



					<p>Eric</p>
---	---	---	---	---	-------------

1  
00:00:10,790 --> 00:00:07,670  
hello and welcome to today's NASA

2  
00:00:12,890 --> 00:00:10,800  
Google+ Hangout observing Earth from

3  
00:00:14,960 --> 00:00:12,900  
space I'm Lauren Worley I'm the press

4  
00:00:17,600 --> 00:00:14,970  
secretary at NASA and I'm super excited

5  
00:00:19,490 --> 00:00:17,610  
you've all joined us today NASA does a

6  
00:00:21,350 --> 00:00:19,500  
lot of earth observations so what we

7  
00:00:24,109 --> 00:00:21,360  
learn about climate and weather

8  
00:00:25,400 --> 00:00:24,119  
observation can be applied across

9  
00:00:27,560 --> 00:00:25,410  
different platforms and we've got a

10  
00:00:29,720 --> 00:00:27,570  
really awesome lineup of folks here to

11  
00:00:31,099 --> 00:00:29,730  
talk about how we do that so let's get

12  
00:00:33,829 --> 00:00:31,109  
to it i'm going to introduce them first

13  
00:00:36,799 --> 00:00:33,839

with me here at NASA headquarters is

14

00:00:39,069 --> 00:00:36,809

astronaut Rick Mastracchio and Japanese

15

00:00:42,770 --> 00:00:39,079

space agency astronaut Koichi Wakata

16

00:00:44,419 --> 00:00:42,780

just returned from 188 days on board the

17

00:00:46,399 --> 00:00:44,429

International Space Station and we've

18

00:00:48,619 --> 00:00:46,409

got lots of questions about their view

19

00:00:51,410 --> 00:00:48,629

of Earth from there we're also joined by

20

00:00:52,729 --> 00:00:51,420

a gale Stefanik Jackson she's the global

21

00:00:55,669 --> 00:00:52,739

precipitation measurement mission

22

00:00:56,930 --> 00:00:55,679

project manager and she's out at the

23

00:00:59,989 --> 00:00:56,940

Goddard Space Flight Center in Greenbelt

24

00:01:01,520 --> 00:00:59,999

Maryland and also with us today we have

25

00:01:03,889 --> 00:01:01,530

of America's weather predicting

26

00:01:06,650 --> 00:01:03,899

boyfriend Eric Holthaus who's also a

27

00:01:08,480 --> 00:01:06,660

meteorologist and a writer for slate com

28

00:01:10,130 --> 00:01:08,490

now Eric is going to be taking your

29

00:01:11,780 --> 00:01:10,140

questions and asking some questions on

30

00:01:14,270 --> 00:01:11,790

your behalf and we really want to engage

31

00:01:17,780 --> 00:01:14,280

you in this conversation so send us your

32

00:01:20,630 --> 00:01:17,790

questions to at NASA using hashtag ask

33

00:01:22,460 --> 00:01:20,640

NASA and we'll get your questions asked

34

00:01:24,620 --> 00:01:22,470

to one of our awesome panelist here in

35

00:01:26,300 --> 00:01:24,630

the air so to get us started i'm going

36

00:01:28,130 --> 00:01:26,310

to turn over to astronaut rick

37

00:01:30,230 --> 00:01:28,140

mastracchio tell us a little bit more

38

00:01:32,720 --> 00:01:30,240

about his mission has returned to Earth

39

00:01:35,360 --> 00:01:32,730

and some work they did observing Earth

40

00:01:37,250 --> 00:01:35,370

from space well thanks Lauren yeah we

41

00:01:39,650 --> 00:01:37,260

had a great mission Quechee and I and

42

00:01:42,350 --> 00:01:39,660

our Russian commander Misha Torin

43

00:01:44,510 --> 00:01:42,360

launched out of kazakhstan on a Russian

44

00:01:47,240 --> 00:01:44,520

Soyuz rocket way back in November first

45

00:01:48,950 --> 00:01:47,250

week of no we flew up to the

46

00:01:50,510 --> 00:01:48,960

International Space Station random doing

47

00:01:53,149 --> 00:01:50,520

and only about six hours we did the

48

00:01:56,060 --> 00:01:53,159

quick the quick trip we call it and we

49

00:01:56,990 --> 00:01:56,070

started our long-duration mission we did

50

00:01:58,610 --> 00:01:57,000

a lot of things while we're up there

51  
00:02:01,040 --> 00:01:58,620  
young to big things that were up there

