00:20:51,830 --> 00:20:48,640
and where they see precipitation

543
00:20:54,630 --> 00:20:51,840
exceeding the uh flash flood guidance or

544
00:20:56,230 --> 00:20:54,640
soil measure deficit they issue a flash

545
00:20:57,430 --> 00:20:56,240
flood warning or a flood warning

546
00:21:00,230 --> 00:20:57,440
immediately

547
00:21:02,950 --> 00:21:00,240
now this map of surface soil moisture

548
00:21:05,270 --> 00:21:02,960
cannot be generated from

549
00:21:07,110 --> 00:21:05,280
uh probes that are in the ground to

550
00:21:08,149 --> 00:21:07,120
measure soil moisture they're just far

551
00:21:09,990 --> 00:21:08,159
too

552
00:21:12,710 --> 00:21:10,000
far and fume between to be able to

553
00:21:13,990 --> 00:21:12,720
produce such a map at county level

554
00:21:15,669 --> 00:21:14,000
so what the

555
00:21:17,430 --> 00:21:15,679
operation does is that they take

556
00:21:19,830 --> 00:21:17,440
precipitation history measurements

557
00:21:22,149 --> 00:21:19,840
history of precipitation they use models

558
00:21:24,789 --> 00:21:22,159
to make an estimate of what they think

559
00:21:26,789 --> 00:21:24,799
the soil moisture ought to be now smap

560
00:21:27,909 --> 00:21:26,799
will make direct measurements of this

561
00:21:30,149 --> 00:21:27,919
variable

562
00:21:31,990 --> 00:21:30,159
at much higher resolution at about 10

563
00:21:33,270 --> 00:21:32,000

kilometer resolution rather than county

564
00:21:36,630 --> 00:21:33,280
level

565
00:21:37,990 --> 00:21:36,640
another example of smap applications is

566
00:21:38,870 --> 00:21:38,000
that the other extreme and the next

567
00:21:41,270 --> 00:21:38,880
slide

568
00:21:43,669 --> 00:21:41,280
this is the u.s drought monitor again

569
00:21:46,950 --> 00:21:43,679
this is an operational product that's in

570
00:21:50,630 --> 00:21:46,960
this case operate updated weekly

571
00:21:52,549 --> 00:21:50,640
this is an estimate of the agricultural

572
00:21:54,789 --> 00:21:52,559
drought that exists in the united states

573
00:21:57,669 --> 00:21:54,799
right now and you can see the big dry in

574
00:22:00,230 --> 00:21:57,679
california is very prominent in this

575
00:22:02,470 --> 00:22:00,240
latest graphic

576
00:22:05,270 --> 00:22:02,480
now the great definition of agricultural

577
00:22:07,669 --> 00:22:05,280
drought is a deficit in soil moisture

578
00:22:10,310 --> 00:22:07,679
and again in this case there's nowhere

579
00:22:12,950 --> 00:22:10,320
near adequate ground stations to be able

580
00:22:16,310 --> 00:22:12,960
to produce such a map so this map is

581
00:22:18,710 --> 00:22:16,320
also produced with models that are fed

582
00:22:20,950 --> 00:22:18,720
the history of precipitation in order to

583
00:22:23,830 --> 00:22:20,960
produce an estimate of surface soil

584
00:22:26,149 --> 00:22:23,840
moisture and again smap will produce

585
00:22:29,430 --> 00:22:26,159
direct measurements of this quantity at

586
00:22:31,830 --> 00:22:29,440
high resolution which will help refine

587
00:22:35,110 --> 00:22:31,840
and prepare these two important

588
00:22:37,190 --> 00:22:35,120

applications for the next generation

589
00:22:39,430 --> 00:22:37,200
and with that i'll turn it over to brad

590
00:22:42,549 --> 00:22:39,440
thanks tara hello everyone

591
00:22:45,669 --> 00:22:42,559
the applied research program of smap is

592
00:22:48,230 --> 00:22:45,679
targets opportunities for smap data sets

593
00:22:49,669 --> 00:22:48,240
to directly impact decision makers in

594
00:22:51,990 --> 00:22:49,679
the united states

595
00:22:55,190 --> 00:22:52,000
and around the world

596
00:22:57,510 --> 00:22:55,200
next slide please

597
00:22:59,990 --> 00:22:57,520
they do this by providing access to

598
00:23:01,270 --> 00:23:00,000
simulated data as you see here in this

599
00:23:04,070 --> 00:23:01,280
slide

600
00:23:06,390 --> 00:23:04,080
to applied users and applied researchers

601
00:23:08,470 --> 00:23:06,400
so they can evaluate this data in their

602
00:23:11,029 --> 00:23:08,480
decision making processes

603
00:23:12,549 --> 00:23:11,039
and and discover what it can be used for

604
00:23:14,230 --> 00:23:12,559
and how it's going to impact those

605
00:23:16,230 --> 00:23:14,240
processes

606
00:23:18,630 --> 00:23:16,240
the goals of the appliance map applied

607
00:23:21,029 --> 00:23:18,640
research program are to engage users

608
00:23:23,110 --> 00:23:21,039
early in the mission development process

609
00:23:24,390 --> 00:23:23,120
to improve the delivery of the data

610
00:23:26,230 --> 00:23:24,400
products

611
00:23:29,990 --> 00:23:26,240
and to incorporate that community

612
00:23:32,470 --> 00:23:30,000
feedback into the mission process

613
00:23:35,270 --> 00:23:32,480

now how do we meet those goals

614
00:23:36,710 --> 00:23:35,280
one way is to engage the community

615
00:23:40,230 --> 00:23:36,720
called the

616
00:23:42,710 --> 00:23:40,240
early adopters next slide please

617
00:23:44,390 --> 00:23:42,720
smap mission has 38

618
00:23:49,990 --> 00:23:44,400
early adopters

619
00:23:52,470 --> 00:23:50,000
data simulated data that this map

620
00:23:54,230 --> 00:23:52,480
mission provides

621
00:23:55,669 --> 00:23:54,240
now these early adopters come from the

622
00:23:58,470 --> 00:23:55,679
private sector they come from

623
00:24:00,549 --> 00:23:58,480
universities they come from

624
00:24:02,710 --> 00:24:00,559
government agencies and non-government

625
00:24:04,710 --> 00:24:02,720
agencies

626
00:24:06,710 --> 00:24:04,720
one of these early adopters is the

627
00:24:09,029 --> 00:24:06,720
united states department of agriculture

628
00:24:13,430 --> 00:24:09,039
foreign agricultural service next slide

629
00:24:19,750 --> 00:24:17,029
usda is responsible for assessing global

630
00:24:23,750 --> 00:24:19,760
crop production on a monthly basis

631
00:24:26,310 --> 00:24:23,760
and soil moisture is a major factor in

632
00:24:28,390 --> 00:24:26,320
crop production if not the major factor

633
00:24:30,789 --> 00:24:28,400
