1
00:00:00,160 --> 00:00:10,390
[Music]

2
00:00:13,030 --> 00:00:10,709
an

3
00:00:14,789 --> 00:00:13,040
uninterrupted series of satellites has

4
00:00:16,310 --> 00:00:14,799
collected sea level measurements for

5
00:00:19,349 --> 00:00:16,320
nearly 30 years

6
00:00:21,510 --> 00:00:19,359
and now a joint u.s european effort

7
00:00:23,029 --> 00:00:21,520
will launch the next spacecraft to

8
00:00:25,750 --> 00:00:23,039
continue this legacy

9
00:00:27,830 --> 00:00:25,760
of monitoring sea surface height welcome

10
00:00:29,109 --> 00:00:27,840
i am marina jericho with nasa's jet

11
00:00:31,109 --> 00:00:29,119
propulsion laboratory

12
00:00:32,950 --> 00:00:31,119
and we are here at vandenberg air force

13
00:00:35,510 --> 00:00:32,960

base in central california

14
00:00:37,910 --> 00:00:35,520
where we are launching the sentinel 6

15
00:00:39,910 --> 00:00:37,920
michael freilick satellite tomorrow

16
00:00:41,830 --> 00:00:39,920
i am your host today as we bring you a

17
00:00:44,150 --> 00:00:41,840
closer look into the science

18
00:00:44,869 --> 00:00:44,160
behind this mission that will continue

19
00:00:47,830 --> 00:00:44,879
to help us

20
00:00:50,150 --> 00:00:47,840
understand how our oceans are changing

21
00:00:50,630 --> 00:00:50,160
following this briefing at 2pm pacific

22
00:00:52,310 --> 00:00:50,640
time

23
00:00:54,470 --> 00:00:52,320
we'll be back with another panel to

24
00:00:57,029 --> 00:00:54,480
discuss the readiness of the spacecraft

25
00:00:58,549 --> 00:00:57,039
the launch vehicle and the range for

26
00:01:00,709 --> 00:00:58,559
tomorrow's launch

27
00:01:03,110 --> 00:01:00,719
this has been a true international

28
00:01:05,509 --> 00:01:03,120
collaboration among several agencies

29
00:01:06,149 --> 00:01:05,519
which you will see represented today in

30
00:01:08,789 --> 00:01:06,159
a first

31
00:01:10,710 --> 00:01:08,799
joint earth mission teaming nasa and the

32
00:01:13,109 --> 00:01:10,720
european space agency

33
00:01:15,590 --> 00:01:13,119
along with other partners the european

34
00:01:18,630 --> 00:01:15,600
organization for the exploitation of

35
00:01:19,190 --> 00:01:18,640
meteorological satellites or umetsat the

36
00:01:21,749 --> 00:01:19,200
national

37
00:01:22,710 --> 00:01:21,759
oceanic and atmospheric administration

38
00:01:26,230 --> 00:01:22,720

or noaa

39
00:01:28,070 --> 00:01:26,240
and the french space agency canes this c

40
00:01:29,670 --> 00:01:28,080
level scout will collect the most

41
00:01:32,550 --> 00:01:29,680
accurate data yet

42
00:01:33,350 --> 00:01:32,560
on sea level and how it changes over

43
00:01:34,950 --> 00:01:33,360
time

44
00:01:37,270 --> 00:01:34,960
during this briefing we are taking

45
00:01:40,550 --> 00:01:37,280
questions from the media via the telecon

46
00:01:43,510 --> 00:01:40,560
line press star 1 to get into the cues

47
00:01:44,149 --> 00:01:43,520
or via social media with the hashtag

48
00:01:47,109 --> 00:01:44,159
seeing

49
00:01:49,270 --> 00:01:47,119
the seas as we are social distancing i

50
00:01:50,870 --> 00:01:49,280
will introduce you virtually to some of

51
00:01:53,830 --> 00:01:50,880
the key scientists

52
00:01:55,350 --> 00:01:53,840
who will be involved with the mission on

53
00:01:57,749 --> 00:01:55,360
studying the data coming from the

54
00:02:00,789 --> 00:01:57,759
sentinel 6 michael frylick satellite

55
00:02:01,910 --> 00:02:00,799
and distributing it worldwide on our

56
00:02:04,469 --> 00:02:01,920
panel today

57
00:02:05,190 --> 00:02:04,479
we have nasa's earth division director

58
00:02:08,309 --> 00:02:05,200
karen st

59
00:02:10,630 --> 00:02:08,319
germain craig donlon

60
00:02:13,270 --> 00:02:10,640
the european space agency's project

61
00:02:15,830 --> 00:02:13,280
scientist for this mission

62
00:02:17,910 --> 00:02:15,840
remko charu the umetsat project

63
00:02:19,830 --> 00:02:17,920

scientist for sentinel 6 michael

64
00:02:22,470 --> 00:02:19,840
freilich

65
00:02:23,350 --> 00:02:22,480
josh willis of nasa's jet propulsion

66
00:02:26,949 --> 00:02:23,360
laboratory

67
00:02:31,030 --> 00:02:26,959
nasa project scientist for this mission

68
00:02:33,830 --> 00:02:31,040
deidra byrne oceanographer at noaa

69
00:02:35,670 --> 00:02:33,840
and lastly luanne thompson a university

70
00:02:38,470 --> 00:02:35,680
of washington oceanographer

71
00:02:40,309 --> 00:02:38,480
who is part of the science team a

72
00:02:42,070 --> 00:02:40,319
reminder to the media you can ask

73
00:02:44,309 --> 00:02:42,080
question by pressing star

74
00:02:45,750 --> 00:02:44,319
one for anyone watching who would like

75
00:02:48,150 --> 00:02:45,760
to submit a question

76
00:02:49,670 --> 00:02:48,160
you can do so by using the seeing the

77
00:02:51,670 --> 00:02:49,680
seas hashtag

78
00:02:53,270 --> 00:02:51,680
we will begin with nasa's earth science

79
00:02:57,030 --> 00:02:53,280
division director karen st

80
00:02:57,750 --> 00:02:57,040
germain welcome karen thank you so much

81
00:03:00,470 --> 00:02:57,760
marina

82
00:03:00,869 --> 00:03:00,480
it is great to be here i could not be

83
00:03:03,190 --> 00:03:00,879
more

84
00:03:05,110 --> 00:03:03,200
excited for our launch coming up

85
00:03:06,949 --> 00:03:05,120
tomorrow

86
00:03:08,869 --> 00:03:06,959
the sentinel 6 michael freilick launch

87
00:03:12,710 --> 00:03:08,879
is exciting to me for

88
00:03:14,550 --> 00:03:12,720

really three reasons the first is

89
00:03:17,270 --> 00:03:14,560
of course it's my first launch as the

90
00:03:19,750 --> 00:03:17,280
nasa earth science director

91
00:03:20,470 --> 00:03:19,760
but perhaps more importantly is the

92
00:03:22,550 --> 00:03:20,480
impact

93
00:03:25,190 --> 00:03:22,560
this uh this satellite is going to have

94
00:03:26,550 --> 00:03:25,200
on our understanding of our earth system

95
00:03:28,470 --> 00:03:26,560
and the third reason is really the

96
00:03:30,830 --> 00:03:28,480
people behind

97
00:03:32,149 --> 00:03:30,840
this mission and what it took to make it

98
00:03:34,550 --> 00:03:32,159
happen

99
00:03:36,390 --> 00:03:34,560
so let me start with the with the impact

100
00:03:39,430 --> 00:03:36,400
this mission is going to have

101
00:03:41,990 --> 00:03:39,440
you know our our earth is a system

102
00:03:42,949 --> 00:03:42,000
of intricately connected dynamics

103
00:03:46,789 --> 00:03:42,959
between

104
00:03:49,670 --> 00:03:46,799
land ocean ice atmosphere

105
00:03:52,470 --> 00:03:49,680
and also of course our human communities

106
00:03:54,869 --> 00:03:52,480
and and that system is changing

107
00:03:56,149 --> 00:03:54,879
and and because 70 percent of the

108
00:03:59,350 --> 00:03:56,159
earth's surface is

109
00:04:03,350 --> 00:03:59,360
is ocean the oceans play an enormous

110
00:04:05,910 --> 00:04:03,360
role in how the whole system changes

111
00:04:06,630 --> 00:04:05,920
and these these global changes are of

112
00:04:08,630 --> 00:04:06,640
course

113
00:04:10,710 --> 00:04:08,640

creating both risks and opportunities

114
00:04:14,070 --> 00:04:10,720
for our human communities

115
00:04:16,949 --> 00:04:14,080
and at nasa what we do is we use that

116
00:04:18,390 --> 00:04:16,959
the vantage point of space to get a

117
00:04:21,909 --> 00:04:18,400
global view

118
00:04:23,909 --> 00:04:21,919
of of the earth and and in this case

119
00:04:25,510 --> 00:04:23,919
uh sentinel 6 michael freilick is going

120
00:04:29,189 --> 00:04:25,520
to give us a global view

121
00:04:29,990 --> 00:04:29,199
of the sea surface height we will use

122
00:04:32,390 --> 00:04:30,000
that

123
00:04:33,430 --> 00:04:32,400
along with our models and our predictive

124
00:04:36,550 --> 00:04:33,440
capability

125
00:04:39,030 --> 00:04:36,560
to really understand how the changing

126
00:04:41,430 --> 00:04:39,040
sea level is going to impact

127
00:04:43,670 --> 00:04:41,440
community coastal communities and

128
00:04:46,070 --> 00:04:43,680
weather worldwide

129
00:04:47,510 --> 00:04:46,080
as i'll you'll see in this uh in this

130
00:04:49,189 --> 00:04:47,520
next chart here

131
00:04:50,629 --> 00:04:49,199
sentinel 6 michael freilich is the

132
00:04:52,790 --> 00:04:50,639
newest addition

133
00:04:54,310 --> 00:04:52,800
to the nasa fleet and you'll see that

134
00:04:56,390 --> 00:04:54,320
many of

135
00:04:58,150 --> 00:04:56,400
the uh the satellites in the nasa fleet

136
00:05:00,230 --> 00:04:58,160
were developed collaboratively with

137
00:05:02,070 --> 00:05:00,240
international partners

138
00:05:04,230 --> 00:05:02,080

and that's that's important because the

139
00:05:05,749 --> 00:05:04,240
challenges we're facing are truly global

140
00:05:08,310 --> 00:05:05,759
and it's and it's taking

141
00:05:10,230 --> 00:05:08,320
a coordinated effort around the world in

142
00:05:11,270 --> 00:05:10,240
space agencies to make all the

143
00:05:13,270 --> 00:05:11,280
observations

144
00:05:14,310 --> 00:05:13,280
we need to make to understand how our

145
00:05:18,710 --> 00:05:14,320
our climate

146
00:05:22,629 --> 00:05:18,720
is changing sentinel 6 michael freilich

147
00:05:24,710 --> 00:05:22,639
will continue a nearly 30-year record

148
00:05:25,990 --> 00:05:24,720
along with its its twin that will launch

149
00:05:28,390 --> 00:05:26,000
a few years later

150
00:05:30,230 --> 00:05:28,400
will continue our record of sea surface

151
00:05:35,110 --> 00:05:30,240
height observation

152
00:05:38,230 --> 00:05:37,189
it's it's a it's a it's a critical

153
00:05:40,710 --> 00:05:38,240
observation

154
00:05:41,430 --> 00:05:40,720
for a number of reasons but it's its

155
00:05:44,629 --> 00:05:41,440
power is

156
00:05:46,870 --> 00:05:44,639
really unleashed when we combine

157
00:05:48,310 --> 00:05:46,880
our altimetry observations or the sea

158
00:05:50,310 --> 00:05:48,320
surface height measurements

159
00:05:52,550 --> 00:05:50,320
with the observations we get from the