52  
00:02:02,899 --> 00:02:01,050  
for to do science and research of course

53  
00:02:05,090 --> 00:02:02,909  
the other one is maintained the space

54  
00:02:06,469 --> 00:02:05,100  
station and then folks asked us what do

55  
00:02:08,389 --> 00:02:06,479  
you do in your spare time well of course

56  
00:02:10,879 --> 00:02:08,399  
the main thing we do is we look down at

57  
00:02:12,709 --> 00:02:10,889  
the earth we have this great cupola it's

58  
00:02:13,520 --> 00:02:12,719  
a series it's a small room with seven

59  
00:02:14,780 --> 00:02:13,530  
windows and look

60  
00:02:18,080 --> 00:02:14,790  
right down on eros we have some great

61  
00:02:20,660 --> 00:02:18,090  
great views of the earth Wow awesome

62  
00:02:23,330 --> 00:02:20,670  
coochie anything to to add there to open

63  
00:02:26,150 --> 00:02:23,340

us up yeah it is says rick said the

64

00:02:28,220 --> 00:02:26,160

crippled the room with the seven window

65

00:02:30,199 --> 00:02:28,230

and this is our favorite place we have a

66

00:02:33,590 --> 00:02:30,209

lot of work science maintenance

67

00:02:36,380 --> 00:02:33,600

spacewalk robotics retrieving the the

68

00:02:38,600 --> 00:02:36,390

spaceship that I ride but the looking at

69

00:02:41,350 --> 00:02:38,610

the window at the earth through the

70

00:02:43,190 --> 00:02:41,360

windows because just outstanding

71

00:02:45,050 --> 00:02:43,200

terrific and we're going to ask you some

72

00:02:47,690 --> 00:02:45,060

more questions coming up on that but

73

00:02:49,910 --> 00:02:47,700

let's get over to Gail at Goddard Space

74

00:02:51,410 --> 00:02:49,920

Flight Center and Gail give us a little

75

00:02:53,960 --> 00:02:51,420

tell us a little bit more about your

76  
00:02:56,030 --> 00:02:53,970  
mission GPM but also the important work

77  
00:02:59,360 --> 00:02:56,040  
that we do observing the earth and earth

78  
00:03:02,449 --> 00:02:59,370  
science work at NASA yeah I'm very

79  
00:03:03,710 --> 00:03:02,459  
thrilled to be here with you today our

80  
00:03:06,110 --> 00:03:03,720  
mission the global precipitation

81  
00:03:08,600 --> 00:03:06,120  
measurement mission our core Observatory

82  
00:03:10,729 --> 00:03:08,610  
launched just this past baby we're right

83  
00:03:13,340 --> 00:03:10,739  
and we're already getting some really

84  
00:03:15,590 --> 00:03:13,350  
fantastic data from it all sorts of

85  
00:03:18,410 --> 00:03:15,600  
precipitation from light rains a heavy

86  
00:03:20,870 --> 00:03:18,420  
rain to fall and snow but there are also

87  
00:03:23,390 --> 00:03:20,880  
five other earth science missions that

88  
00:03:26,539 --> 00:03:23,400

are being launched right now this year

89

00:03:28,250 --> 00:03:26,549

from NASA all different missions and so

90

00:03:29,750 --> 00:03:28,260

NASA is really looking at all different

91

00:03:31,370 --> 00:03:29,760

parts of the earth we want to understand

92

00:03:33,560 --> 00:03:31,380

the earth as much as we want to

93

00:03:34,910 --> 00:03:33,570

understand the other planets so we have

94

00:03:37,160 --> 00:03:34,920

satellites that are looking at the ocean

95

00:03:39,199 --> 00:03:37,170

salinity we have satellites that are

96

00:03:41,270 --> 00:03:39,209

looking at aquifers and how much water

97

00:03:44,030 --> 00:03:41,280

is stored in those aquifers or how much

98

00:03:45,830 --> 00:03:44,040

water is stored any ice sheets and

99

00:03:47,780 --> 00:03:45,840

glaciers we have satellites they're

100

00:03:50,000 --> 00:03:47,790

looking at land the land why

101  
00:03:52,370 --> 00:03:50,010  
characteristics whether it be vegetation

102  
00:03:55,910 --> 00:03:52,380  
difference trees we also have satellites

103  