in crop production

634
00:24:33,350 --> 00:24:30,799
so as you can see here the model with

635
00:24:35,669 --> 00:24:33,360
the satellite simulated satellite data

636
00:24:36,710 --> 00:24:35,679
compared to the model data with just

637
00:24:41,269 --> 00:24:36,720
ground

638
00:24:43,909 --> 00:24:41,279

completeness the spatial resolution on

639
00:24:47,029 --> 00:24:43,919
the right side is much more significant

640
00:24:49,430 --> 00:24:47,039
than without the simulated data

641
00:24:51,510 --> 00:24:49,440
now we have many early adopters that are

642
00:24:53,510 --> 00:24:51,520
focused on our own water resource

643
00:24:55,269 --> 00:24:53,520
challenges in this nation

644
00:24:57,029 --> 00:24:55,279
one of those was mentioned

645
00:24:59,750 --> 00:24:57,039
earlier

646
00:25:01,350 --> 00:24:59,760
it's the united states drought monitor

647
00:25:03,590 --> 00:25:01,360
and it's run out of the national drought

648
00:25:05,430 --> 00:25:03,600
mitigation center at the university of

649
00:25:07,029 --> 00:25:05,440
nebraska-lincoln

650
00:25:08,789 --> 00:25:07,039
roll video

651
00:25:11,590 --> 00:25:08,799
soil moisture is really a critical

652
00:25:14,070 --> 00:25:11,600
component in understanding drought and

653
00:25:16,470 --> 00:25:14,080
where it's developing how severe it is

654
00:25:19,269 --> 00:25:16,480
traditionally soil moisture information

655
00:25:21,110 --> 00:25:19,279
has been acquired through ground-based

656
00:25:22,710 --> 00:25:21,120
measurements or probes in the soil which

657
00:25:25,190 --> 00:25:22,720
are few and far between so we're

658
00:25:26,710 --> 00:25:25,200
interested in smap to give us more

659
00:25:29,269 --> 00:25:26,720
detailed

660
00:25:31,269 --> 00:25:29,279
information on soil moisture variations

661
00:25:33,029 --> 00:25:31,279
across large areas really filling the

662
00:25:34,549 --> 00:25:33,039
gaps between where these sensors are on

663
00:25:36,789 --> 00:25:34,559

the ground to give us a more detailed

664
00:25:38,549 --> 00:25:36,799
spatial view of how things are changing

665
00:25:40,390 --> 00:25:38,559
in the soil over time

666
00:25:43,190 --> 00:25:40,400
as we get these data at a higher

667
00:25:44,950 --> 00:25:43,200
resolution covering the entire country

668
00:25:46,630 --> 00:25:44,960
we're going to do our jobs better when

669
00:25:48,070 --> 00:25:46,640
you see the drought monitor map coming

670
00:25:50,230 --> 00:25:48,080
out each week we're going to have more

671
00:25:51,990 --> 00:25:50,240
confidence and some of the inputs that

672
00:25:53,510 --> 00:25:52,000
we're looking at especially with regards

673
00:25:56,230 --> 00:25:53,520
to soil moisture are going to be of a

674
00:25:58,070 --> 00:25:56,240
higher level and of a greater quality

675
00:26:02,070 --> 00:25:58,080
and more utility than anything we've had

676
00:26:07,029 --> 00:26:04,310
the smart mission is a true innovator

677
00:26:09,590 --> 00:26:07,039
not only in its groundbreaking space

678
00:26:10,789 --> 00:26:09,600
technology and its critical basic

679
00:26:13,990 --> 00:26:10,799
research

680
00:26:16,230 --> 00:26:14,000
but also in its ability to integrate

681
00:26:19,029 --> 00:26:16,240
applied users early in the mission

682
00:26:22,830 --> 00:26:19,039
development process to accelerate

683
00:26:25,269 --> 00:26:22,840
the use of nasa data in decision making

684
00:26:27,269 --> 00:26:25,279
processes back to you steve

685
00:26:29,590 --> 00:26:27,279
okay thank you brad thank you to all our

686
00:26:32,230 --> 00:26:29,600
panelists all right we'll take questions

687
00:26:34,870 --> 00:26:32,240
now uh from both the media and those

688
00:26:37,110 --> 00:26:34,880

watching online uh just as a reminder if

689
00:26:39,029 --> 00:26:37,120
you are watching us online and would

690
00:26:40,230 --> 00:26:39,039
like to ask a question please use the

691
00:26:41,909 --> 00:26:40,240
hashtag

692
00:26:44,310 --> 00:26:41,919
asknasa

693
00:26:46,549 --> 00:26:44,320
for the media on the phone lines as a

694
00:26:48,950 --> 00:26:46,559
reminder if you want to ask a question

695
00:26:51,430 --> 00:26:48,960
press star one

696
00:26:53,190 --> 00:26:51,440
we'll start with

697
00:26:54,710 --> 00:26:53,200
a questions here in the audience before

698
00:26:56,710 --> 00:26:54,720
going to the phone line uh first

699
00:26:59,350 --> 00:26:56,720
question please identify yourself sir

700
00:27:00,870 --> 00:26:59,360
sure thanks steve uh eric hand with

701
00:27:03,350 --> 00:27:00,880
science magazine

702
00:27:04,230 --> 00:27:03,360
um uh i guess first questions for kent

703
00:27:06,950 --> 00:27:04,240
um

704
00:27:08,070 --> 00:27:06,960
i'm really impressed by this uh

705
00:27:09,269 --> 00:27:08,080
design

706
00:27:10,789 --> 00:27:09,279
i mean it looks like something out of a

707
00:27:12,950 --> 00:27:10,799
dr seuss book

708
00:27:15,350 --> 00:27:12,960
uh almost you know with this crazy boom

709
00:27:17,350 --> 00:27:15,360
and this really large reflector maybe

710
00:27:18,950 --> 00:27:17,360
you can tell tell us a little bit more

711
00:27:20,549 --> 00:27:18,960
about um

712
00:27:23,190 --> 00:27:20,559
uh why

713
00:27:25,830 --> 00:27:23,200

this particular design was chosen

714
00:27:28,950 --> 00:27:25,840
and also you know if it has any

715
00:27:30,389 --> 00:27:28,960
forerunners um if if this was

716
00:27:32,149 --> 00:27:30,399
you know completely

717
00:27:34,470 --> 00:27:32,159
uh created here just for this mission or

718
00:27:36,950 --> 00:27:34,480
or if it's based on any older technology

719
00:27:37,990 --> 00:27:36,960
older missions um and then finally you

720
00:27:40,389 --> 00:27:38,000
know what

721
00:27:43,029 --> 00:27:40,399
um what the the most challenging part of

722
00:27:45,350 --> 00:27:43,039
this design is what's the riskiest

723
00:27:48,789 --> 00:27:45,360
uh part of all these moving parts and

724
00:27:50,389 --> 00:27:48,799
and weird torques and crazy unfolding