160
00:05:54,230 --> 00:05:52,560
other satellites in the nasa fleet and

161
00:05:57,510 --> 00:05:54,240
the international fleet

162
00:05:59,909 --> 00:05:57,520
in the next chart you'll see that it's

163
00:06:02,950 --> 00:05:59,919

really when we combine

164
00:06:05,590 --> 00:06:02,960
altimetry observations with

165
00:06:05,990 --> 00:06:05,600
observations from our gravity missions

166
00:06:09,430 --> 00:06:06,000
and so

167
00:06:10,950 --> 00:06:09,440
forth that we can not only see that the

168
00:06:12,870 --> 00:06:10,960
sea level is rising

169
00:06:15,590 --> 00:06:12,880
and that's the the top curve you see on

170
00:06:18,390 --> 00:06:15,600
this chart but we can also tell

171
00:06:20,710 --> 00:06:18,400
how much of that change is coming from

172
00:06:22,870 --> 00:06:20,720
melting ice sheets and glaciers

173
00:06:25,350 --> 00:06:22,880
and how much of that change is coming

174
00:06:27,270 --> 00:06:25,360
from thermal expansion of the oceans

175
00:06:28,629 --> 00:06:27,280
themselves in other words when the

176
00:06:31,110 --> 00:06:28,639
oceans warm

177
00:06:32,390 --> 00:06:31,120
they expand so the middle chart here

178
00:06:34,790 --> 00:06:32,400
about two-thirds

179
00:06:35,990 --> 00:06:34,800
of the the sea level rise that we're

180
00:06:37,510 --> 00:06:36,000
seeing is due to the

181
00:06:39,749 --> 00:06:37,520
melting ice sheets and glaciers and

182
00:06:41,830 --> 00:06:39,759
one-third is due to that expansion

183
00:06:42,870 --> 00:06:41,840
so that's the kind of power we get in

184
00:06:46,150 --> 00:06:42,880
when we combine

185
00:06:49,270 --> 00:06:46,160
observations another is

186
00:06:54,070 --> 00:06:49,280
when we talk about hurricanes um and and

187
00:06:57,189 --> 00:06:54,080
and tropical storms so sea level rise

188
00:07:00,230 --> 00:06:57,199

or or sea level observations can

189
00:07:02,710 --> 00:07:00,240
tell us where there's warm water

190
00:07:04,309 --> 00:07:02,720
in in our oceans and this is

191
00:07:05,830 --> 00:07:04,319
particularly important this year as

192
00:07:08,870 --> 00:07:05,840
we're seeing a record-breaking

193
00:07:11,430 --> 00:07:08,880
uh hurricane season in the atlantic when

194
00:07:12,629 --> 00:07:11,440
when a tropical storm passes over warm

195
00:07:14,629 --> 00:07:12,639
water

196
00:07:15,670 --> 00:07:14,639
we can expect that it may rapidly

197
00:07:17,350 --> 00:07:15,680
intensify

198
00:07:19,670 --> 00:07:17,360
and that's really critical for warning

199
00:07:22,150 --> 00:07:19,680
our coastal communities

200
00:07:23,830 --> 00:07:22,160
and and we get that when we combine the

201
00:07:26,150 --> 00:07:23,840
altimetry observations

202
00:07:27,909 --> 00:07:26,160
with our weather satellites so it's this

203
00:07:30,230 --> 00:07:27,919
combination it's this fleet

204
00:07:31,909 --> 00:07:30,240
that's observing the entire earth system

205
00:07:33,830 --> 00:07:31,919
that really gives us

206
00:07:37,589 --> 00:07:33,840
the insight into how the whole earth

207
00:07:40,230 --> 00:07:37,599
system is changing

208
00:07:42,230 --> 00:07:40,240
i mentioned partners and and this uh

209
00:07:45,350 --> 00:07:42,240
this partnership with issa

210
00:07:47,670 --> 00:07:45,360
is is a first for us at this level in

211
00:07:48,469 --> 00:07:47,680
the earth science division within uh

212
00:07:50,710 --> 00:07:48,479
nasa

213
00:07:52,150 --> 00:07:50,720

and it's been a terrific experience this

214
00:07:53,510 --> 00:07:52,160
team has worked through all the

215
00:07:56,390 --> 00:07:53,520
challenges of covid

216
00:07:57,670 --> 00:07:56,400
to get us to where we are one day before

217
00:07:59,830 --> 00:07:57,680
launch

218
00:08:01,189 --> 00:07:59,840
this is also a special mission for me

219
00:08:03,990 --> 00:08:01,199
because

220
00:08:05,189 --> 00:08:04,000
mike frylock's name is is is on the side

221
00:08:07,990 --> 00:08:05,199
of this satellite

222
00:08:08,710 --> 00:08:08,000
mike was my predecessor is the earth

223
00:08:12,070 --> 00:08:08,720
science

224
00:08:15,589 --> 00:08:12,080
director he was also a leader in the

225
00:08:16,309 --> 00:08:15,599
field a mentor and a friend to many of

226
00:08:19,589 --> 00:08:16,319
us

227
00:08:21,670 --> 00:08:19,599
and uh and so it's an extra special day

228
00:08:23,670 --> 00:08:21,680
when we see when we will see this

229
00:08:24,390 --> 00:08:23,680
satellite launch the satellite that he

230
00:08:27,830 --> 00:08:24,400
worked so

231
00:08:30,550 --> 00:08:27,840
hard to to put in place

232
00:08:32,070 --> 00:08:30,560
so it's a great weekend for a launch and

233
00:08:34,790 --> 00:08:32,080
we're looking forward to it and

234
00:08:35,829 --> 00:08:34,800
i'm going to pass off now to my good

235
00:08:38,230 --> 00:08:35,839
friend

236
00:08:39,269 --> 00:08:38,240
dr craig donilon who's the esa project

237
00:08:42,709 --> 00:08:39,279
scientist

238
00:08:45,430 --> 00:08:42,719

craig thanks karen

239
00:08:47,269 --> 00:08:45,440
i could have my first slide please i

240
00:08:49,190 --> 00:08:47,279
think we both agree that earth from

241
00:08:50,949 --> 00:08:49,200
space is beautiful

242
00:08:52,550 --> 00:08:50,959
i mean it's glory and it's technical or

243
00:08:54,470 --> 00:08:52,560
is seen in this copernicus ii

244
00:08:55,670 --> 00:08:54,480
image of arie atoll in the republic of

245
00:08:57,910 --> 00:08:55,680
the maldives

246
00:08:59,670 --> 00:08:57,920
i mean in one picture both the majesty

247
00:09:00,870 --> 00:08:59,680
and the fragility of our world is

248
00:09:03,190 --> 00:09:00,880
revealed

249
00:09:05,430 --> 00:09:03,200
but sea level rise is a direct threat to

250
00:09:07,670 --> 00:09:05,440
the very existence of ariatol

251
00:09:08,870 --> 00:09:07,680
and it also threatens major cities with

252
00:09:11,190 --> 00:09:08,880
increased flooding

253
00:09:12,630 --> 00:09:11,200
including new york london amsterdam

254
00:09:14,470 --> 00:09:12,640
tokyo and more

255
00:09:16,550 --> 00:09:14,480
it's estimated that about two to three

256
00:09:18,310 --> 00:09:16,560
million more people are exposed

257
00:09:20,870 --> 00:09:18,320
for every one centimeter rise in sea

258
00:09:22,389 --> 00:09:20,880
level next slide please

259
00:09:24,230 --> 00:09:22,399
as you mentioned our earth system is

260
00:09:24,949 --> 00:09:24,240
changing the dynamic balance that has

261
00:09:27,190 --> 00:09:24,959
persisted

262
00:09:28,230 --> 00:09:27,200
for before the industrial revolution has

263
00:09:30,389 --> 00:09:28,240

been upset by

264
00:09:31,430 --> 00:09:30,399
the almost instantaneous combustion of

265
00:09:34,630 --> 00:09:31,440
huge reserves

266
00:09:36,230 --> 00:09:34,640
of carbon as our society has developed

267
00:09:37,910 --> 00:09:36,240
and we see evidence of this dramatic

268
00:09:39,750 --> 00:09:37,920
change in many different measurements

269
00:09:41,670 --> 00:09:39,760
and events around the world

270
00:09:43,829 --> 00:09:41,680
but they all point in the same direction

271
00:09:45,990 --> 00:09:43,839
the earth is warming

272
00:09:48,630 --> 00:09:46,000
and the greatest indicator of this earth

273
00:09:50,389 --> 00:09:48,640
system imbalance is sea level rise

274
00:09:52,070 --> 00:09:50,399
it's because it integrates the total

275
00:09:53,750 --> 00:09:52,080
impact of global warming

276
00:09:55,750 --> 00:09:53,760
that's dominated by the ice sheet

277
00:09:56,630 --> 00:09:55,760
melting the thermal expansion of the sea

278
00:09:59,190 --> 00:09:56,640
water and

279
00:10:01,350 --> 00:09:59,200
changes in the terrestrial water storage

280
00:10:03,990 --> 00:10:01,360
next slide please

281
00:10:05,350 --> 00:10:04,000
as karen mentioned sea level rise is not

282
00:10:07,350 --> 00:10:05,360
the same everywhere

283
00:10:09,190 --> 00:10:07,360
and rather than relying on a few local

284
00:10:10,230 --> 00:10:09,200
tide gauges dotted around the world's

285
00:10:12,470 --> 00:10:10,240
coastlines

286
00:10:14,230 --> 00:10:12,480
we need a global tide gauge in space to

287
00:10:14,870 --> 00:10:14,240
monitor the complexity of what's going

288
00:10:16,870 --> 00:10:14,880

on

289
00:10:18,790 --> 00:10:16,880
and collect evidence of these changes to

290
00:10:19,430 --> 00:10:18,800
make the best decisions for our future

291
00:10:22,150 --> 00:10:19,440
world

292
00:10:23,590 --> 00:10:22,160
based on scientific evidence next slide

293
00:10:25,910 --> 00:10:23,600
please

294
00:10:27,990 --> 00:10:25,920
now sentencing michael frylick is a new

295
00:10:30,150 --> 00:10:28,000
satellite to do just this

296
00:10:31,590 --> 00:10:30,160
with enhanced continuity compared to the

297
00:10:32,310 --> 00:10:31,600
previous missions that have flown in

298
00:10:34,310 --> 00:10:32,320
this orbit

299
00:10:35,590 --> 00:10:34,320
we have a brand new synthetic aperture

300
00:10:37,590 --> 00:10:35,600
radar altimeter

301
00:10:39,110 --> 00:10:37,600
and a microwave radiometer that really

302
00:10:41,030 --> 00:10:39,120
are at the heart of the mission

303
00:10:42,550 --> 00:10:41,040
measuring c surface height reference to

304
00:10:44,310 --> 00:10:42,560
the same datums as the

305
00:10:46,710 --> 00:10:44,320
global positioning satellites that are

306
00:10:48,310 --> 00:10:46,720
used in your in your smartphones

307
00:10:50,069 --> 00:10:48,320
and many people ask about the shape of

308
00:10:51,030 --> 00:10:50,079
this spacecraft our little house in

309
00:10:53,350 --> 00:10:51,040
space

310
00:10:54,790 --> 00:10:53,360
well sentinel 6 has a design heritage in

311
00:10:57,910 --> 00:10:54,800
the european space agency

312
00:10:59,990 --> 00:10:57,920
cryosat satellite and this allows us to

313
00:11:01,670 --> 00:11:00,000

put solar panels directly on the side of

314
00:11:03,509 --> 00:11:01,680
the satellite limiting the need for big

315
00:11:05,190 --> 00:11:03,519