00:03:59,330 --> 00:03:55,920  
that are looking at changes in terms of

104  
00:04:00,860 --> 00:03:59,340  
the water on the earth circles meow

105  
00:04:03,110 --> 00:04:00,870  
sound likes looking at the chemistry of

106  
00:04:05,300 --> 00:04:03,120  
the atmosphere and we have our satellite

107  
00:04:07,250 --> 00:04:05,310  
which is the GPM mission that is looking

108  
00:04:09,319 --> 00:04:07,260  
at the precipitation and we're being

109  
00:04:11,780 --> 00:04:09,329  
able to get measurements all around the

110  
00:04:13,610 --> 00:04:11,790  
globe every three hours of precipitation

111  
00:04:18,490 --> 00:04:13,620  
which is important for science and

112  
00:04:22,540 --> 00:04:21,099  
so very cool very cool all right well

113  
00:04:23,560 --> 00:04:22,550

we've talked to be giving you an

114

00:04:25,750 --> 00:04:23,570

overview of what we want to talk about

115

00:04:27,280 --> 00:04:25,760

today let's head over to Eric Eric I

116

00:04:29,410 --> 00:04:27,290

know you got a couple questions to get

117

00:04:32,260 --> 00:04:29,420

us kicked off here in our discussion

118

00:04:34,360 --> 00:04:32,270

today yeah thanks Lauren and this is

119

00:04:37,090 --> 00:04:34,370

really kind of a dream come true for me

120

00:04:40,320 --> 00:04:37,100

I grew up a NASA nerd just like pretty

121

00:04:44,170 --> 00:04:40,330

much every American kid in the 80s

122

00:04:47,980 --> 00:04:44,180

watching space shuttle launches and and

123

00:04:50,530 --> 00:04:47,990

I was lucky enough to kind of have a

124

00:04:55,570 --> 00:04:50,540

dream of my my lifetime to go with my

125

00:04:57,880 --> 00:04:55,580

dad to watch the last see you last

126  
00:05:00,970 --> 00:04:57,890  
discovery launch in Florida a couple

127  
00:05:04,450 --> 00:05:00,980  
years ago and it is just really like a

128  
00:05:08,560 --> 00:05:04,460  
thrill to be here to talk to astronauts

129  
00:05:12,340 --> 00:05:08,570  
in and actually I I when I was in in

130  
00:05:14,350 --> 00:05:12,350  
college I had a internship with Gail at

131  
00:05:16,840 --> 00:05:14,360  
goddard space flight center so I've

132  
00:05:20,260 --> 00:05:16,850  
known Gail for about 10 years and Nats

133  
00:05:23,200 --> 00:05:20,270  
has been kind of a part of my part of my

134  
00:05:25,990 --> 00:05:23,210  
life since then following along with

135  
00:05:28,510 --> 00:05:26,000  
these missions so you know just like I

136  
00:05:31,750 --> 00:05:28,520  
think pretty much everyone has this

137  
00:05:34,390 --> 00:05:31,760  
question for for Rickon and coochie but

138  
00:05:36,130 --> 00:05:34,400

what did it feel like looking down at

139

00:05:37,990 --> 00:05:36,140

the earth from from the space station

140

00:05:42,430 --> 00:05:38,000

what kind of emotions were you feeling

141

00:05:44,830 --> 00:05:42,440

when you're seeing that cupola yeah yeah

142

00:05:46,780 --> 00:05:44,840

well or see everybody the cupola first

143

00:05:48,460 --> 00:05:46,790

of all is a relatively relatively new

144

00:05:51,969 --> 00:05:48,470

addition to the space station and

145

00:05:53,830 --> 00:05:51,979

actually my last shuttle mission 2010

146

00:05:55,719 --> 00:05:53,840

the cupola was a brand new module just

147

00:05:57,880 --> 00:05:55,729

brought up by the mission before so we

148

00:06:01,210 --> 00:05:57,890

got to we got one of the first views of

149

00:06:02,920 --> 00:06:01,220

Akuma shuttle mission 2010 and I had

150

00:06:04,810 --> 00:06:02,930

been on a couple of previous show

151  
00:06:06,010 --> 00:06:04,820  
emissions we didn't have that view so it

152  
00:06:08,350 --> 00:06:06,020  
was a great addition to the space

153  
00:06:09,880 --> 00:06:08,360  