725
00:27:51,750 --> 00:27:50,399
booms thanks

726
00:27:52,789 --> 00:27:51,760
okay thank you

727
00:27:54,710 --> 00:27:52,799
um

728
00:27:56,710 --> 00:27:54,720
yeah let's see there were several uh

729
00:27:58,950 --> 00:27:56,720
parts to the question first of all why

730
00:28:01,909 --> 00:27:58,960
why this design when you have two

731
00:28:03,350 --> 00:28:01,919
instruments sharing a common aperture

732
00:28:06,870 --> 00:28:03,360
a reflector

733
00:28:09,029 --> 00:28:06,880
is a very efficient and cost-effective

734
00:28:11,190 --> 00:28:09,039
way to allow those those

735
00:28:12,630 --> 00:28:11,200
two instruments to share that aperture

736
00:28:15,350 --> 00:28:12,640
if we had to use something like an

737
00:28:18,070 --> 00:28:15,360
active array we'd basically have to have

738
00:28:19,830 --> 00:28:18,080

multiple sets of array electronics

739
00:28:22,549 --> 00:28:19,840
to support each instrument function here

740
00:28:24,549 --> 00:28:22,559
we can have those electronics integrated

741
00:28:26,149 --> 00:28:24,559
comfortably in boxes

742
00:28:27,909 --> 00:28:26,159
where they where they could be more

743
00:28:29,669 --> 00:28:27,919
efficiently packaged

744
00:28:31,990 --> 00:28:29,679
and the reflector supports both both

745
00:28:33,510 --> 00:28:32,000
functions very very efficiently

746
00:28:35,190 --> 00:28:33,520
the spinning approach as we mentioned

747
00:28:38,870 --> 00:28:35,200
that's been used before

748
00:28:41,590 --> 00:28:38,880
for other uh other science missions like

749
00:28:44,389 --> 00:28:41,600
quikscat and seawinds for example they

750
00:28:47,269 --> 00:28:44,399
used a spinning antenna very much

751
00:28:50,470 --> 00:28:47,279
similar to this much smaller size

752
00:28:51,590 --> 00:28:50,480
to again map the entire oceans in that

753
00:28:53,350 --> 00:28:51,600
case

754
00:28:54,149 --> 00:28:53,360
very efficiently

755
00:28:56,310 --> 00:28:54,159
these

756
00:28:58,389 --> 00:28:56,320
large reflector antennas have been

757
00:28:59,669 --> 00:28:58,399
commonly used for

758
00:29:01,510 --> 00:28:59,679
communication

759
00:29:05,269 --> 00:29:01,520
satellites typically in fact actually

760
00:29:07,830 --> 00:29:05,279
much larger antennas have been flown

761
00:29:10,549 --> 00:29:07,840
we are a smaller variant of a design

762
00:29:12,389 --> 00:29:10,559
produced by northrop grumman so we've

763
00:29:13,430 --> 00:29:12,399

we've scaled down

764
00:29:16,070 --> 00:29:13,440
um

765
00:29:17,990 --> 00:29:16,080
and uh the uh we've done a lot of

766
00:29:21,190 --> 00:29:18,000
testing on this particularly over the

767
00:29:23,750 --> 00:29:21,200
last year to make sure that we have high

768
00:29:25,350 --> 00:29:23,760
confidence that will uh it will work as

769
00:29:27,269 --> 00:29:25,360
as intended during the deployment

770
00:29:30,070 --> 00:29:27,279
process

771
00:29:32,870 --> 00:29:30,080
does that answer the question okay

772
00:29:35,269 --> 00:29:32,880
okay we'll go to the phone lines with

773
00:29:37,350 --> 00:29:35,279
our first question from sandin totten

774
00:29:38,710 --> 00:29:37,360
southern california public radio go

775
00:29:40,789 --> 00:29:38,720
ahead and send it

776
00:29:42,389 --> 00:29:40,799
hi thanks a lot for um for explaining

777
00:29:43,269 --> 00:29:42,399
all this um i have two questions one

778
00:29:44,470 --> 00:29:43,279
that should be relatively

779
00:29:46,630 --> 00:29:44,480
straightforward and another maybe a

780
00:29:48,230 --> 00:29:46,640
little more complicated the first do we

781
00:29:51,350 --> 00:29:48,240
know what percentage of the earth's

782
00:29:53,110 --> 00:29:51,360
water is in soil moisture across the

783
00:29:54,549 --> 00:29:53,120
globe like what kind of

784
00:29:56,870 --> 00:29:54,559
numbers it represents

785
00:29:57,990 --> 00:29:56,880
in terms of the overall water and second

786
00:29:59,190 --> 00:29:58,000
i was wondering you know we're here in

787
00:30:00,070 --> 00:29:59,200
california we're struggling with this

788
00:30:01,750 --> 00:30:00,080

drought i was wondering if you could go

789
00:30:03,750 --> 00:30:01,760
into a little more detail about how this

790
00:30:05,110 --> 00:30:03,760
data could actually be used not just to

791
00:30:07,430 --> 00:30:05,120
give us a picture of the drought but to

792
00:30:10,470 --> 00:30:07,440
maybe help us deal with it or predict

793
00:30:15,750 --> 00:30:12,870
okay i'll take that the fraction of

794
00:30:19,029 --> 00:30:15,760
water that's in soil is actually tiny

795
00:30:21,190 --> 00:30:19,039
it's much less than one percent about 97

796
00:30:23,029 --> 00:30:21,200
percent of the water in the globe

797
00:30:25,510 --> 00:30:23,039
is locked up in the oceans

798
00:30:27,909 --> 00:30:25,520
and the rest of that is in

799
00:30:28,710 --> 00:30:27,919
the cryosphere in the ice

800
00:30:31,190 --> 00:30:28,720
but

801
00:30:33,269 --> 00:30:31,200
that small percentage does in the soil

802
00:30:35,510 --> 00:30:33,279
is rather

803
00:30:37,909 --> 00:30:35,520
important and very active because it's

804
00:30:40,070 --> 00:30:37,919
what's interacting with the terrestrial

805
00:30:41,190 --> 00:30:40,080
biosphere with the vegetation

806
00:30:43,909 --> 00:30:41,200
it's what's

807
00:30:46,470 --> 00:30:43,919
determining how much runoff occurs due

808
00:30:49,029 --> 00:30:46,480
to incident precipitation how much fresh

809
00:30:52,389 --> 00:30:49,039
water there is in the rivers and lakes

810
00:30:54,310 --> 00:30:52,399
and so it's it's a tiny amount but a

811
00:30:56,389 --> 00:30:54,320
very important amount it's not the

812
00:30:58,549 --> 00:30:56,399
percentage of the total that's important

813
00:31:00,070 --> 00:30:58,559

but where that soil moisture is and what

814
00:31:01,590 --> 00:31:00,080
is affecting

815
00:31:03,990 --> 00:31:01,600
the second question

816
00:31:06,070 --> 00:31:04,000
does that address your first question oh

817
00:31:10,230 --> 00:31:06,080