solar wings that have to move

316
00:11:07,030 --> 00:11:05,200
and that makes for a very stable

317
00:11:09,110 --> 00:11:07,040
satellite design which is really

318
00:11:09,990 --> 00:11:09,120
important for a satellite ultimate

319
00:11:13,110 --> 00:11:10,000
emission

320
00:11:15,110 --> 00:11:13,120
next slide please now to make the

321
00:11:15,670 --> 00:11:15,120
measurements uh the satellite uses a

322
00:11:17,350 --> 00:11:15,680
razor

323
00:11:19,430 --> 00:11:17,360
a radar pulse that's sent down and

324
00:11:20,069 --> 00:11:19,440
reflected off the sea surface and we

325
00:11:23,430 --> 00:11:20,079
time

326
00:11:24,949 --> 00:11:23,440
return

327
00:11:27,269 --> 00:11:24,959
and we would see it we receive a

328
00:11:29,509 --> 00:11:27,279
waveform and from this waveform

329
00:11:30,870 --> 00:11:29,519
we can determine the sea surface height

330
00:11:33,030 --> 00:11:30,880
from the radar range

331
00:11:34,710 --> 00:11:33,040
the significant wave height from the

332
00:11:36,150 --> 00:11:34,720
slope of the leading edge

333
00:11:37,910 --> 00:11:36,160
and the wind speed from the surface

334
00:11:40,310 --> 00:11:37,920
roughness of the waves on the ocean and

335
00:11:41,990 --> 00:11:40,320
people will talk about that a bit later

336
00:11:43,750 --> 00:11:42,000
and the timing arrangement that we have

337
00:11:45,750 --> 00:11:43,760
on board the spacecraft allows us to

338
00:11:46,150 --> 00:11:45,760

exploit the doppler characteristics of

339
00:11:48,949 --> 00:11:46,160
the

340
00:11:50,310 --> 00:11:48,959
radar uh allowing us to bring a whole

341
00:11:51,990 --> 00:11:50,320
bunch of measurements together at the

342
00:11:54,629 --> 00:11:52,000
same point on the earth's surface

343
00:11:55,350 --> 00:11:54,639
and average those and at the same time

344
00:11:57,030 --> 00:11:55,360
reduce the

345
00:11:59,190 --> 00:11:57,040
long track resolution of the instrument

346
00:12:01,590 --> 00:11:59,200
to just about 300 meters which is

347
00:12:03,110 --> 00:12:01,600
compared to two kilometers for previous

348
00:12:05,670 --> 00:12:03,120
missions pretty good

349
00:12:07,590 --> 00:12:05,680
we can do both the low resolution and

350
00:12:09,350 --> 00:12:07,600
the high resolution mode at the same

351
00:12:11,190 --> 00:12:09,360
time which is really important

352
00:12:12,470 --> 00:12:11,200
because by introducing new technology

353
00:12:14,550 --> 00:12:12,480
into the time series

354
00:12:16,790 --> 00:12:14,560
we don't want to destabilize that time

355
00:12:19,110 --> 00:12:16,800
series so we need to look at both types

356
00:12:20,550 --> 00:12:19,120
of measurements the old ones and the new

357
00:12:22,550 --> 00:12:20,560
and in order to get our accurate

358
00:12:23,750 --> 00:12:22,560
measurements of sea level rise we

359
00:12:25,990 --> 00:12:23,760
average data

360
00:12:28,230 --> 00:12:26,000
over about a 10 day period taking all of

361
00:12:30,710 --> 00:12:28,240
the measurements over the global ocean

362
00:12:32,150 --> 00:12:30,720
to give us the sea surface height from

363
00:12:36,389 --> 00:12:32,160

which we can then compute

364
00:12:38,710 --> 00:12:36,399
sea level rise next slide please

365
00:12:40,389 --> 00:12:38,720
now kubernetes is the world's largest

366
00:12:40,710 --> 00:12:40,399
operational earth observation system

367
00:12:42,629 --> 00:12:40,720
it's

368
00:12:44,470 --> 00:12:42,639
implemented by the european space agency

369
00:12:46,230 --> 00:12:44,480
on behalf of the european commission

370
00:12:47,990 --> 00:12:46,240
together with umeza and it includes a

371
00:12:50,150 --> 00:12:48,000
fleet of complementary satellites

372
00:12:52,069 --> 00:12:50,160
working together in synergy

373
00:12:53,269 --> 00:12:52,079
particularly with ocean models and

374
00:12:56,790 --> 00:12:53,279
allowing us to do

375
00:12:59,509 --> 00:12:56,800
uh climate and and ocean forecasting

376
00:13:00,710 --> 00:12:59,519
but these work like a painting each

377
00:13:02,629 --> 00:13:00,720
additional color

378
00:13:04,550 --> 00:13:02,639
that we can use to paint a wonderful

379
00:13:06,790 --> 00:13:04,560
scientific picture of the earth

380
00:13:08,629 --> 00:13:06,800
but michael freilich goes further and

381
00:13:09,110 --> 00:13:08,639
this really leverages the special and

382
00:13:11,990 --> 00:13:09,120
unique

383
00:13:13,430 --> 00:13:12,000
relationship between nasa noaa umitzat

384
00:13:15,590 --> 00:13:13,440
and the european space as you'd see

385
00:13:17,190 --> 00:13:15,600
together with the european commission

386
00:13:17,990 --> 00:13:17,200
and it really follows the collaborative

387
00:13:20,550 --> 00:13:18,000
principles

388
00:13:22,470 --> 00:13:20,560

championed by michael fralick himself

389
00:13:24,629 --> 00:13:22,480
and so tonight all of the dedicated

390
00:13:25,910 --> 00:13:24,639
mission teams working around the world

391
00:13:27,990 --> 00:13:25,920
are really looking forward to the launch

392
00:13:29,829 --> 00:13:28,000
of michael feilik it's going to be a new

393
00:13:31,350 --> 00:13:29,839
star in the sky allowing us to deliver

394
00:13:32,310 --> 00:13:31,360
the best quality measurements of sea

395
00:13:34,470 --> 00:13:32,320
level rise

396
00:13:35,670 --> 00:13:34,480
ocean waves and winds to make the best

397
00:13:38,790 --> 00:13:35,680
decisions today

398
00:13:40,629 --> 00:13:38,800
for everybody in the future so i'll hand

399
00:13:43,430 --> 00:13:40,639
over now to uh ramko sharoo

400
00:13:44,069 --> 00:13:43,440
from umitzat who's the humansite mission

401
00:13:49,110 --> 00:13:44,079
scientist

402
00:13:51,590 --> 00:13:49,120
ramco over to you thank you craig

403
00:13:53,910 --> 00:13:51,600
well copernicus sentinel 6 mission is

404
00:13:56,550 --> 00:13:53,920
going to be very exciting for unicef

405
00:13:58,230 --> 00:13:56,560
it's actually the first ultimate radar

406
00:14:00,310 --> 00:13:58,240
temperature mission that humidity has

407
00:14:02,389 --> 00:14:00,320
been leading from the start

408
00:14:03,509 --> 00:14:02,399
we have designed and set up the ground

409
00:14:06,470 --> 00:14:03,519
segment

410
00:14:07,030 --> 00:14:06,480
and our processing chain and now we are

411
00:14:09,430 --> 00:14:07,040
ready

412
00:14:12,949 --> 00:14:09,440
in a few days from now to take over the

413
00:14:15,269 --> 00:14:12,959

operation of the sentinel 6 satellite

414
00:14:16,710 --> 00:14:15,279
then we will download the first data

415
00:14:19,590 --> 00:14:16,720
from the satellite

416
00:14:20,710 --> 00:14:19,600
and we will from that create the most

417
00:14:23,430 --> 00:14:20,720
accurate

418
00:14:24,069 --> 00:14:23,440
sea level wave height and wind speed

419
00:14:27,509 --> 00:14:24,079
measurements

420
00:14:30,629 --> 00:14:27,519
ever similar six as

421
00:14:33,189 --> 00:14:30,639
traco red is shown fits nicely into this

422
00:14:35,670 --> 00:14:33,199
constellation of copenhagen's missions

423
00:14:36,389 --> 00:14:35,680
apart from sentinel 6 there are actually

424
00:14:39,269 --> 00:14:36,399
two

425
00:14:39,750 --> 00:14:39,279
other satellites with altimeters on

426
00:14:42,949 --> 00:14:39,760
board

427
00:14:46,389 --> 00:14:42,959
called semill3a and central 3b first

428
00:14:49,910 --> 00:14:48,949
those satellites are also operated by

429
00:14:53,269 --> 00:14:49,920
human sets

430
00:14:55,350 --> 00:14:53,279
from here in darmstadt and these are

431
00:14:57,910 --> 00:14:55,360
very complementary missions

432
00:14:59,030 --> 00:14:57,920
as you can see in the slides the

433
00:15:01,430 --> 00:14:59,040
purplish

434
00:15:03,430 --> 00:15:01,440
colored ground tracks are very dense

435
00:15:06,230 --> 00:15:03,440
they are those from 10ml 3a

436
00:15:07,269 --> 00:15:06,240
and channel 3b and they can observe the

437
00:15:11,829 --> 00:15:07,279
smaller scale

438
00:15:15,269 --> 00:15:11,839

features like ocean eddies

439
00:15:16,870 --> 00:15:15,279
6 continues the heritage of 30 years of

440
00:15:20,389 --> 00:15:16,880
its predecessors

441
00:15:23,910 --> 00:15:20,399
making a more coarse pattern here

442
00:15:25,189 --> 00:15:23,920
in white it will focus on the larger

443
00:15:28,949 --> 00:15:25,199
scale features

444
00:15:29,749 --> 00:15:28,959
like el nino and it will very accurately

445
00:15:32,550 --> 00:15:29,759
trace

446
00:15:34,870 --> 00:15:32,560
sea level rise both globally and

447
00:15:37,749 --> 00:15:34,880
regionally

448
00:15:39,269 --> 00:15:37,759
after launch we will have a year of

449
00:15:43,910 --> 00:15:39,279
commissioning

450
00:15:47,110 --> 00:15:43,920
that focuses on running the processors

451
00:15:50,389 --> 00:15:47,120
and analyzing the data that we

452
00:15:52,230 --> 00:15:50,399
have processed we will check the

453
00:15:53,269 --> 00:15:52,240
measurements together with our partner

454
00:15:56,389 --> 00:15:53,279
agencies

455
00:15:59,189 --> 00:15:56,399
but also with a number of experts in the

456
00:16:04,710 --> 00:16:02,790
we can compare the data to ocean models

457
00:16:06,829 --> 00:16:04,720
but most importantly we can compare it

458
00:16:10,230 --> 00:16:06,839
to its predecessor

459
00:16:11,030 --> 00:16:10,240
json3 and to facilitate that the two

460
00:16:13,670 --> 00:16:11,040
satellites

461
00:16:15,430 --> 00:16:13,680
will be flying only 30 seconds apart on

462
00:16:18,150 --> 00:16:15,440
the same orbit

463
00:16:20,310 --> 00:16:18,160

that means that they will basically see

464
00:16:20,710 --> 00:16:20,320
the same ocean conditions and that of

465
00:16:22,550 --> 00:16:20,720
course

466
00:16:23,990 --> 00:16:22,560
makes comparing the measurements much

467
00:16:25,910 --> 00:16:24,000
better and

468
00:16:27,670 --> 00:16:25,920
as craig already indicated because we

469
00:16:29,430 --> 00:16:27,680
have also a new technology

470
00:16:31,350 --> 00:16:29,440