station it has unprecedented views of

154  
00:06:12,070 --> 00:06:09,890  
the planet earth below because of all

155  
00:06:14,020 --> 00:06:12,080  
the different windows you can see for

156  
00:06:15,760 --> 00:06:14,030  
thousands of miles in almost every

157  
00:06:19,570 --> 00:06:15,770  
direction so it's an incredible

158  
00:06:20,800 --> 00:06:19,580  
incredible view you know I think what I

159  
00:06:22,270 --> 00:06:20,810  
always say to folks is whenever you look

160  
00:06:23,830 --> 00:06:22,280  
out the window you always think if I

161  
00:06:25,480 --> 00:06:23,840  
seen it all now I've been on three or

162  
00:06:26,860 --> 00:06:25,490  
four space missions and I've seen it all

163  
00:06:28,420 --> 00:06:26,870

now but every time you look out the

164

00:06:30,010 --> 00:06:28,430

window you see something that you've

165

00:06:32,330 --> 00:06:30,020

never seen before you see something more

166

00:06:35,659 --> 00:06:32,340

beautiful than in the last time

167

00:06:36,770 --> 00:06:35,669

look out the window so I think it kind

168

00:06:39,350 --> 00:06:36,780

of gives you a lot of different emotions

169

00:06:40,790 --> 00:06:39,360

but the biggest emotion i have is the

170

00:06:43,040 --> 00:06:40,800

beauty the beauty of the earth the

171

00:06:44,780 --> 00:06:43,050

incredible several things that we see

172

00:06:46,490 --> 00:06:44,790

down here it's amazing that we try so

173

00:06:47,689 --> 00:06:46,500

hard to get off the planet and then once

174

00:06:50,270 --> 00:06:47,699

we get off the planet we spend all our

175

00:06:55,460 --> 00:06:50,280

time looking back at it that's pretty

176

00:06:58,159 --> 00:06:55,470

interesting what about you co lchi yeah

177

00:07:01,010 --> 00:06:58,169

I totally agree with Rick we go around

178

00:07:03,409 --> 00:07:01,020

the earth every 90 minutes so and then

179

00:07:05,690 --> 00:07:03,419

during this period of six months we flew

180

00:07:09,770 --> 00:07:05,700

over the flu around the earth more than

181

00:07:11,810 --> 00:07:09,780

3,000 times so I since the earth is very

182

00:07:13,790 --> 00:07:11,820

small and it looks very precious with

183

00:07:16,670 --> 00:07:13,800

the background of pitch black space and

184

00:07:19,219 --> 00:07:16,680

earth seems like a small special big

185

00:07:21,050 --> 00:07:19,229

spaceship I would say it has a co2

186

00:07:23,180 --> 00:07:21,060

removal system temperature control

187

00:07:25,010 --> 00:07:23,190

system if one of those systems onboard

188

00:07:28,040 --> 00:07:25,020

the space station breaks it's a lot of

189

00:07:30,050 --> 00:07:28,050

work to force to repair so by flying

190

00:07:32,420 --> 00:07:30,060

around the earth that we really would

191

00:07:37,820 --> 00:07:32,430

like to protect this environment of the

192

00:07:40,310 --> 00:07:37,830

earth so both you and we're active on

193

00:07:42,920 --> 00:07:40,320

Twitter when you were when you were in

194

00:07:46,250 --> 00:07:42,930

the space station um and I looked back

195

00:07:47,750 --> 00:07:46,260

at some of that sound here your photos

196

00:07:55,100 --> 00:07:47,760

that you took in you know it's kind of

197

00:07:57,800 --> 00:07:55,110

breathhtaking to see that but what was 11

198

00:07:59,180 --> 00:07:57,810

view or 11 thing that you saw out there

199

00:08:01,490 --> 00:07:59,190

that kind of changed the way that you

200

00:08:02,839 --> 00:08:01,500

you think about Earth or or maybe

201  
00:08:06,379 --> 00:08:02,849  
something that you saw that you can mix

202  
00:08:07,820 --> 00:08:06,389  
back yeah well I think we chant I would

203  
00:08:09,670 --> 00:08:07,830  
agree on this one the other most one of

204  
00:08:12,260 --> 00:08:09,680  