yeah totally thank you okay the second

818
00:31:16,389 --> 00:31:13,029
the measurements that smap makes

819
00:31:18,389 --> 00:31:16,399
will be direct measurements of the

820
00:31:21,669 --> 00:31:18,399
indicator of agricultural drought which

821
00:31:23,750 --> 00:31:21,679
is as the deficit in soil moisture so it

822
00:31:25,750 --> 00:31:23,760
will produce a

823
00:31:27,750 --> 00:31:25,760
high resolution at about 10 kilometer

824
00:31:29,509 --> 00:31:27,760
resolution

825
00:31:32,950 --> 00:31:29,519
map of the drought

826
00:31:35,350 --> 00:31:32,960
but droughts are initiated forced and

827
00:31:38,310 --> 00:31:35,360
maintained but much larger scale

828
00:31:39,909 --> 00:31:38,320
processes things such as the

829
00:31:42,470 --> 00:31:39,919
interaction between the oceans in the

830
00:31:45,430 --> 00:31:42,480
atmosphere and over land and over

831
00:31:47,990 --> 00:31:45,440
continental regions land and atmosphere

832
00:31:51,269 --> 00:31:48,000
so it's not just mapping the local

833
00:31:53,669 --> 00:31:51,279
california region but seeing how the

834
00:31:56,549 --> 00:31:53,679
continents as a whole

835
00:31:58,549 --> 00:31:56,559
reinforce and feedback onto the climate

836
00:32:01,990 --> 00:31:58,559
system in order to make these things

837
00:32:03,669 --> 00:32:02,000
last beyond just weather scale

838
00:32:05,990 --> 00:32:03,679

okay our next question from the phone

839
00:32:08,310 --> 00:32:06,000
lines is roseanne skirble voice of

840
00:32:10,630 --> 00:32:08,320
america um yeah thank you very much for

841
00:32:13,029 --> 00:32:10,640
doing this um my question is is how this

842
00:32:15,110 --> 00:32:13,039
house map fits into the the complement

843
00:32:16,470 --> 00:32:15,120
of earth monitoring

844
00:32:19,990 --> 00:32:16,480
instruments that were launched over the

845
00:32:23,029 --> 00:32:20,000
last uh over the last year and and what

846
00:32:27,590 --> 00:32:23,039
what it can do that we can't do we

847
00:32:32,149 --> 00:32:29,269
all right i'll i'll take the first part

848
00:32:33,830 --> 00:32:32,159
of that um

849
00:32:35,990 --> 00:32:33,840
one of the things that nasa is trying to

850
00:32:37,669 --> 00:32:36,000
do is to look at

851
00:32:39,350 --> 00:32:37,679
make sure that we have ways of measuring

852
00:32:41,830 --> 00:32:39,360
the various parts of the different

853
00:32:44,789 --> 00:32:41,840
cycles the energy cycle the water cycle

854
00:32:46,389 --> 00:32:44,799
the carbon cycle and so smap fits into

855
00:32:49,110 --> 00:32:46,399
that with going through the soil

856
00:32:50,870 --> 00:32:49,120
moisture which we here at nasa have not

857
00:32:53,029 --> 00:32:50,880
been collecting

858
00:32:55,190 --> 00:32:53,039
recently

859
00:32:57,430 --> 00:32:55,200
but i will turn it over to dara to

860
00:33:00,389 --> 00:32:57,440
answer the rest of that question

861
00:33:02,789 --> 00:33:00,399
i think next year next couple of years

862
00:33:05,430 --> 00:33:02,799
is going to be very exciting for earth

863
00:33:08,710 --> 00:33:05,440

science because of gpm

864
00:33:11,269 --> 00:33:08,720
map and oco-2 these are three missions

865
00:33:14,549 --> 00:33:11,279
that are measuring three variables in

866
00:33:17,269 --> 00:33:14,559
the water and carbon cycle that's

867
00:33:18,549 --> 00:33:17,279
forcing the global system so oco-2 will

868
00:33:20,149 --> 00:33:18,559
produce

869
00:33:21,590 --> 00:33:20,159
carbon dioxide

870
00:33:24,789 --> 00:33:21,600
profile

871
00:33:26,950 --> 00:33:24,799
columnar column dioxide measurements as

872
00:33:29,110 --> 00:33:26,960
well as fluorescence it will measure how

873
00:33:30,149 --> 00:33:29,120
much photosynthesis is going on in

874
00:33:32,149 --> 00:33:30,159
plants

875
00:33:35,350 --> 00:33:32,159
that with smap is a very powerful

876
00:33:38,710 --> 00:33:35,360
measurement you can you can decipher

877
00:33:40,230 --> 00:33:38,720
how the terrestrial biosphere vegetation

878
00:33:41,590 --> 00:33:40,240
is responding to soil moisture

879
00:33:44,389 --> 00:33:41,600
variations

880
00:33:46,389 --> 00:33:44,399
with gpm precipitation and soil moisture

881
00:33:49,350 --> 00:33:46,399
the connections are obvious those are

882
00:33:51,430 --> 00:33:49,360
the one of them is the principal flux in

883
00:33:53,350 --> 00:33:51,440
the water cycle the other one soil

884
00:33:55,750 --> 00:33:53,360
moisture is a principle

885
00:33:57,430 --> 00:33:55,760
state variable in the terrestrial water

886
00:33:59,669 --> 00:33:57,440
cycle so the two together is really

887
00:34:01,590 --> 00:33:59,679
powerful

888
00:34:03,750 --> 00:34:01,600

okay one more question uh we have on the

889
00:34:06,389 --> 00:34:03,760
phone line frank mooring aviation week

890
00:34:08,310 --> 00:34:06,399
go ahead frank

891
00:34:10,230 --> 00:34:08,320
thank you um

892
00:34:11,669 --> 00:34:10,240
i'm interested to know how sort of the

893
00:34:12,629 --> 00:34:11,679
follow up on that last question and

894
00:34:15,669 --> 00:34:12,639
that's

895
00:34:17,510 --> 00:34:15,679
how the data from the um

896
00:34:19,030 --> 00:34:17,520
the smap instruments

897
00:34:22,470 --> 00:34:19,040
would

898
00:34:28,069 --> 00:34:22,480
be used to calibrate or refine or

899
00:34:31,349 --> 00:34:29,109
orbiting instruments and i'm

900
00:34:33,589 --> 00:34:31,359
particularly interested in grace which

901
00:34:35,829 --> 00:34:33,599
the gray satellites which i understand

902
00:34:37,829 --> 00:34:35,839
measure the the ground

903
00:34:39,829 --> 00:34:37,839
or the the reservoirs of water and

904
00:34:41,349 --> 00:34:39,839
drought conditions and this is an

905
00:34:44,389 --> 00:34:41,359
unrelated question but i'll go ahead and

906
00:34:45,190 --> 00:34:44,399
ask it and that's

907
00:34:47,270 --> 00:34:45,200
for

908
00:34:49,750 --> 00:34:47,280
kent kellogg how the

909
00:34:52,149 --> 00:34:49,760
the reflect of the single aperture

910
00:34:53,909 --> 00:34:52,159