this is very important we will do this

471
00:16:36,069 --> 00:16:31,360
for a whole year to make sure

472
00:16:40,069 --> 00:16:36,079
that we have a full continuity

473
00:16:43,990 --> 00:16:40,079
once we are confident that all the data

474
00:16:47,189 --> 00:16:44,000
is good then we will send it

475
00:16:49,749 --> 00:16:47,199
to all of the users

476
00:16:51,110 --> 00:16:49,759
this will include meteorological

477
00:16:54,710 --> 00:16:51,120
agencies

478
00:16:57,110 --> 00:16:54,720
signed users but also anybody who is

479
00:16:58,949 --> 00:16:57,120
interested in the data

480
00:17:00,310 --> 00:16:58,959
as soon or as long as you have an

481
00:17:04,549 --> 00:17:00,320
internet connection

482
00:17:05,909 --> 00:17:04,559
you can get the data for free now after

483
00:17:08,710 --> 00:17:05,919
that year

484
00:17:11,990 --> 00:17:08,720
of com commissioning seminal six will

485
00:17:14,630 --> 00:17:12,000
become the reference mission

486
00:17:15,189 --> 00:17:14,640
that means it's the reference for all

487
00:17:18,549 --> 00:17:15,199
other

488
00:17:23,510 --> 00:17:18,559

altimeters sea level

489
00:17:27,429 --> 00:17:26,630
now json3 is then available to be moved

490
00:17:30,470 --> 00:17:27,439
in a slightly

491
00:17:33,510 --> 00:17:30,480
different orbit it can for example

492
00:17:35,669 --> 00:17:33,520
just like the previous missions

493
00:17:36,549 --> 00:17:35,679
then be retired into a slightly

494
00:17:38,310 --> 00:17:36,559
different orbit

495
00:17:39,750 --> 00:17:38,320
where it can do something else for

496
00:17:43,510 --> 00:17:39,760
example map

497
00:17:44,789 --> 00:17:43,520
the c service very accurately in a very

498
00:17:47,750 --> 00:17:44,799
dense pattern and

499
00:17:48,950 --> 00:17:47,760
very high detail and since the sea

500
00:17:50,950 --> 00:17:48,960
surface maps

501
00:17:52,070 --> 00:17:50,960
after the gravity field it actually

502
00:17:55,750 --> 00:17:52,080
highlights

503
00:17:59,190 --> 00:17:55,760
sea mounts and

504
00:18:02,470 --> 00:17:59,200
troughs and also ridges

505
00:18:04,150 --> 00:18:02,480
deep below the ocean surface

506
00:18:06,870 --> 00:18:04,160
and scientists have been able to use

507
00:18:11,190 --> 00:18:06,880
this data to make a very detailed

508
00:18:13,750 --> 00:18:11,200
global map of the sea bottom

509
00:18:14,630 --> 00:18:13,760
still we know the topography of the moon

510
00:18:17,909 --> 00:18:14,640
better

511
00:18:21,669 --> 00:18:17,919
than our own ocean bottom

512
00:18:23,029 --> 00:18:21,679
and still thousands of sea mounts are to

513
00:18:26,710 --> 00:18:23,039

be detected

514
00:18:33,270 --> 00:18:30,150
in the meantime sentinel 6 will

515
00:18:36,870 --> 00:18:33,280
keep continuing this 30-year record

516
00:18:39,750 --> 00:18:36,880
of sea level rise in this plot you see

517
00:18:42,230 --> 00:18:39,760
12 alt images that have been flying

518
00:18:45,190 --> 00:18:42,240
during the last 30 years

519
00:18:47,270 --> 00:18:45,200
and the pattern that is revealed is

520
00:18:50,070 --> 00:18:47,280
similar between all of them

521
00:18:51,110 --> 00:18:50,080
you see a rise of as much as 9

522
00:18:53,990 --> 00:18:51,120
centimeter

523
00:18:54,630 --> 00:18:54,000
over the last 30 years and we can even

524
00:18:57,990 --> 00:18:54,640
see

525
00:19:01,110 --> 00:18:58,000
a slight increase of the rise

526
00:19:02,710 --> 00:19:01,120
over the last decade

527
00:19:04,310 --> 00:19:02,720
so this mission is going to be very

528
00:19:07,669 --> 00:19:04,320
important for everybody

529
00:19:10,310 --> 00:19:07,679
particularly those in coastal regions

530
00:19:11,510 --> 00:19:10,320
and it's very satisfying for me to have

531
00:19:14,870 --> 00:19:11,520
been

532
00:19:17,029 --> 00:19:14,880
working

533
00:19:19,909 --> 00:19:17,039
for 30 years with settlers altimeter

534
00:19:23,029 --> 00:19:19,919
data and the last seven years on central

535
00:19:26,150 --> 00:19:23,039
sixth so it's a pleasure to see sentinel

536
00:19:30,150 --> 00:19:26,160
microflight we launched and then

537
00:19:36,310 --> 00:19:30,160
after that see the first data coming out

538
00:19:41,510 --> 00:19:39,750

i certainly do thanks rimco uh

539
00:19:43,510 --> 00:19:41,520
thank you also for all your work over

540
00:19:44,789 --> 00:19:43,520
the years i know it's been a long haul

541
00:19:47,510 --> 00:19:44,799
for you

542
00:19:49,110 --> 00:19:47,520
well sentinel 6 what can we say about it

543
00:19:51,510 --> 00:19:49,120
it's the satellite so nice

544
00:19:53,669 --> 00:19:51,520
we built it twice that's right in fact

545
00:19:55,270 --> 00:19:53,679
there are actually two michael freilix

546
00:19:56,870 --> 00:19:55,280
not two michael freilix satellites but

547
00:19:58,630 --> 00:19:56,880
two sentinel six satellites

548
00:20:00,549 --> 00:19:58,640
the first one sentinel six michael

549
00:20:03,029 --> 00:20:00,559
freilick will launch tomorrow

550
00:20:05,430 --> 00:20:03,039
and in five years from now we'll launch

551
00:20:07,750 --> 00:20:05,440
its successor sentinel 6b

552
00:20:08,549 --> 00:20:07,760
now this is a huge deal for us climate

553
00:20:10,549 --> 00:20:08,559
scientists

554
00:20:11,830 --> 00:20:10,559
because it means we get to look at the

555
00:20:14,390 --> 00:20:11,840
oceans for a full

556
00:20:15,909 --> 00:20:14,400
10 years in an unbroken record and it's

557
00:20:16,950 --> 00:20:15,919
the first time we've been able to build

558
00:20:19,029 --> 00:20:16,960
two in a row

559
00:20:20,149 --> 00:20:19,039
so we can launch them back to back and

560
00:20:21,909 --> 00:20:20,159
extend the record

561
00:20:23,270 --> 00:20:21,919
much farther than we've been able to so

562
00:20:25,350 --> 00:20:23,280
far now

563
00:20:27,830 --> 00:20:25,360

the record of global sea level rise

564
00:20:29,590 --> 00:20:27,840
actually as rimco just showed goes back

565
00:20:32,310 --> 00:20:29,600
to the early 90s

566
00:20:33,510 --> 00:20:32,320
and what's interesting about it is that

567
00:20:35,909 --> 00:20:33,520
you can see

568
00:20:37,190 --> 00:20:35,919
the rate of rise is actually increasing

569
00:20:38,789 --> 00:20:37,200
so in the 90s

570
00:20:40,470 --> 00:20:38,799
sea level was rising at about two

571
00:20:42,630 --> 00:20:40,480
millimeters per year

572
00:20:43,830 --> 00:20:42,640
in the 2000s it was more like three

573
00:20:46,149 --> 00:20:43,840
millimeters per year

574
00:20:47,669 --> 00:20:46,159
and now it's more like four or close to

575
00:20:49,669 --> 00:20:47,679
five millimeters per year

576
00:20:52,149 --> 00:20:49,679
so we're watching the rate of sea level

577
00:20:54,149 --> 00:20:52,159
rise increase right before our very eyes

578
00:20:55,190 --> 00:20:54,159
and it's satellites like this that allow

579
00:20:57,750 --> 00:20:55,200
us to do it

580
00:20:58,789 --> 00:20:57,760
now the rising ocean is important for

581
00:21:01,909 --> 00:20:58,799
climate change

582
00:21:02,549 --> 00:21:01,919
because over 90 percent of the heat

583
00:21:04,789 --> 00:21:02,559
trapped

584
00:21:05,750 --> 00:21:04,799
by greenhouse gases that we release into

585
00:21:08,549 --> 00:21:05,760
the atmosphere

586
00:21:10,630 --> 00:21:08,559
is actually going into the oceans so we

587
00:21:13,510 --> 00:21:10,640
often think about it as global warming

588
00:21:15,110 --> 00:21:13,520

but really it's ocean warming the oceans

589
00:21:17,430 --> 00:21:15,120
are the really big player

590
00:21:18,630 --> 00:21:17,440
in terms of absorbing heat from the

591
00:21:21,909 --> 00:21:18,640
climate system

592
00:21:22,549 --> 00:21:21,919
so the ocean's warm the water expands

593
00:21:24,630 --> 00:21:22,559
that's about

594
00:21:25,750 --> 00:21:24,640
one third of sea level rise as karen

595
00:21:27,590 --> 00:21:25,760
mentioned earlier

596
00:21:29,430 --> 00:21:27,600
the rest is from melting glaciers and

597
00:21:31,029 --> 00:21:29,440
ice sheets that are reacting to the

598
00:21:33,350 --> 00:21:31,039
warming environment too

599
00:21:34,149 --> 00:21:33,360
so these missions really give us our

600
00:21:37,029 --> 00:21:34,159
most important

601
00:21:39,029 --> 00:21:37,039
yardstick for measuring climate change

602
00:21:40,630 --> 00:21:39,039
and how it's playing out on the planet

603
00:21:42,789 --> 00:21:40,640
but they don't just measure climate

604
00:21:45,350 --> 00:21:42,799
change in fact this is a huge

605
00:21:47,350 --> 00:21:45,360
impact as craig mentioned hundreds of

606
00:21:49,990 --> 00:21:47,360
millions of people will be affected by

607
00:21:52,549 --> 00:21:50,000
sea level rise in the coming decades

608
00:21:54,470 --> 00:21:52,559
and right now as climate scientists

609
00:21:55,029 --> 00:21:54,480
we're really good at predicting global

610
00:21:57,190 --> 00:21:55,039
warming

611
00:21:58,230 --> 00:21:57,200
but we're not so great at predicting sea

612
00:22:00,310 --> 00:21:58,240
level rise

613
00:22:02,789 --> 00:22:00,320

and our best tool for predicting the

614
00:22:03,350 --> 00:22:02,799
next 10 or 20 or 30 years of sea level

615
00:22:05,270 --> 00:22:03,360
rise

616
00:22:07,430 --> 00:22:05,280
is what's happening today and what's

617
00:22:08,310 --> 00:22:07,440
happened for the last 10 to 20 to 30

618
00:22:10,710 --> 00:22:08,320
years

619
00:22:11,669 --> 00:22:10,720
so these are really important tools for

620
00:22:13,830 --> 00:22:11,679
climate

621
00:22:15,750 --> 00:22:13,840
and of course the oceans which cover

622
00:22:17,190 --> 00:22:15,760
more than 70 percent of the planet play

623
00:22:19,110 --> 00:22:17,200
a huge role in

624
00:22:20,470 --> 00:22:19,120
many aspects of our climate i think

625
00:22:21,430 --> 00:22:20,480
we'll hear a little bit more about that

626
00:22:24,070 --> 00:22:21,440
later

627
00:22:25,110 --> 00:22:24,080
but in the meantime sentinel 6 also has

628