most beautiful things we see are the

205  
00:08:14,000 --> 00:08:12,270  
aurora borealis the Northern Lights with

206  
00:08:15,740 --> 00:08:14,010  
the Southern Lights they are just

207  
00:08:17,180 --> 00:08:15,750  
incredible and if you get if you're out

208  
00:08:19,159 --> 00:08:17,190  
looking out the window at just the right

209  
00:08:20,990 --> 00:08:19,169  
time and the Sun activity solar activity

210  
00:08:23,450 --> 00:08:21,000  
earth everything lines up perfectly you

211  
00:08:25,219 --> 00:08:23,460  
get these great waves of green light

212  
00:08:27,920 --> 00:08:25,229  
coming off the plan and even some red

213  
00:08:29,540 --> 00:08:27,930

lights and it's just incredible and then

214

00:08:31,310 --> 00:08:29,550

one night we were out there and Venus

215

00:08:33,589 --> 00:08:31,320

was rising the full moon was rising

216

00:08:35,750 --> 00:08:33,599

through this aurora borealis and it was

217

00:08:38,420 --> 00:08:35,760

like the universe putting on a show for

218

00:08:42,800 --> 00:08:38,430

for Mike Hopkins and poo Ichi ni and it

219

00:08:45,680 --> 00:08:42,810

was absolutely beautiful and the imagio

220

00:08:46,130 --> 00:08:45,690

Gareth is impressive especially in the

221

00:08:48,770 --> 00:08:46,140

northern

222

00:08:50,600 --> 00:08:48,780

atmosphere the city lights in the during

223

00:08:53,240 --> 00:08:50,610

the daytime you can see the cover of

224

00:08:55,310 --> 00:08:53,250

nature like strong winds beautiful

225

00:08:57,650 --> 00:08:55,320

clouds different colors and ocean has a

226

00:09:00,620 --> 00:08:57,660

different colors of blue but when you go

227

00:09:03,350 --> 00:09:00,630

to the night night side what you see is

228

00:09:06,590 --> 00:09:03,360

I don't know brilliant the city life and

229

00:09:09,290 --> 00:09:06,600

it really shows you know the technology

230

00:09:11,390 --> 00:09:09,300

of human human society and then how huge

231

00:09:13,970 --> 00:09:11,400

the energy consumption is and I'm sure

232

00:09:16,250 --> 00:09:13,980

aliens if they see from outside you can

233

00:09:19,330 --> 00:09:16,260

really tell that that this planet is you

234

00:09:21,830 --> 00:09:19,340

know we have a lot of people yeah um

235

00:09:28,130 --> 00:09:21,840

we're not confirming we've met we've

236

00:09:34,040 --> 00:09:28,140

seen any aliens Allah I don't want to

237

00:09:36,590 --> 00:09:34,050

don't break too much news here but riff

238

00:09:38,900 --> 00:09:36,600

in some of your your tweets I saw that

239

00:09:42,230 --> 00:09:38,910

you were taking trying to take photos of

240

00:09:44,390 --> 00:09:42,240

your of your home state of Connecticut

241

00:09:46,160 --> 00:09:44,400

what did it feel like flying over a

242

00:09:48,110 --> 00:09:46,170

place that you knew so well on the

243

00:09:51,950 --> 00:09:48,120

ground and then seeing it from a

244

00:09:54,170 --> 00:09:51,960

different way up in up in states yeah I

245

00:09:55,760 --> 00:09:54,180

did I try to take a try to take a lot of

246

00:09:57,560 --> 00:09:55,770

pictures of my home state of Connecticut

247

00:09:59,720 --> 00:09:57,570

in the Northeast it's very recognizable

248

00:10:01,130 --> 00:09:59,730

to me because I'm from there it was

249

00:10:02,720 --> 00:10:01,140

interesting though I flown three

250

00:10:04,130 --> 00:10:02,730

previous Shuttle missions but all my

251  
00:10:06,230 --> 00:10:04,140  
shuttle missions were in the summer or

252  
00:10:08,030 --> 00:10:06,240  
in the spring and when I was flying over

253  
00:10:09,260 --> 00:10:08,040  
the planet and flying over the Northeast

254  
00:10:10,940 --> 00:10:09,270  
and flying all the United States

255  