the reflector handles an active and a

911
00:34:55,190 --> 00:34:53,919
passive um

912
00:34:56,869 --> 00:34:55,200
signal at the same time are they

913
00:34:57,750 --> 00:34:56,879

different frequencies or how does that

914
00:35:00,710 --> 00:34:57,760
work

915
00:35:04,230 --> 00:35:02,870
so go with the first one so

916
00:35:06,870 --> 00:35:04,240
grace

917
00:35:08,470 --> 00:35:06,880
is a fantastic mission it's a it

918
00:35:11,270 --> 00:35:08,480
measures gravity anomalies it's a

919
00:35:13,030 --> 00:35:11,280
non-photonic remote sensing mission it

920
00:35:14,790 --> 00:35:13,040
produces

921
00:35:17,510 --> 00:35:14,800
estimates of

922
00:35:20,230 --> 00:35:17,520
density variations much of it due to the

923
00:35:22,710 --> 00:35:20,240
columnar water that exists everywhere

924
00:35:24,950 --> 00:35:22,720
from the atmosphere the precipitable

925
00:35:27,349 --> 00:35:24,960
water all the way to surface soil

926
00:35:29,990 --> 00:35:27,359
moisture and into the groundwater

927
00:35:33,190 --> 00:35:30,000
so it's it's a measurement of the total

928
00:35:34,550 --> 00:35:33,200
integrated water that it it sees

929
00:35:36,390 --> 00:35:34,560
but it's at

930
00:35:37,589 --> 00:35:36,400
fairly coarse resolutions hundreds of

931
00:35:38,630 --> 00:35:37,599
kilometers

932
00:35:40,710 --> 00:35:38,640
there's

933
00:35:41,510 --> 00:35:40,720
significant activities going on right

934
00:35:44,150 --> 00:35:41,520
now

935
00:35:46,390 --> 00:35:44,160
the combining surface soil moisture

936
00:35:48,630 --> 00:35:46,400
measurements which respond on weather

937
00:35:50,790 --> 00:35:48,640
time scales and on very

938
00:35:53,750 --> 00:35:50,800

small spatial

939
00:35:56,310 --> 00:35:53,760
scales and grace measurements which are

940
00:35:58,950 --> 00:35:56,320
columnar and much coarser resolution and

941
00:36:00,790 --> 00:35:58,960
and together with models these two very

942
00:36:02,870 --> 00:36:00,800
different resolution and very different

943
00:36:04,790 --> 00:36:02,880
sensing depth measurements can get

944
00:36:06,390 --> 00:36:04,800
integrated in order to produce a much

945
00:36:09,430 --> 00:36:06,400
better picture of the terrestrial water

946
00:36:12,230 --> 00:36:09,440
cycle so this is an ongoing and

947
00:36:15,270 --> 00:36:12,240
well-recognized activity

948
00:36:19,670 --> 00:36:15,280
okay the second question was how do the

949
00:36:21,750 --> 00:36:19,680
radar and radiometer coexist

950
00:36:23,190 --> 00:36:21,760
operationally on the same mission

951
00:36:24,950 --> 00:36:23,200
it's a great question because you have

952
00:36:27,349 --> 00:36:24,960
this very noisy

953
00:36:30,069 --> 00:36:27,359
active radar

954
00:36:31,990 --> 00:36:30,079
uh sharing the same aperture with a very

955
00:36:34,470 --> 00:36:32,000
sensitive scientific receiver that wants

956
00:36:35,589 --> 00:36:34,480
to live in a very quiet

957
00:36:37,430 --> 00:36:35,599
neighborhood so it's a little bit like

958
00:36:40,470 --> 00:36:37,440
having a rock band

959
00:36:42,950 --> 00:36:40,480
sitting next door to a library

960
00:36:43,910 --> 00:36:42,960
and the way we deal with that

961
00:36:46,790 --> 00:36:43,920
is

962
00:36:48,710 --> 00:36:46,800
the the two measurements are

963
00:36:50,310 --> 00:36:48,720

at different frequencies first of all so

964
00:36:52,550 --> 00:36:50,320
that helps

965
00:36:55,190 --> 00:36:52,560
the radiometer actually listens in

966
00:36:56,710 --> 00:36:55,200
between the radar pulses so remember the

967
00:36:59,349 --> 00:36:56,720
radar is an active instrument that's

968
00:37:01,109 --> 00:36:59,359
sending out pulses very short pulses and

969
00:37:03,589 --> 00:37:01,119
then it's listening for a relatively

970
00:37:06,230 --> 00:37:03,599
long period of time and the radiometer

971
00:37:08,390 --> 00:37:06,240
can use that long period of time to

972
00:37:11,349 --> 00:37:08,400
acquire its measurement

973
00:37:13,030 --> 00:37:11,359
and and then we have another layer of of

974
00:37:15,430 --> 00:37:13,040
insulation if you will we have a great

975
00:37:18,630 --> 00:37:15,440
deal of filtering built into the system

976
00:37:20,790 --> 00:37:18,640
to make sure that the the radiometer is

977
00:37:22,390 --> 00:37:20,800
protected from any noise that's being

978
00:37:23,990 --> 00:37:22,400
generated by the radar

979
00:37:25,190 --> 00:37:24,000
and of course in ground testing we spend

980
00:37:27,349 --> 00:37:25,200
a lot of time

981
00:37:30,230 --> 00:37:27,359
evaluating those two instruments working

982
00:37:33,589 --> 00:37:30,240
together and making sure that

983
00:37:35,750 --> 00:37:33,599
the radiometer is not perturbed uh by

984
00:37:37,190 --> 00:37:35,760
the by the radar operation so that's a

985
00:37:39,270 --> 00:37:37,200
very good question

986
00:37:42,950 --> 00:37:39,280
by the way we're not the first mission

987
00:37:45,510 --> 00:37:42,960
to fly a radiometer and a radar together

988
00:37:47,829 --> 00:37:45,520

aquarius did that as well so there is

989
00:37:48,870 --> 00:37:47,839
some some heritage and legacy there that

990
00:37:51,349 --> 00:37:48,880
we've

991
00:37:54,230 --> 00:37:51,359
benefited from and then built on that

992
00:37:55,270 --> 00:37:54,240
so did that answer your question

993
00:37:57,270 --> 00:37:55,280
thank you

994
00:37:59,510 --> 00:37:57,280
okay well we'll take a couple questions

995
00:38:02,150 --> 00:37:59,520
at this point from social media over to

996
00:38:06,150 --> 00:38:03,670
hello our first question here comes from

997
00:38:08,310 --> 00:38:06,160
twitter user william who asks curious

998
00:38:09,829 --> 00:38:08,320
why 50 days before the antenna is spun

999
00:38:13,109 --> 00:38:09,839
up or 20 days before the antenna is

1000
00:38:15,190 --> 00:38:13,119
deployed just an abundance of caution

1001
00:38:17,750 --> 00:38:15,200
no uh it's actually a very good question

1002
00:38:19,349 --> 00:38:17,760
we we lay out very carefully