00:22:27,350 --> 00:22:25,120
a new toy

629
00:22:29,510 --> 00:22:27,360
uh i think we have an animation there's

630
00:22:31,430 --> 00:22:29,520
a sentinel there's a radio occultation

631
00:22:34,310 --> 00:22:31,440
receiver on sentinel six

632
00:22:34,950 --> 00:22:34,320
so this uh is an antenna that looks

633
00:22:37,270 --> 00:22:34,960
forward

634
00:22:39,590 --> 00:22:37,280
as the satellite flies around the earth

635
00:22:42,149 --> 00:22:39,600
and as it looks forward it sees

636
00:22:43,029 --> 00:22:42,159
gps satellites coming up above the

637
00:22:45,510 --> 00:22:43,039
horizon

638
00:22:46,789 --> 00:22:45,520

and as they do the signal from the gps

639
00:22:48,310 --> 00:22:46,799
satellite

640
00:22:49,830 --> 00:22:48,320
passes through the earth's atmosphere

641
00:22:52,310 --> 00:22:49,840
and skims off of it

642
00:22:52,870 --> 00:22:52,320
as it does it slows down and the

643
00:22:55,430 --> 00:22:52,880
satellite

644
00:22:55,990 --> 00:22:55,440
measures how much that slowing happens

645
00:22:58,549 --> 00:22:56,000
and that

646
00:22:59,430 --> 00:22:58,559
actually bends around the uh the earth

647
00:23:01,430 --> 00:22:59,440
as you can see

648
00:23:02,630 --> 00:23:01,440
on the rear facing set the rear-facing

649
00:23:05,029 --> 00:23:02,640
antenna right here

650
00:23:06,830 --> 00:23:05,039
now we use that information to actually

651
00:23:08,070 --> 00:23:06,840
figure out the temperature and the

652
00:23:10,950 --> 00:23:08,080
humidity

653
00:23:12,230 --> 00:23:10,960
of the atmosphere not just at one

654
00:23:13,990 --> 00:23:12,240
location but

655
00:23:15,350 --> 00:23:14,000
as a function of height throughout the

656
00:23:16,310 --> 00:23:15,360
atmosphere so you can actually get a

657
00:23:18,470 --> 00:23:16,320
profile

658
00:23:19,430 --> 00:23:18,480
of temperature and humidity which is

659
00:23:20,870 --> 00:23:19,440
really cool

660
00:23:22,950 --> 00:23:20,880
it's really great for numerical weather

661
00:23:24,149 --> 00:23:22,960
prediction and in fact it's so cool i

662
00:23:27,270 --> 00:23:24,159
think i have to put on my

663
00:23:29,270 --> 00:23:27,280

my sunglasses before i introduce our

664
00:23:36,230 --> 00:23:29,280
next speaker which is deirdre byrne

665
00:23:38,870 --> 00:23:36,240
no oceanographer stay cool deirdre it's

666
00:23:41,909 --> 00:23:38,880
climate elvis

667
00:23:43,590 --> 00:23:41,919
um yes so i wanted to talk a little bit

668
00:23:45,510 --> 00:23:43,600
it's obvious it should be obvious to you

669
00:23:46,950 --> 00:23:45,520
guys now that sentinel 6 has a really

670
00:23:49,350 --> 00:23:46,960
important climate mission

671
00:23:50,070 --> 00:23:49,360
but um we're getting the data in real

672
00:23:53,830 --> 00:23:50,080
time and

673
00:23:56,870 --> 00:23:53,840
at noaa we're excited also

674
00:23:58,470 --> 00:23:56,880
about using these data to improve our

675
00:24:00,070 --> 00:23:58,480
real-time ocean products which is

676
00:24:01,430 --> 00:24:00,080
something we call now casting and in

677
00:24:03,669 --> 00:24:01,440
particular i'm going to talk

678
00:24:04,710 --> 00:24:03,679
about the potential to improve

679
00:24:07,269 --> 00:24:04,720
predictions of

680
00:24:09,190 --> 00:24:07,279
hurricane intensification so hurricanes

681
00:24:12,870 --> 00:24:09,200
take energy from the ocean surface

682
00:24:16,310 --> 00:24:12,880
waters um a warm ocean under a hurricane

683
00:24:18,470 --> 00:24:16,320
will tend to spin it up and a cool ocean

684
00:24:19,029 --> 00:24:18,480
under hurricane will tend to dampen its

685
00:24:20,870 --> 00:24:19,039
strength

686
00:24:22,310 --> 00:24:20,880
so sentinel 6 when it's added to the

687
00:24:23,430 --> 00:24:22,320
constellation of satellites already

688
00:24:25,830 --> 00:24:23,440

flying is going to

689
00:24:27,510 --> 00:24:25,840
improve um the accuracy of our near

690
00:24:28,950 --> 00:24:27,520
surface ocean heat content products

691
00:24:29,990 --> 00:24:28,960
which is something that comes out every

692
00:24:32,230 --> 00:24:30,000
day

693
00:24:33,110 --> 00:24:32,240
and is used by hurricane forecasters so

694
00:24:35,590 --> 00:24:33,120
it's important

695
00:24:37,669 --> 00:24:35,600
um for this application to realize that

696
00:24:38,950 --> 00:24:37,679
because sentinel 6 is a radar instrument

697
00:24:40,950 --> 00:24:38,960
it's an active instrument

698
00:24:42,789 --> 00:24:40,960
it can actually see through the clouds

699
00:24:43,269 --> 00:24:42,799
which is a huge advantage for hurricane

700
00:24:44,789 --> 00:24:43,279
work

701
00:24:46,390 --> 00:24:44,799
um now i just want to mention that

702
00:24:47,909 --> 00:24:46,400
hurricanes have always been a big deal

703
00:24:50,789 --> 00:24:47,919
but because of global warming

704
00:24:51,190 --> 00:24:50,799
they're becoming more powerful they're

705
00:24:52,549 --> 00:24:51,200
wetter

706
00:24:54,310 --> 00:24:52,559
they're slower moving they're

707
00:24:56,390 --> 00:24:54,320
intensifying more rapidly

708
00:24:58,549 --> 00:24:56,400
they're spinning down more slowly and

709
00:25:00,149 --> 00:24:58,559
now the conditions that spawn hurricanes

710
00:25:02,149 --> 00:25:00,159
are occurring over a larger area of the

711
00:25:03,110 --> 00:25:02,159
ocean so that makes it even more

712
00:25:04,549 --> 00:25:03,120
critical to have

713
00:25:07,110 --> 00:25:04,559

accurate hurricane predictions could i

714
00:25:09,909 --> 00:25:07,120
have my first image please

715
00:25:11,269 --> 00:25:09,919
um so what i'm showing here is you know

716
00:25:12,149 --> 00:25:11,279
people are becoming aware of this this

717
00:25:14,789 --> 00:25:12,159
actually hit the

718
00:25:15,990 --> 00:25:14,799
um the newspaper the daily newspaper

719
00:25:17,909 --> 00:25:16,000
which was a thrill to me

720
00:25:20,230 --> 00:25:17,919
and the figure on the right is showing

721
00:25:21,350 --> 00:25:20,240
you the upper ocean heat content on

722
00:25:23,750 --> 00:25:21,360
october 7th

723
00:25:24,870 --> 00:25:23,760
as hurricane delta was passing over and

724
00:25:26,789 --> 00:25:24,880
there's a little track there of the

725
00:25:28,950 --> 00:25:26,799
hurricane and as it crossed that red

726
00:25:31,110 --> 00:25:28,960
warm patch in the caribbean the

727
00:25:33,909 --> 00:25:31,120
hurricane spun up from having a

728
00:25:35,669 --> 00:25:33,919
top maximum sustained winds of 20 knots

729
00:25:38,070 --> 00:25:35,679
to 120 knots

730
00:25:39,430 --> 00:25:38,080
so that's a really um that's a really

731
00:25:42,549 --> 00:25:39,440
critical tool for us

732
00:25:43,430 --> 00:25:42,559
just it's another you know another tool

733
00:25:45,669 --> 00:25:43,440
in our in our

734
00:25:46,470 --> 00:25:45,679
tool kit for a better uh hurricane

735
00:25:49,669 --> 00:25:46,480
prediction

736
00:25:52,789 --> 00:25:49,679
um could i have my next image please

737
00:25:55,110 --> 00:25:52,799
and as craig mentioned ocean surface

738
00:25:58,710 --> 00:25:55,120

roughness and significant wave height

739
00:26:00,070 --> 00:25:58,720
are part of the radar waveform that come

740
00:26:01,590 --> 00:26:00,080
when you're making measurements of sea

741
00:26:03,430 --> 00:26:01,600
level but i want to emphasize that the

742
00:26:05,510 --> 00:26:03,440
significant wave height is actually

743
00:26:07,510 --> 00:26:05,520
a useful measurement in and of itself so

744
00:26:09,430 --> 00:26:07,520
at noaa's ocean prediction center

745
00:26:10,950 --> 00:26:09,440
forecasters use the significant wave

746
00:26:12,310 --> 00:26:10,960
height to provide marine warnings and

747
00:26:14,149 --> 00:26:12,320
predictions

748
00:26:15,909 --> 00:26:14,159
as real-time data this information is

749
00:26:17,430 --> 00:26:15,919
particularly useful for ship routing

750
00:26:19,029 --> 00:26:17,440
around storms in this picture

751
00:26:20,630 --> 00:26:19,039
this is a screen shot from a

752
00:26:22,950 --> 00:26:20,640
forecaster's actual

753
00:26:24,470 --> 00:26:22,960
screen the forecaster is warning

754
00:26:27,669 --> 00:26:24,480
mariners about waves

755
00:26:30,710 --> 00:26:27,679
reaching between 45 and 57

756
00:26:33,669 --> 00:26:30,720
feet high in an intense pacific storm

757
00:26:34,390 --> 00:26:33,679
so the real-time data have an essential

758
00:26:37,510 --> 00:26:34,400
mission in

759
00:26:39,430 --> 00:26:37,520
protecting property and saving lives and

760
00:26:41,190 --> 00:26:39,440
used in retrospect significant way fight

761
00:26:43,510 --> 00:26:41,200
is also useful for things like

762
00:26:44,950 --> 00:26:43,520
risk assessments in the marine insurance

763
00:26:50,149 --> 00:26:44,960

industry

764
00:26:54,310 --> 00:26:51,909
i also wanted to mention that noaa

765
00:26:55,750 --> 00:26:54,320
brings significant in-water assets to

766
00:26:57,669 --> 00:26:55,760
enhance the valley of this mission in

767
00:26:58,630 --> 00:26:57,679
particular we maintain a large network

768
00:27:01,190 --> 00:26:58,640
of tide gauges

769
00:27:02,310 --> 00:27:01,200
around the u.s coast because land can

770
00:27:04,549 --> 00:27:02,320
experience

771
00:27:05,350 --> 00:27:04,559
forces like uplift and subsidence and

772
00:27:07,110 --> 00:27:05,360
erosion

773
00:27:08,470 --> 00:27:07,120
tide gauges are essential to link the

774
00:27:09,510 --> 00:27:08,480
satellite record to what's going on

775
00:27:11,430 --> 00:27:09,520
around the coast

776
00:27:12,950 --> 00:27:11,440
and our other big in water measurement

777
00:27:14,710 --> 00:27:12,960
system that's

778
00:27:16,789 --> 00:27:14,720
critical for the sentinel program is the

779
00:27:19,669 --> 00:27:16,799
argo program argo pro

780
00:27:21,269 --> 00:27:19,679
floats are robotic probes they drift

781
00:27:21,909 --> 00:27:21,279
around in the ocean and they cycle up

782
00:27:23,990 --> 00:27:21,919
and down

783