00:10:12,830 --> 00:10:10,950  
everything was green and beautiful and

256  
00:10:14,840 --> 00:10:12,840  
it was easy to recognize easy to pick

257  
00:10:16,760 --> 00:10:14,850  
out different landmarks and the lakes

258  
00:10:18,260 --> 00:10:16,770  
and things like that this is my first

259  
00:10:20,420 --> 00:10:18,270  
time being in orbit in the wintertime

260  
00:10:22,640 --> 00:10:20,430  
and I tell you it's much much more

261  
00:10:26,210 --> 00:10:22,650  
difficult to identify things because you

262  
00:10:28,100 --> 00:10:26,220  
used late very often to identify in find

263  
00:10:30,020 --> 00:10:28,110

places and of course when the lakes are

264

00:10:31,850 --> 00:10:30,030

frozen over and all the cities are

265

00:10:34,190 --> 00:10:31,860

covered with snow it's not much to look

266

00:10:35,510 --> 00:10:34,200

at you so I remember thinking how hard

267

00:10:36,980 --> 00:10:35,520

it was to get pictures of my hometown

268

00:10:38,780 --> 00:10:36,990

because I looked down and alls I would

269

00:10:40,340 --> 00:10:38,790

see would be ice and snow and maybe a

270

00:10:42,350 --> 00:10:40,350

few rocks here and there I was kind of

271

00:10:44,330 --> 00:10:42,360

wondering people really live down there

272

00:10:46,100 --> 00:10:44,340

so one of the thoughts ahead was one

273

00:10:47,750 --> 00:10:46,110

glad I'm up here and that's spending

274

00:10:51,440 --> 00:10:47,760

winter under the Northeast I know they

275

00:10:56,150 --> 00:10:51,450

had a really bad winter this year yeah

276  
00:10:59,270 --> 00:10:56,160  
and we're starting to find some evidence

277  
00:11:00,060 --> 00:10:59,280  
and NASA is helping helping study this

278  
00:11:01,800 --> 00:11:00,070  
but

279  
00:11:03,660 --> 00:11:01,810  
you know winters it some of the

280  
00:11:05,700 --> 00:11:03,670  
impressions are that you know global

281  
00:11:08,430 --> 00:11:05,710  
warming is is just going to be you know

282  
00:11:10,200 --> 00:11:08,440  
a couple degrees warmer on average every

283  
00:11:11,670 --> 00:11:10,210  
single day everywhere in the world and

284  
00:11:13,860 --> 00:11:11,680  
it's not like that at all I mean if

285  
00:11:17,090 --> 00:11:13,870  
there's unpredictable ways that the

286  
00:11:19,740 --> 00:11:17,100  
planet is changing so was there any

287  
00:11:24,540 --> 00:11:19,750  
visible signs of climate change that you

288  
00:11:26,070 --> 00:11:24,550

could see from space actually uh it's

289

00:11:27,690 --> 00:11:26,080

very difficult to see from outside

290

00:11:30,000 --> 00:11:27,700

because you know we take a lot of

291

00:11:33,780 --> 00:11:30,010

pictures but it's a you know it's not a

292

00:11:36,810 --> 00:11:33,790

continuous measurement of the actual

293

00:11:39,060 --> 00:11:36,820

data and this is what the gale and her

294

00:11:41,340 --> 00:11:39,070

team is doing at Goddard and precisely

295

00:11:44,610 --> 00:11:41,350

measuring the temperature distribution

296

00:11:46,830 --> 00:11:44,620

of the precipitation rainfall and you

297

00:11:48,780 --> 00:11:46,840

know snow and other atoms temperatures

298

00:11:51,510 --> 00:11:48,790

of the affords temperatures of on the /

299

00:11:53,970 --> 00:11:51,520

of the ocean so you know we have this

300

00:11:55,800 --> 00:11:53,980

objective view but NASA and other

301  
00:11:58,200 --> 00:11:55,810  
international space agencies are

302  
00:12:00,120 --> 00:11:58,210  
collecting those that are precisely on

303  
00:12:05,730 --> 00:12:00,130  
the continuous basis to be able to

304  
00:12:07,470 --> 00:12:05,740  
monitor the other change in front um so

305  
00:12:11,300 --> 00:12:07,480  
we're getting a couple of questions now

306  