1003
00:38:21,030 --> 00:38:19,359
the sequence of events that we want to

1004
00:38:23,190 --> 00:38:21,040
do after launch

1005
00:38:25,430 --> 00:38:23,200
we want to deploy the antenna as soon as

1006
00:38:27,270 --> 00:38:25,440
possible after launch but we can't do

1007
00:38:29,670 --> 00:38:27,280
that until we get all the engineering

1008
00:38:31,270 --> 00:38:29,680
subsystems sufficiently checked out so

1009
00:38:33,270 --> 00:38:31,280
that we know the attitude control is

1010
00:38:35,349 --> 00:38:33,280
working we know that the communication

1011
00:38:37,589 --> 00:38:35,359
system is working we have a cadence

1012
00:38:39,349 --> 00:38:37,599
established with the ground system uh

1013
00:38:41,510 --> 00:38:39,359

you know things there has to be a

1014
00:38:43,190 --> 00:38:41,520
certain infrastructure working and

1015
00:38:44,310 --> 00:38:43,200
operational

1016
00:38:48,630 --> 00:38:44,320
with the

1017
00:38:50,950 --> 00:38:48,640
the antenna uh the spinning operation

1018
00:38:53,030 --> 00:38:50,960
there's a little more flexibility there

1019
00:38:55,510 --> 00:38:53,040
we decided we wanted to do our final

1020
00:38:58,390 --> 00:38:55,520
orbit adjustments before we spun up the

1021
00:39:00,630 --> 00:38:58,400
antenna and uh but we need to get the

1022
00:39:03,270 --> 00:39:00,640
antenna spun up in order for us to

1023
00:39:05,990 --> 00:39:03,280
complete the final steps of the

1024
00:39:10,069 --> 00:39:06,000
observatory

1025
00:39:11,510 --> 00:39:10,079
margin days built in so there is a

1026
00:39:12,550 --> 00:39:11,520
little bit of conservatism in the

1027
00:39:14,230 --> 00:39:12,560
schedule

1028
00:39:15,910 --> 00:39:14,240
we don't want to rush we want to be very

1029
00:39:17,990 --> 00:39:15,920
careful and deliberate and make sure we

1030
00:39:19,990 --> 00:39:18,000
have a chance to look at the data before

1031
00:39:22,069 --> 00:39:20,000
we go on to the next step of the

1032
00:39:24,230 --> 00:39:22,079
commissioning activity

1033
00:39:25,670 --> 00:39:24,240
but there is a very logical thought out

1034
00:39:26,710 --> 00:39:25,680
sequence and there's not that much

1035
00:39:28,630 --> 00:39:26,720
margin

1036
00:39:33,510 --> 00:39:28,640
you know embedded in it but great

1037
00:39:37,510 --> 00:39:35,510
all right next question uh is actually a

1038
00:39:39,990 --> 00:39:37,520

couple of them combined from about data

1039
00:39:42,069 --> 00:39:40,000
here carl on twitter asks what time

1040
00:39:44,550 --> 00:39:42,079
frame will smap data become available

1041
00:39:46,950 --> 00:39:44,560
publicly also will this be available via

1042
00:39:49,109 --> 00:39:46,960
ftp or data catalog

1043
00:39:50,790 --> 00:39:49,119
also mike on ustreams asking once the

1044
00:39:54,829 --> 00:39:50,800
data is made available to the public

1045
00:39:59,030 --> 00:39:56,790
day the

1046
00:40:00,790 --> 00:39:59,040
science data acquisition begins three

1047
00:40:03,349 --> 00:40:00,800
months after launch after all the

1048
00:40:06,550 --> 00:40:03,359
commissioning has been completed

1049
00:40:07,829 --> 00:40:06,560
the data will undergo evaluation in the

1050
00:40:09,190 --> 00:40:07,839
data that comes down has to be

1051
00:40:11,510 --> 00:40:09,200
calibrated

1052
00:40:13,910 --> 00:40:11,520
and validated that's intense activity at

1053
00:40:16,950 --> 00:40:13,920
the beginning the first release of the

1054
00:40:19,109 --> 00:40:16,960
geophysical products takes place at

1055
00:40:20,470 --> 00:40:19,119
six months after the start of the data

1056
00:40:23,270 --> 00:40:20,480
acquisition that's called the beta

1057
00:40:25,430 --> 00:40:23,280
release the instrument data

1058
00:40:27,430 --> 00:40:25,440
the radar and radiometer measurements

1059
00:40:29,109 --> 00:40:27,440
will get released three months after

1060
00:40:30,790 --> 00:40:29,119
acquisition this is just to make sure

1061
00:40:33,109 --> 00:40:30,800
that all the

1062
00:40:35,750 --> 00:40:33,119
calibration offsets have been

1063
00:40:37,750 --> 00:40:35,760

implemented and then the validated data

1064
00:40:41,109 --> 00:40:37,760
gets released after

1065
00:40:43,430 --> 00:40:41,119
one year so that's the data that's been

1066
00:40:45,190 --> 00:40:43,440
through the validation process the early

1067
00:40:47,030 --> 00:40:45,200
adopters

1068
00:40:49,270 --> 00:40:47,040
enter agreement with

1069
00:40:50,550 --> 00:40:49,280
the project and they get access to the

1070
00:40:52,950 --> 00:40:50,560
data

1071
00:40:55,109 --> 00:40:52,960
alongside the science team because they

1072
00:40:57,109 --> 00:40:55,119
are critical in the calibration and

1073
00:40:59,270 --> 00:40:57,119
validation as well and they that gets

1074
00:41:02,470 --> 00:40:59,280
them a chance to prepare to use the data

1075
00:41:03,670 --> 00:41:02,480
operationally so the data gets released

1076
00:41:07,829 --> 00:41:03,680
uh

1077
00:41:12,150 --> 00:41:09,910
wonderful last question here from

1078
00:41:14,870 --> 00:41:12,160
twitter user named katie could the data

1079
00:41:16,870 --> 00:41:14,880
from smap theoretically help us predict

1080
00:41:23,510 --> 00:41:16,880
and possibly even mitigate or negate the

1081
00:41:29,430 --> 00:41:27,349
the mitigation of droughts happens by

1082
00:41:31,030 --> 00:41:29,440
knowledge of

1083
00:41:33,990 --> 00:41:31,040
where it's happening

1084
00:41:35,030 --> 00:41:34,000
how it's expanding and the prospects of

1085
00:41:38,069 --> 00:41:35,040
it

1086
00:41:40,470 --> 00:41:38,079
going away obviously we can't affect the

1087
00:41:43,510 --> 00:41:40,480
uh the drought itself that's a natural

1088
00:41:45,510 --> 00:41:43,520

phenomena but how we react to it and how

1089
00:41:47,510 --> 00:41:45,520
vulnerable our systems are our food

1090
00:41:52,870 --> 00:41:47,520
systems

1091
00:41:55,190 --> 00:41:52,880
are is going to get affected by what

1092
00:41:56,150 --> 00:41:55,200
information we have in order to deal

1093