00:27:25,669 --> 00:27:24,000
making what we call profile measurements

784
00:27:26,789 --> 00:27:25,679
and those profile measurements are an

785
00:27:29,269 --> 00:27:26,799
essential tool

786
00:27:30,630 --> 00:27:29,279
in translating the sea level rise

787
00:27:32,230 --> 00:27:30,640
measured by sentinel 6

788
00:27:33,830 --> 00:27:32,240

into measurements of ocean warming but

789
00:27:35,909 --> 00:27:33,840
they're also essential to the hurricane

790
00:27:38,470 --> 00:27:35,919
prediction tools i mentioned earlier

791
00:27:39,990 --> 00:27:38,480
more most recently we've extended these

792
00:27:41,350 --> 00:27:40,000
profiles into the deep ocean with a

793
00:27:43,029 --> 00:27:41,360
program called deep argo

794
00:27:44,870 --> 00:27:43,039
and those probes are being deployed in

795
00:27:46,870 --> 00:27:44,880
areas that have been

796
00:27:48,630 --> 00:27:46,880
seen to be experiencing rapid change in

797
00:27:49,430 --> 00:27:48,640
their deep waters most of which are of

798
00:27:51,350 --> 00:27:49,440
polar origin

799
00:27:52,549 --> 00:27:51,360
i want to emphasize argo is a truly

800
00:27:54,470 --> 00:27:52,559
international program with

801
00:27:55,669 --> 00:27:54,480
many many countries participating and

802
00:27:57,830 --> 00:27:55,679
there are currently around

803
00:27:58,789 --> 00:27:57,840
4 000 argo probes in the ocean at the

804
00:28:01,190 --> 00:27:58,799
moment

805
00:28:01,830 --> 00:28:01,200
but the us plays a big role in that i

806
00:28:03,909 --> 00:28:01,840
believe

807
00:28:06,310 --> 00:28:03,919
we've funded about half of those probes

808
00:28:09,510 --> 00:28:06,320
and as you can see here in the

809
00:28:11,909 --> 00:28:09,520
noaa argo lab in seattle we calibrate

810
00:28:13,350 --> 00:28:11,919
the probes and deploy them off our ships

811
00:28:16,549 --> 00:28:13,360
that's the figure on the right

812
00:28:17,669 --> 00:28:16,559
and all in all that program has been a

813
00:28:20,549 --> 00:28:17,679

huge success

814
00:28:21,590 --> 00:28:20,559
um and is a is a critical partner to go

815
00:28:23,669 --> 00:28:21,600
along with the

816
00:28:24,789 --> 00:28:23,679
the sentinel six satellite and other

817
00:28:29,510 --> 00:28:24,799
altimeters flying

818
00:28:36,389 --> 00:28:32,630
so as um craig already mentioned

819
00:28:37,909 --> 00:28:36,399
um and yeah i want to mention that um

820
00:28:40,149 --> 00:28:37,919
noah and our partners

821
00:28:42,149 --> 00:28:40,159
nasa issa and yumeza operate many kinds

822
00:28:43,590 --> 00:28:42,159
of satellites so we measure ocean color

823
00:28:46,149 --> 00:28:43,600
ocean surface temperatures

824
00:28:47,590 --> 00:28:46,159
ocean winds and these types of

825
00:28:48,070 --> 00:28:47,600
information are synthesized into

826
00:28:49,909 --> 00:28:48,080
products

827
00:28:51,830 --> 00:28:49,919
that we use for ecosystem monitoring we

828
00:28:53,350 --> 00:28:51,840
use for protection tools for harmful

829
00:28:55,190 --> 00:28:53,360
algal blooms

830
00:28:56,870 --> 00:28:55,200
and we use them to drive ocean models

831
00:28:58,310 --> 00:28:56,880
like the one you can see in the figure

832
00:29:00,310 --> 00:28:58,320
um

833
00:29:01,990 --> 00:29:00,320
and those models feed into weather

834
00:29:03,750 --> 00:29:02,000
predictions so just having one

835
00:29:04,149 --> 00:29:03,760
additional satellite in the mix is going

836
00:29:06,630 --> 00:29:04,159
to

837
00:29:08,549 --> 00:29:06,640
increase the frequency and density of

838
00:29:10,470 --> 00:29:08,559

sea level measurements available

839
00:29:12,230 --> 00:29:10,480
and in particular that's been shown to

840
00:29:14,710 --> 00:29:12,240
be critical for accurate prediction of

841
00:29:17,669 --> 00:29:14,720
ocean currents in coastal waters

842
00:29:18,389 --> 00:29:17,679
so in addition sentinel 6 is exciting to

843
00:29:22,070 --> 00:29:18,399
us because

844
00:29:24,870 --> 00:29:22,080
it is flying new and better instruments

845
00:29:26,470 --> 00:29:24,880
and there is a possibility of using new

846
00:29:28,070 --> 00:29:26,480
techniques on the data that would get us

847
00:29:28,950 --> 00:29:28,080
information just a little bit closer to

848
00:29:31,909 --> 00:29:28,960
the coast

849
00:29:32,789 --> 00:29:31,919
so it's just a few miles but every

850
00:29:35,830 --> 00:29:32,799
little bit helps

851
00:29:37,669 --> 00:29:35,840
so that's a promising development for

852
00:29:39,029 --> 00:29:37,679
providing more accurate and timely

853
00:29:41,590 --> 00:29:39,039
coastal predictions

854
00:29:43,350 --> 00:29:41,600
so ultimately you know to me the

855
00:29:45,029 --> 00:29:43,360
sentinel 6 missions are exciting because

856
00:29:46,470 --> 00:29:45,039
they're going to allow us to provide

857
00:29:48,470 --> 00:29:46,480
better information to coastal

858
00:29:50,870 --> 00:29:48,480
communities that's 40 of the

859
00:29:52,710 --> 00:29:50,880
u.s population and they're really

860
00:29:54,710 --> 00:29:52,720
experiencing the brunt of a lot of

861
00:29:57,269 --> 00:29:54,720
climate change inundations stronger

862
00:30:00,549 --> 00:29:57,279
hurricanes things like that

863
00:30:03,510 --> 00:30:00,559

and now over to luanne

864
00:30:04,470 --> 00:30:03,520
thanks deirdre so i want to talk to you

865
00:30:06,870 --> 00:30:04,480
about

866
00:30:09,029 --> 00:30:06,880
other applications of sea level to the

867
00:30:09,430 --> 00:30:09,039
study of the ocean's role in climate

868
00:30:12,070 --> 00:30:09,440
both

869
00:30:13,830 --> 00:30:12,080
climate variability and change and in

870
00:30:15,510 --> 00:30:13,840
particular the continuity of the

871
00:30:17,350 --> 00:30:15,520
satellite mission is really important

872
00:30:17,990 --> 00:30:17,360
for climate studies because we need to

873
00:30:19,510 --> 00:30:18,000
know

874
00:30:21,430 --> 00:30:19,520
how climate has changed over long

875
00:30:25,029 --> 00:30:21,440
periods especially if we want to know

876
00:30:26,710 --> 00:30:25,039
what controls monthly to year by year

877
00:30:28,470 --> 00:30:26,720
changes in climate

878
00:30:30,149 --> 00:30:28,480
so the first example i want to talk

879
00:30:34,070 --> 00:30:30,159
about is el nino

880
00:30:36,470 --> 00:30:34,080
so go ahead and show the first slide

881
00:30:37,350 --> 00:30:36,480
so many of us have heard about el nino

882
00:30:39,350 --> 00:30:37,360
and it has

883
00:30:41,350 --> 00:30:39,360
impacts all over the globe and it

884
00:30:42,870 --> 00:30:41,360
initiates in the tropical pacific where

885
00:30:46,630 --> 00:30:42,880
the tropical pacific

886
00:30:48,310 --> 00:30:46,640
warms and then that sets off uh

887
00:30:49,750 --> 00:30:48,320
reverberation through the atmosphere

888
00:30:51,590 --> 00:30:49,760

that then impact

889
00:30:53,430 --> 00:30:51,600
areas of the planet that are far from

890
00:30:55,669 --> 00:30:53,440
the tropical pacific

891
00:30:58,070 --> 00:30:55,679
i'm sitting in seattle and right now

892
00:31:00,870 --> 00:30:58,080
we're experiencing a very wet and cold

893
00:31:03,509 --> 00:31:00,880
fall and early winter and you can see

894
00:31:05,669 --> 00:31:03,519
that orange

895
00:31:06,630 --> 00:31:05,679
circle over alaska and the pacific

896
00:31:10,310 --> 00:31:06,640
northwest

897
00:31:11,430 --> 00:31:10,320
that shows drying and warming during el

898
00:31:13,990 --> 00:31:11,440
nino

899
00:31:14,470 --> 00:31:14,000
we are in the middle of a la nina which

900
00:31:17,269 --> 00:31:14,480
is

901
00:31:19,110 --> 00:31:17,279
the direct opposite of el nino during el

902
00:31:22,230 --> 00:31:19,120
ninos you also have

903
00:31:23,990 --> 00:31:22,240
really dry uh weather over indonesia and

904
00:31:27,110 --> 00:31:24,000
the rainforest there and you

905
00:31:28,549 --> 00:31:27,120
often see very large fires but this is

906
00:31:31,110 --> 00:31:28,559
all coming from

907
00:31:32,549 --> 00:31:31,120
the tropical pacific in that green area

908
00:31:34,389 --> 00:31:32,559
so now we're going to look at

909
00:31:36,310 --> 00:31:34,399
what sea level tells us about what's

910
00:31:40,310 --> 00:31:36,320
going on with the tropical pacific with

911
00:31:44,070 --> 00:31:41,669
can you give me the next slide please

912
00:31:47,590 --> 00:31:44,080
there we go so this is sea level

913
00:31:50,789 --> 00:31:47,600

from 2015 to 2016 and you see

914
00:31:51,509 --> 00:31:50,799
this this red which indicates high sea

915
00:31:53,830 --> 00:31:51,519
level

916
00:31:54,870 --> 00:31:53,840
now what does that mean what that means

917
00:31:57,590 --> 00:31:54,880
is that there

918
00:31:58,310 --> 00:31:57,600
is a rise a local rise in sea level and

919
00:32:01,590 --> 00:31:58,320
in fact

920
00:32:03,669 --> 00:32:01,600
it's almost um up to a meter in some

921
00:32:05,830 --> 00:32:03,679
places in the tropical pacific

922
00:32:07,909 --> 00:32:05,840
now that doesn't sound like that much

923
00:32:09,590 --> 00:32:07,919
but it represents a huge amount of heat

924
00:32:12,389 --> 00:32:09,600
in the ocean

925
00:32:14,149 --> 00:32:12,399
if we think about water water can hold a

926
00:32:15,669 --> 00:32:14,159
huge amount of heat and in fact when i

927
00:32:17,750 --> 00:32:15,679
go to bed at night

928
00:32:20,310 --> 00:32:17,760
and my feet are cold i use a hot water

929
00:32:23,350 --> 00:32:20,320
bottle not a hot air bottle

930
00:32:24,789 --> 00:32:23,360
so that to that about a meter or so

931
00:32:27,269 --> 00:32:24,799
a little bit less than a meter of sea

932
00:32:28,230 --> 00:32:27,279
level rise actually represents warming

933
00:32:31,350 --> 00:32:28,240
of the ocean

934
00:32:34,630 --> 00:32:31,360
from the surface down to several hundred

935
00:32:36,870 --> 00:32:34,640
several hundred feet or a hundred meters

936
00:32:38,070 --> 00:32:36,880
that's a huge amount of warm water and

937
00:32:40,789 --> 00:32:38,080
with that warm water

938
00:32:42,230 --> 00:32:40,799

we can tickle that atmosphere or even

939
00:32:44,870 --> 00:32:42,240
push it a little bit

940
00:32:46,230 --> 00:32:44,880
and then see those impacts far from the

941
00:32:48,389 --> 00:32:46,240
tropical pacific

942
00:32:50,389 --> 00:32:48,399
so sea level is really important for

943
00:32:52,310 --> 00:32:50,399
understanding what controls el nino and

944
00:32:54,549 --> 00:32:52,320
la nina and the transitions

945
00:32:55,590 --> 00:32:54,559
and can potentially help help us predict

946
00:32:57,350 --> 00:32:55,600
it

947
00:32:59,190 --> 00:32:57,360
so we're going to go ahead and start

948
00:33:01,509 --> 00:32:59,200
talking about ocean currents with the

949
00:33:03,350 --> 00:33:01,519
next animation

950
00:33:05,029 --> 00:33:03,360
so the other thing about sea level that

951
00:33:06,549 --> 00:33:05,039
deirdre mentioned is that it actually

952
00:33:08,630 --> 00:33:06,559
gives us a really accurate

953
00:33:10,870 --> 00:33:08,640
representative this representation of

954
00:33:13,029 --> 00:33:10,880
the surface currents in the ocean

955
00:33:14,710 --> 00:33:13,039
so here's an animation of circ surface

956
00:33:18,149 --> 00:33:14,720
currents and you can see

957
00:33:20,070 --> 00:33:18,159
the um gulf of mexico where you see this

958
00:33:21,590 --> 00:33:20,080
big eddy going around

959
00:33:23,110 --> 00:33:21,600
and that's where deirdre was talking

960
00:33:26,630 --> 00:33:23,120
about the

961
00:33:28,310 --> 00:33:26,640
impacts of sea level rise on hurricanes

962
00:33:30,310 --> 00:33:28,320
and then you see the gulf stream coming

963
00:33:31,269 --> 00:33:30,320

up the eastern seaboard of the u.s and

964
00:33:33,590 --> 00:33:31,279
going out

965
00:33:34,310 --> 00:33:33,600
into the north pacific i mean the north

966
00:33:35,990 --> 00:33:34,320
atlantic

967
00:33:38,230 --> 00:33:36,000
the really interesting thing about sea

968
00:33:40,710 --> 00:33:38,240
level is that the sea level doesn't ride

969
00:33:41,750 --> 00:33:40,720
downhill i mean the currents don't ride

970
00:33:44,470 --> 00:33:41,760
downhill

971
00:33:45,190 --> 00:33:44,480
they ride along the hill and the steeper

972
00:33:48,310 --> 00:33:45,200
the hill

973
00:33:49,350 --> 00:33:48,320
of sea level the faster the currents so

974
00:33:51,350 --> 00:33:49,360
that animation

975
00:33:53,430 --> 00:33:51,360
ended up in my favorite current the gulf

976
00:33:54,549 --> 00:33:53,440
stream which is key to my research right

977
00:33:56,789 --> 00:33:54,559
now

978
00:33:58,710 --> 00:33:56,799
so let's go on to the next slide and

979
00:33:59,750 --> 00:33:58,720
start talking about the ocean's role in

980
00:34:03,509 --> 00:33:59,760
climate and how

981
00:34:06,549 --> 00:34:03,519
it exchanges heat with the atmosphere

982
00:34:08,310 --> 00:34:06,559
now the global warming signal of

983
00:34:10,149 --> 00:34:08,320
from excess carbon dioxide in the

984
00:34:12,550 --> 00:34:10,159
atmosphere gives us about

985
00:34:13,990 --> 00:34:12,560
an excess of 2 watts per meter squared

986
00:34:15,430 --> 00:34:14,000
over the ocean

987
00:34:17,990 --> 00:34:15,440
now if you look over the gulf stream

988
00:34:20,230 --> 00:34:18,000

once again east of the us

989
00:34:22,149 --> 00:34:20,240
you might be able to see that um the

990
00:34:23,190 --> 00:34:22,159
amount of heat that's leaving the ocean

991
00:34:25,909 --> 00:34:23,200
and going to the

992
00:34:26,389 --> 00:34:25,919
atmosphere is two orders of a magnitude

993
00:34:29,349 --> 00:34:26,399
bigger

994
00:34:31,270 --> 00:34:29,359
that's 200 watts per meter squared and

995
00:34:33,349 --> 00:34:31,280
that also represents

996
00:34:35,030 --> 00:34:33,359
a area of the ocean that has large

997
00:34:38,470 --> 00:34:35,040
variations in sea level

998
00:34:39,909 --> 00:34:38,480
or the the heat content of the upper

999
00:34:42,230 --> 00:34:39,919
ocean

1000
00:34:44,710 --> 00:34:42,240
and with that information of how that

1001
00:34:47,349 --> 00:34:44,720
heat content is changing

1002
00:34:48,310 --> 00:34:47,359
by observing sea level we can also learn

1003
00:34:50,950 --> 00:34:48,320
things about

1004
00:34:53,430 --> 00:34:50,960
how we can use this huge heat capacity

1005
00:34:56,950 --> 00:34:53,440
ocean to actually understand

1006
00:35:00,310 --> 00:34:56,960
what controls weather over europe

1007
00:35:02,950 --> 00:35:00,320
on time scales from a month to

1008
00:35:04,630 --> 00:35:02,960
several years so sea level these sea

1009
00:35:06,630 --> 00:35:04,640
level measurements are not just about

1010
00:35:09,430 --> 00:35:06,640
what's going on around the coast

1011
00:35:10,150 --> 00:35:09,440
but they also tell us about what

1012
00:35:13,109 --> 00:35:10,160
controls

1013
00:35:15,030 --> 00:35:13,119

the climate over months to years and in

1014
00:35:17,510 --> 00:35:15,040
particular what the role is

1015
00:35:18,630 --> 00:35:17,520
for controlling this climate variability

1016
00:35:21,270 --> 00:35:18,640
and change

1017
00:35:23,829 --> 00:35:21,280
okay i'll send it back to you marina you

1018
00:35:27,990 --> 00:35:25,910
thank you so much luanne we are now

1019
00:35:28,550 --> 00:35:28,000
ready to take media questions remember

1020
00:35:31,430 --> 00:35:28,560
to press

1021
00:35:33,670 --> 00:35:31,440
star one to get put in the queue and

1022
00:35:35,829 --> 00:35:33,680
please direct your questions to one of

1023
00:35:37,829 --> 00:35:35,839
the panelists that we just heard from

1024
00:35:39,270 --> 00:35:37,839
we're also taking questions through the

1025
00:35:42,790 --> 00:35:39,280
seeing the seas

1026
00:35:45,109 --> 00:35:42,800
hashtag on all social media platforms

1027
00:35:46,150 --> 00:35:45,119
so right now on the phone we have

1028
00:35:52,230 --> 00:35:46,160
elizabeth

1029
00:35:54,550 --> 00:35:52,240
hi and thank you so much for taking my

1030
00:35:56,310 --> 00:35:54,560
question this is probably for deirdre

1031
00:35:58,310 --> 00:35:56,320
if i was a member of the public

1032
00:36:00,069 --> 00:35:58,320
following this mission what kind of maps

1033
00:36:01,910 --> 00:36:00,079
charts or other data products could i

1034
00:36:03,349 --> 00:36:01,920
look forward to for sentinel 6

1035
00:36:08,390 --> 00:36:03,359
and also about when will they be

1036
00:36:13,270 --> 00:36:12,550
well we'll be folding the sentinel 6

1037
00:36:15,589 --> 00:36:13,280
data

1038
00:36:16,710 --> 00:36:15,599

in with all of the other altimeters in

1039
00:36:19,589 --> 00:36:16,720
the in the family

1040
00:36:20,790 --> 00:36:19,599
so you you really wouldn't see from our

1041
00:36:23,990 --> 00:36:20,800
information products

1042
00:36:26,310 --> 00:36:24,000
a special sentinel 6 map

1043
00:36:27,750 --> 00:36:26,320
we take in all the available information

1044
00:36:29,190 --> 00:36:27,760
and we use it together

1045
00:36:30,790 --> 00:36:29,200
which is not to say you can't go get the

1046
00:36:34,470 --> 00:36:30,800
sentinel 6 data if you want it

1047
00:36:42,069 --> 00:36:34,480
but just from the user end

1048
00:36:47,109 --> 00:36:44,870
all right thank you so much for that and

1049
00:36:49,990 --> 00:36:47,119
now we will head over to the hashtag

1050
00:36:51,270 --> 00:36:50,000
seeing the sea social media questions

1051
00:36:54,950 --> 00:36:51,280
our first question

1052
00:36:58,069 --> 00:36:54,960
comes from caribbean gis on twitter

1053
00:36:59,270 --> 00:36:58,079
asking will hashtag sentinel 6 data be

1054
00:37:02,710 --> 00:36:59,280
made available

1055
00:37:03,430 --> 00:37:02,720
to the public on g or other portals

1056
00:37:13,030 --> 00:37:03,440
question

1057
00:37:13,750 --> 00:37:13,040
if you really want to get to the data

1058
00:37:15,750 --> 00:37:13,760
first you need to

1059
00:37:17,589 --> 00:37:15,760
to wait a bit as i explained we first

1060
00:37:19,430 --> 00:37:17,599
want to analyze the data before we're

1061
00:37:22,230 --> 00:37:19,440
going to release it to all users

1062
00:37:23,190 --> 00:37:22,240
but we do that over the next year we'll

1063
00:37:25,750 --> 00:37:23,200

start

1064
00:37:27,510 --> 00:37:25,760
that in around six months and all the

1065
00:37:28,550 --> 00:37:27,520
products will be available by the end of

1066
00:37:30,870 --> 00:37:28,560
the year

1067
00:37:33,109 --> 00:37:30,880
um you can get it from umitzat you can

1068
00:37:35,190 --> 00:37:33,119
go to the unsub website and find

1069
00:37:37,750 --> 00:37:35,200
the earth observation portal the eo

1070
00:37:41,109 --> 00:37:37,760
portal and you set up an account

1071
00:37:41,829 --> 00:37:41,119
and from that onwards you can download

1072
00:37:45,829 --> 00:37:41,839
the data

1073
00:37:48,390 --> 00:37:45,839
once it's available it's very simple and

1074
00:37:49,270 --> 00:37:48,400
i you i hope that you all enjoy the

1075
00:37:51,510 --> 00:37:49,280
products

1076
00:37:53,510 --> 00:37:51,520
also as dear manson mentioned of course

1077
00:37:56,069 --> 00:37:53,520
we also

1078
00:37:58,310 --> 00:37:56,079
distribute this data to other agencies

1079
00:38:00,950 --> 00:37:58,320
that then make their own products

1080
00:38:02,790 --> 00:38:00,960
like noaa is doing but also for example

1081
00:38:05,030 --> 00:38:02,800
the copernicus marine environmental

1082
00:38:08,710 --> 00:38:05,040
monitoring services cmamps

1083
00:38:09,910 --> 00:38:08,720
we'll be doing ecmwf the european center

1084
00:38:12,230 --> 00:38:09,920
for medium range

1085
00:38:13,270 --> 00:38:12,240
weather forecast will be so settle 6

1086
00:38:15,589 --> 00:38:13,280
will start to

1087
00:38:16,310 --> 00:38:15,599
be incorporated in a lot of the user

1088
00:38:23,109 --> 00:38:16,320

products that

1089
00:38:26,390 --> 00:38:24,790
and i think that's what makes this

1090
00:38:28,790 --> 00:38:26,400