00:42:00,630 --> 00:41:56,160
with it

1094
00:42:05,750 --> 00:42:02,710
okay our next question is from the phone

1095
00:42:06,790 --> 00:42:05,760
lines uh irene klotz at reuters go ahead

1096
00:42:08,870 --> 00:42:06,800
irene

1097
00:42:10,230 --> 00:42:08,880
thanks very much i just was wondering if

1098
00:42:15,510 --> 00:42:10,240
someone had a

1099
00:42:18,790 --> 00:42:17,030
the overall

1100
00:42:20,790 --> 00:42:18,800
commitment for nasa was that we would

1101
00:42:29,190 --> 00:42:20,800
produce launch and operate this mission

1102
00:42:32,710 --> 00:42:30,710
okay our next

1103
00:42:34,550 --> 00:42:32,720
including launch including launch yes

1104
00:42:35,750 --> 00:42:34,560
sir

1105
00:42:38,150 --> 00:42:35,760
all right our next question from the

1106
00:42:41,670 --> 00:42:38,160
phone lines is becky austin from live

1107
00:42:46,150 --> 00:42:43,030
hi can you

1108
00:42:49,510 --> 00:42:46,160
somebody address why it's important to

1109
00:42:53,349 --> 00:42:49,520
measure whether the soil moisture is

1110
00:42:56,069 --> 00:42:53,359
frozen or liquid and how that relates to

1111
00:42:58,390 --> 00:42:56,079
for example flooding hazards or other

1112
00:43:01,030 --> 00:42:58,400
hazards that the mission will contribute

1113
00:43:05,990 --> 00:43:02,870

that um the

1114
00:43:06,950 --> 00:43:06,000
frozen thought classification is one of

1115
00:43:09,190 --> 00:43:06,960
the

1116
00:43:11,270 --> 00:43:09,200
products that this map mission will

1117
00:43:13,670 --> 00:43:11,280
produce is mostly based upon the high

1118
00:43:16,150 --> 00:43:13,680
resolution radar there is a very strong

1119
00:43:19,829 --> 00:43:16,160
signal change when the soil and the

1120
00:43:22,069 --> 00:43:19,839
landscape freezes and when it's thought

1121
00:43:23,990 --> 00:43:22,079
the principal reason that we're

1122
00:43:26,870 --> 00:43:24,000
interested in that is the carbon cycle

1123
00:43:29,829 --> 00:43:26,880
but flooding is obviously also affected

1124
00:43:33,109 --> 00:43:29,839
by frozen and salt surfaces

1125
00:43:36,309 --> 00:43:33,119
the vast boreal forests in

1126
00:43:38,470 --> 00:43:36,319
alaska northern canada and vast regions

1127
00:43:39,270 --> 00:43:38,480
of siberia there's a lot of biomass

1128
00:43:42,309 --> 00:43:39,280
there

1129
00:43:44,390 --> 00:43:42,319
and in the net this biomass picks up

1130
00:43:47,670 --> 00:43:44,400
carbon dioxide from the air

1131
00:43:49,910 --> 00:43:47,680
and assimilates it into its leaves and

1132
00:43:52,390 --> 00:43:49,920
trunk and branches biomass

1133
00:43:54,870 --> 00:43:52,400
and in in the winter it slowly releases

1134
00:43:58,150 --> 00:43:54,880
that over long term in the net the net

1135
00:44:00,309 --> 00:43:58,160
exchange is zero it takes up as much as

1136
00:44:02,589 --> 00:44:00,319
it releases but

1137
00:44:04,309 --> 00:44:02,599
depending on the duration of the

1138
00:44:06,950 --> 00:44:04,319

freeze-to-thaw

1139
00:44:10,069 --> 00:44:06,960
cycle in a year that same location may

1140
00:44:12,950 --> 00:44:10,079
be a net so-called source of carbon or a

1141
00:44:16,390 --> 00:44:12,960
net sink of carbon and as the border

1142
00:44:17,990 --> 00:44:16,400
latitudes are have a changing

1143
00:44:20,630 --> 00:44:18,000
winter duration

1144
00:44:22,550 --> 00:44:20,640
some of these forests may change from

1145
00:44:25,109 --> 00:44:22,560
neutrality to being a net source or a

1146
00:44:27,030 --> 00:44:25,119
sink that is a very important component

1147
00:44:29,109 --> 00:44:27,040
of the global carbon budget and in fact

1148
00:44:31,510 --> 00:44:29,119
it is referred to as the missing carbon

1149
00:44:34,230 --> 00:44:31,520
problem because we can't account for it

1150
00:44:35,190 --> 00:44:34,240
so smap and the carbon cycle

1151
00:44:40,390 --> 00:44:35,200
um

1152
00:44:42,710 --> 00:44:40,400
entering the carbon budget calculations

1153
00:44:44,390 --> 00:44:42,720
in that way

1154
00:44:46,550 --> 00:44:44,400
okay we have a uh another question from

1155
00:44:48,950 --> 00:44:46,560
the phone lines roseanne scribble again

1156
00:44:50,790 --> 00:44:48,960
from voice of america yeah i just wanted

1157
00:44:52,950 --> 00:44:50,800
to if you could address the challenges

1158
00:44:55,910 --> 00:44:52,960
of uh turning this

1159
00:44:58,309 --> 00:44:55,920
immense amount of data into practical uh

1160
00:45:01,030 --> 00:44:58,319
practical products things that that can

1161
00:45:02,790 --> 00:45:01,040
be used uh that can decision makers can

1162
00:45:05,910 --> 00:45:02,800
can turn to could you could you discuss

1163
00:45:09,910 --> 00:45:07,750

i'll discuss one aspect maybe i'll turn

1164
00:45:11,670 --> 00:45:09,920
one of it over to you guys too um

1165
00:45:14,950 --> 00:45:11,680
because the amount of data and the

1166
00:45:18,230 --> 00:45:14,960
processing of it is is complex and most

1167
00:45:20,710 --> 00:45:18,240
users couldn't just take raw data

1168
00:45:22,230 --> 00:45:20,720
agriculture users and and turn it into a

1169
00:45:24,230 --> 00:45:22,240
soil moisture product that they could

1170
00:45:25,589 --> 00:45:24,240
use but we are producing higher level

1171
00:45:26,790 --> 00:45:25,599
products

1172
00:45:29,109 --> 00:45:26,800
and you see that in some of these

1173
00:45:31,190 --> 00:45:29,119
simulated products that they can use and

1174
00:45:33,270 --> 00:45:31,200
one thing about soil moisture is the

1175
00:45:36,230 --> 00:45:33,280
reason we have so many anxious early

1176
00:45:38,470 --> 00:45:36,240
adopters is they they do know soil

1177
00:45:40,950 --> 00:45:38,480
moisture is important and they do know

1178
00:45:43,430 --> 00:45:40,960
they need better soil moisture because

1179
00:45:45,990 --> 00:45:43,440
most of it's just model data from

1180
00:45:47,589 --> 00:45:46,000
precipitation from a sparse set of

1181
00:45:49,670 --> 00:45:47,599
ground stations

1182
00:45:51,190 --> 00:45:49,680
so adding this level of direct

1183
00:45:53,910 --> 00:45:51,200
measurements

1184
00:45:55,829 --> 00:45:53,920
is going to make a big impact in that

1185
00:45:58,950 --> 00:45:55,839
and you saw that in the video of the u.s

1186
00:46:00,470 --> 00:45:58,960
drought monitor but they do need a help

1187
00:46:01,990 --> 00:46:00,480
and that's where the mission comes in

1188
00:46:03,910 --> 00:46:02,000

and that's why we're interacting with

1189
00:46:06,230 --> 00:46:03,920
these early adopters and producing

1190
00:46:07,829 --> 00:46:06,240
products that they can use and that they

1191
00:46:09,349 --> 00:46:07,839
can access

1192
00:46:13,109 --> 00:46:09,359
i don't know if you guys want to comment

1193
00:46:17,670 --> 00:46:14,790
i don't know in all these years i've

1194
00:46:19,829 --> 00:46:17,680
never had trouble explaining to someone

1195
00:46:22,950 --> 00:46:19,839
why they need soil moisture soil

1196
00:46:25,990 --> 00:46:22,960
moisture for atmospheric modelers is a

1197
00:46:28,470 --> 00:46:26,000
state variable in their models

1198
00:46:30,150 --> 00:46:28,480
it's actually they have to keep track of

1199
00:46:32,069 --> 00:46:30,160
these variables and every time they run

1200
00:46:34,069 --> 00:46:32,079
a numerical weather prediction they have

1201
00:46:35,510 --> 00:46:34,079
to initialize the soil moisture so they

1202
00:46:37,030 --> 00:46:35,520
know exactly

1203
00:46:38,230 --> 00:46:37,040
why they're

1204
00:46:39,750 --> 00:46:38,240
making these measurements and how

1205
00:46:42,069 --> 00:46:39,760
they're going to use it

1206
00:46:44,630 --> 00:46:42,079
in terms of crop models in terms of

1207
00:46:47,270 --> 00:46:44,640
terrestrial ecology models they all have

1208
00:46:49,510 --> 00:46:47,280
soil moisture as a state variable it is

1209
00:46:51,190 --> 00:46:49,520
the state valuable terrestrial system so

1210
00:46:54,829 --> 00:46:51,200
it's not very difficult to explain and

1211
00:46:58,069 --> 00:46:54,839
surely farmers and droughts

1212
00:47:00,230 --> 00:46:58,079
um drought monitoring again agricultural

1213
00:47:03,270 --> 00:47:00,240

drought is defined as

1214
00:47:05,510 --> 00:47:03,280
uh departures from normal in soil

1215
00:47:07,750 --> 00:47:05,520
moisture so i don't think there's

1216
00:47:12,069 --> 00:47:07,760
much difficulty in in translating this

1217
00:47:14,150 --> 00:47:12,079
into practice science or applications

1218
00:47:17,430 --> 00:47:14,160
okay we'll go back to uh social media

1219
00:47:18,790 --> 00:47:17,440
with a few more questions jason

1220
00:47:20,950 --> 00:47:18,800
wonderful this question comes from

1221
00:47:23,270 --> 00:47:20,960
twitter user derek who asks how long

1222
00:47:25,190 --> 00:47:23,280
will nasa's map be able to remain in

1223
00:47:27,109 --> 00:47:25,200
orbit

1224
00:47:29,430 --> 00:47:27,119
okay i'll take that uh

1225
00:47:32,069 --> 00:47:29,440
our requirement uh the the requirement

1226
00:47:34,470 --> 00:47:32,079
that nasa imposed on the mission is for

1227
00:47:36,630 --> 00:47:34,480
a three-year science uh

1228
00:47:38,390 --> 00:47:36,640
three years of science operation

1229
00:47:40,790 --> 00:47:38,400
this is after the commissioning period

1230
00:47:43,270 --> 00:47:40,800
so it's a total of 39

1231
00:47:45,190 --> 00:47:43,280
months however

1232
00:47:46,710 --> 00:47:45,200
we expect if the observatory is

1233
00:47:47,589 --> 00:47:46,720
operating uh

1234
00:47:49,910 --> 00:47:47,599
well

1235
00:47:53,589 --> 00:47:49,920
uh during that period that it will

1236
00:47:55,190 --> 00:47:53,599
operate for many many years beyond that

1237
00:47:56,710 --> 00:47:55,200
there's certainly no

1238
00:47:58,549 --> 00:47:56,720

constraint on the life of the

1239
00:48:00,790 --> 00:47:58,559
observatory from consumables like

1240
00:48:02,069 --> 00:48:00,800
onboard propellant or anything like that

1241
00:48:03,990 --> 00:48:02,079
so we expect

1242
00:48:07,190 --> 00:48:04,000
that we'll get many years of life out of

1243
00:48:10,790 --> 00:48:08,549
wonderful next question comes from

1244
00:48:15,750 --> 00:48:10,800
twitter user justin who asks what is the

1245
00:48:21,109 --> 00:48:17,589
as i mentioned earlier

1246
00:48:23,750 --> 00:48:21,119
the the agency committed to congress

1247
00:48:26,630 --> 00:48:23,760
that we would procure

1248
00:48:33,270 --> 00:48:26,640
operate for three years and launch

1249
00:48:36,630 --> 00:48:34,950
wonderful this last question comes from

1250
00:48:38,630 --> 00:48:36,640
twitter user katie who asks will

1251
00:48:40,790 --> 00:48:38,640
information from this mission help with

1252
00:48:45,190 --> 00:48:40,800
analyzing compositional data from other

1253
00:48:51,190 --> 00:48:46,710
the simple answer is no we're looking

1254
00:48:54,390 --> 00:48:52,950
okay fair enough

1255
00:48:56,630 --> 00:48:54,400
i think that's all the questions we have

1256
00:48:59,670 --> 00:48:56,640
for today there's a lot more information

1257
00:49:01,829 --> 00:48:59,680
about smap online that you can go and

1258
00:49:07,349 --> 00:49:01,839
access all the way up to launch and

1259
00:49:11,349 --> 00:49:09,670
smap and if you'd like to keep in touch

1260
00:49:13,349 --> 00:49:11,359
with all the different earth science

1261
00:49:15,349 --> 00:49:13,359
activities the different missions that

1262
00:49:19,309 --> 00:49:15,359
have gone up this last year there's a

1263
00:49:21,510 --> 00:49:19,319

website for that too and that is

1264
00:49:23,829 --> 00:49:21,520
www.nasa.gov slash

1265
00:49:25,270 --> 00:49:23,839
earthrightnow and of course as always

1266
00:49:28,630 --> 00:49:25,280
you can follow along on all this

1267
00:49:29,670 --> 00:49:28,640
activity on the many nasa social media

1268
00:49:32,069 --> 00:49:29,680
channels

1269
00:49:33,990 --> 00:49:32,079
just as a reminder smap is scheduled to

1270
00:49:36,470 --> 00:49:34,000
launch three weeks from today january

1271
00:49:37,670 --> 00:49:36,480
29th from vandenberg air force base in