product so amazing is that

1091
00:38:29,670 --> 00:38:28,800
everybody has access to it across the

1092
00:38:31,510 --> 00:38:29,680
globe which is

1093
00:38:33,030 --> 00:38:31,520
really incredible we've got our next

1094
00:38:36,630 --> 00:38:33,040
question from twitter

1095
00:38:39,510 --> 00:38:36,640
from ave valencia and the question

1096
00:38:40,150 --> 00:38:39,520
is why is its twin satellite being

1097
00:38:42,630 --> 00:38:40,160
launched

1098
00:38:46,790 --> 00:38:42,640
five years apart would you like to take

1099
00:38:49,829 --> 00:38:46,800
that josh

1100
00:38:52,150 --> 00:38:49,839
uh yeah thanks for the question um we

1101
00:38:53,430 --> 00:38:52,160
need to get uh as long a record as we

1102
00:38:55,030 --> 00:38:53,440
can of sea level

1103
00:38:57,589 --> 00:38:55,040
we've been measuring sea levels since

1104
00:38:59,910 --> 00:38:57,599
the early 90s with these missions

1105
00:39:02,230 --> 00:38:59,920
and each one has just barely launched in

1106
00:39:05,910 --> 00:39:02,240
time before the next one

1107
00:39:07,589 --> 00:39:05,920
has aged and stopped working so

1108
00:39:09,750 --> 00:39:07,599
what's amazing about this satellite is

1109
00:39:10,870 --> 00:39:09,760
really two things first is that we're

1110
00:39:13,990 --> 00:39:10,880
launching it while

1111
00:39:17,270 --> 00:39:14,000
our previous satellite json3 is still

1112
00:39:19,990 --> 00:39:17,280
healthy and young and then the second

1113
00:39:20,870 --> 00:39:20,000

is that we'll have another satellite in

1114
00:39:22,950 --> 00:39:20,880
five years

1115
00:39:24,630 --> 00:39:22,960
as sentinel 6 michael freilix starts to

1116
00:39:27,670 --> 00:39:24,640
age will be able to launch

1117
00:39:28,870 --> 00:39:27,680
sentinel 6b to take its place and extend

1118
00:39:32,710 --> 00:39:28,880
the record a full

1119
00:39:34,790 --> 00:39:32,720
decade and as i said before every decade

1120
00:39:36,550 --> 00:39:34,800
is like a whole new rate of global sea

1121
00:39:37,670 --> 00:39:36,560
level rise that we have to measure all

1122
00:39:39,190 --> 00:39:37,680
over again

1123
00:39:40,950 --> 00:39:39,200
sea level rise isn't going to go away

1124
00:39:42,950 --> 00:39:40,960
anytime soon so we have to keep

1125
00:39:47,430 --> 00:39:42,960
measuring it and the longer the record

1126
00:39:53,910 --> 00:39:50,630
thank you josh next from instagram

1127
00:39:57,750 --> 00:39:53,920
cedric asks how long will sentinel 6

1128
00:40:00,470 --> 00:39:57,760
operate for karen

1129
00:40:02,790 --> 00:40:00,480
sure so each one of the satellites

1130
00:40:05,829 --> 00:40:02,800
sentinel 6 michael freilich as well as

1131
00:40:08,390 --> 00:40:05,839
its its follow-on sentinel 6b

1132
00:40:09,270 --> 00:40:08,400
we anticipate will live about seven

1133
00:40:12,069 --> 00:40:09,280
years

1134
00:40:13,829 --> 00:40:12,079
so that's how we get to uh by launching

1135
00:40:15,349 --> 00:40:13,839
them five years apart that's how we get

1136
00:40:20,870 --> 00:40:15,359
to the decade-long

1137
00:40:25,270 --> 00:40:24,230
great thank you karen and now denzel on

1138
00:40:29,030 --> 00:40:25,280

periscope

1139
00:40:32,630 --> 00:40:29,040
asks what part of the ocean is covered

1140
00:40:33,910 --> 00:40:32,640
by this new satellite that wasn't before

1141
00:40:37,430 --> 00:40:33,920
craig would you like to take that

1142
00:40:40,950 --> 00:40:39,270
it's a really good question the part of

1143
00:40:43,030 --> 00:40:40,960
the ocean that has not been covered

1144
00:40:43,990 --> 00:40:43,040
before is the high resolution part of

1145
00:40:46,069 --> 00:40:44,000
the ocean

1146
00:40:48,950 --> 00:40:46,079
which we can get at by using our

1147
00:40:50,870 --> 00:40:48,960
synthetic aperture radar technologies

1148
00:40:53,589 --> 00:40:50,880
and this means that we can get down to

1149
00:40:54,950 --> 00:40:53,599
just um 300 meters in the long track

1150
00:40:56,550 --> 00:40:54,960
direction

1151
00:40:57,990 --> 00:40:56,560
and in certain parts of the ocean for

1152
00:41:02,069 --> 00:40:58,000
example um

1153
00:41:04,870 --> 00:41:02,079
wiki in the eastern basins of

1154
00:41:06,069 --> 00:41:04,880
the southern pacific how a long wave

1155
00:41:09,190 --> 00:41:06,079
swell rolls in

1156
00:41:10,710 --> 00:41:09,200
from the antarctic uh and the southern

1157
00:41:13,349 --> 00:41:10,720
ocean currents

1158
00:41:14,150 --> 00:41:13,359
and we can see that in the in the sar

1159
00:41:15,829 --> 00:41:14,160
data

1160
00:41:17,510 --> 00:41:15,839
and that hasn't been visible before in

1161
00:41:18,790 --> 00:41:17,520
the low resolution measurements that

1162
00:41:21,190 --> 00:41:18,800
we've had in the past

1163
00:41:22,870 --> 00:41:21,200

the orbit stays exactly the same as the

1164
00:41:23,670 --> 00:41:22,880
predecessor missions because as josh

1165
00:41:26,390 --> 00:41:23,680
manson

1166
00:41:27,430 --> 00:41:26,400
and carol mentioned we need to keep our

1167
00:41:29,109 --> 00:41:27,440
spacecraft

1168
00:41:30,790 --> 00:41:29,119
in that orbit to maintain the same

1169
00:41:32,150 --> 00:41:30,800
measurements for the long duration

1170
00:41:35,190 --> 00:41:32,160
that's how we get the precision of our

1171
00:41:38,230 --> 00:41:35,200
sea level measurements back to you

1172
00:41:42,150 --> 00:41:41,190
thank you craig now astro girl on

1173
00:41:45,510 --> 00:41:42,160
periscope

1174
00:41:47,829 --> 00:41:45,520
asks how much does seawater rise

1175
00:41:53,270 --> 00:41:47,839
each and every year luanne would you

1176
00:41:57,589 --> 00:41:56,069
a few millimeters a year so on

1177
00:42:00,950 --> 00:41:57,599
accumulated over

1178
00:42:02,710 --> 00:42:00,960
the record we have about nine um

1179
00:42:04,870 --> 00:42:02,720
over the last century we have about nine

1180
00:42:07,349 --> 00:42:04,880
centimeters of sea level rise

1181
00:42:09,109 --> 00:42:07,359
um and it's just that sea level rise is

1182
00:42:13,109 --> 00:42:09,119
going to continue to accelerate over

1183
00:42:16,710 --> 00:42:16,150
yes thank you luanne at moon to mars

1184
00:42:20,230 --> 00:42:16,720
quest

1185
00:42:22,630 --> 00:42:20,240
on twitter asks 2020 has produced a

1186
00:42:23,430 --> 00:42:22,640
robust hurricane season in the atlantic

1187
00:42:26,150 --> 00:42:23,440
basin

1188
00:42:26,630 --> 00:42:26,160

will future active hurricane activity

1189
00:42:29,510 --> 00:42:26,640
like

1190
00:42:30,470 --> 00:42:29,520
this year's affect the general average

1191
00:42:33,430 --> 00:42:30,480
sea height

1192
00:42:37,270 --> 00:42:33,440
when compared to the baseline deidre

1193
00:42:43,109 --> 00:42:40,550
um i don't see the

1194
00:42:44,870 --> 00:42:43,119
hurricanes affecting the sea level it's

1195
00:42:45,990 --> 00:42:44,880
more that a higher sea level is

1196
00:42:48,550 --> 00:42:46,000
indicative of more

1197
00:42:49,750 --> 00:42:48,560
heat that's available to feed into the

1198
00:42:52,470 --> 00:42:49,760
hurricanes

1199
00:42:56,550 --> 00:42:52,480
so it's the other way around if i got

1200
00:43:03,430 --> 00:42:59,990
yes thank you lakin on twitter

1201
00:43:06,309 --> 00:43:03,440
asks what is the deepest sea level

1202
00:43:06,950 --> 00:43:06,319
measured so far by the satellites that

1203
00:43:10,230 --> 00:43:06,960
have come

1204
00:43:14,069 --> 00:43:10,240
before sentinel 6.

1205
00:43:18,470 --> 00:43:17,430
sure uh the satellites measure how tall

1206
00:43:20,870 --> 00:43:18,480
the ocean is

1207
00:43:22,870 --> 00:43:20,880
but they don't and they really tell us

1208
00:43:23,750 --> 00:43:22,880
that relative to the center of the whole

1209
00:43:25,829 --> 00:43:23,760
planet so

1210
00:43:27,510 --> 00:43:25,839
what we're watching is how the oceans

1211
00:43:29,349 --> 00:43:27,520
grow over time

1212
00:43:30,710 --> 00:43:29,359
if you think about it it's it's really

1213
00:43:32,950 --> 00:43:30,720

amazing the

1214
00:43:34,150 --> 00:43:32,960
more than 70 percent of the planet is

1215
00:43:35,990 --> 00:43:34,160
covered by oceans

1216
00:43:37,990 --> 00:43:36,000
and all of that is rising so we're

1217
00:43:40,470 --> 00:43:38,000
literally watching the shape of the

1218
00:43:41,670 --> 00:43:40,480
planet change before our very eyes

1219
00:43:43,829 --> 00:43:41,680
and that's what these satellites are

1220
00:43:47,589 --> 00:43:43,839
really so good at

1221
00:43:52,230 --> 00:43:49,670
thanks so much josh and thank you so

1222
00:43:54,230 --> 00:43:52,240
much for media and social media who have

1223
00:43:56,390 --> 00:43:54,240
contributed today to this

1224
00:43:57,430 --> 00:43:56,400
really awesome briefing we all learned

1225
00:43:59,109 --> 00:43:57,440
so very much

1226
00:44:01,430 --> 00:43:59,119
thank you for your questions and thank

1227
00:44:02,069 --> 00:44:01,440
you to our panelists for joining us here

1228
00:44:04,390 --> 00:44:02,079
today

1229
00:44:05,670 --> 00:44:04,400
the u.s european sentinel 6 michael

1230
00:44:07,750 --> 00:44:05,680
freileck satellite

1231
00:44:10,069 --> 00:44:07,760
will launch from vandenberg air force

1232
00:44:12,950 --> 00:44:10,079
base tomorrow morning at first attempt

1233
00:44:14,790 --> 00:44:12,960
907 a.m pacific time for more

1234
00:44:18,470 --> 00:44:14,800
information on the satellite

1235
00:44:21,349 --> 00:44:18,480
go to www.nasa.gov

1236
00:44:22,069 --> 00:44:21,359
sentinel 6 and you can also follow us on

1237
00:44:25,430 --> 00:44:22,079
all social

1238
00:44:26,630 --> 00:44:25,440

media platforms at nasa earth to keep up

1239
00:44:28,950 --> 00:44:26,640
with this mission

1240
00:44:29,750 --> 00:44:28,960
and all the earth missions that we are a

1241
00:44:32,069 --> 00:44:29,760
part of

1242
00:44:33,829 --> 00:44:32,079
thanks so much for joining us today at

1243
00:44:48,829 --> 00:44:33,839
nasa earth science

1244
00:44:48,839 --> 00:44:54,010
watching