00:12:13,410 --> 00:12:11,310  
from the from the Google+ audience um

307  
00:12:16,080 --> 00:12:13,420  
one of the questions is how do you get

308  
00:12:19,890 --> 00:12:16,090  
internet in space to send these these

309  
00:12:21,390 --> 00:12:19,900  
tweets down yeah we do have a we have an

310  
00:12:23,280 --> 00:12:21,400  
internet connection it's relatively new

311  
00:12:26,040 --> 00:12:23,290  
on board space station it's not very

312  
00:12:27,960 --> 00:12:26,050  
stable and we don't have it for a very

313  
00:12:29,970 --> 00:12:27,970

long period of time but that's why

314

00:12:31,680 --> 00:12:29,980

actually twitter is actually really

315

00:12:33,900 --> 00:12:31,690

convenient cuz you're killing type in

316

00:12:36,060 --> 00:12:33,910

140 characters and that's about as much

317

00:12:37,980 --> 00:12:36,070

time as we have usually I had towards

318

00:12:39,300 --> 00:12:37,990

respects and I always had a disciple

319

00:12:40,680 --> 00:12:39,310

should I go back and fix the spelling

320

00:12:43,110 --> 00:12:40,690

mistakes or should i just had sent

321

00:12:44,610 --> 00:12:43,120

because I'm running out of time so you

322

00:12:46,710 --> 00:12:44,620

know it's kind of a new thing on board

323

00:12:48,630 --> 00:12:46,720

the International Space Station and you

324

00:12:50,220 --> 00:12:48,640

know and like everything else so we'll

325

00:12:52,140 --> 00:12:50,230

make it more and more stable the more

326

00:12:54,030 --> 00:12:52,150

folks use it but it's a great thing and

327

00:12:55,950 --> 00:12:54,040

we used it quite a bit for Twitter and

328

00:12:57,450 --> 00:12:55,960

other social media and it was a great

329

00:12:59,160 --> 00:12:57,460

way I remember many times taking a

330

00:13:00,600 --> 00:12:59,170

picture off the window and then coming

331

00:13:01,800 --> 00:13:00,610

back to my computer tweeting and said

332

00:13:03,630 --> 00:13:01,810

hey here's what's going on right now

333

00:13:05,520 --> 00:13:03,640

onboard the space station so it's kind

334

00:13:07,050 --> 00:13:05,530

of fun to share that immediate the

335

00:13:11,070 --> 00:13:07,060

things immediate things that were going

336

00:13:12,690 --> 00:13:11,080

on and Eric that actually segues really

337

00:13:13,530 --> 00:13:12,700

well into a question we got from Saint

338

00:13:16,050 --> 00:13:13,540

Joan of Arc for

339

00:13:17,730 --> 00:13:16,060

graders in Louisiana and their teacher

340

00:13:19,499 --> 00:13:17,740

Marcy Herbert who asked us on Twitter

341

00:13:22,769 --> 00:13:19,509

what does a hurricane look like from

342

00:13:27,150 --> 00:13:22,779

space her again it looks like a huge

343

00:13:31,170 --> 00:13:27,160

like I don't know rolling what is that

344

00:13:34,800 --> 00:13:31,180

how do you say that it is just a I don't

345

00:13:37,499 --> 00:13:34,810

like huge clouds of that twirling it

346

00:13:39,809 --> 00:13:37,509

sorely swirling that love it is very

347

00:13:41,699 --> 00:13:39,819

huge even if you have a large large

348

00:13:43,530 --> 00:13:41,709

field of view and animal can my camel

349

00:13:45,329 --> 00:13:43,540

and it something's very difficult to

350

00:13:47,819 --> 00:13:45,339

capture the entire region of the

351  
00:13:49,230 --> 00:13:47,829  
hurricanes and typhoons and it's amazing

352  
00:13:50,730 --> 00:13:49,240  
yeah and the eye of the hurricane is

353  
00:13:52,710 --> 00:13:50,740  
always the thing where I was looking for

354  
00:13:54,689 --> 00:13:52,720  
some hurricanes are very very large like

355  
00:13:56,249 --> 00:13:54,699  
we she said but the eye of the hurricane

356  
00:13:58,199 --> 00:13:56,259  
is always interesting because you could

357  
00:13:59,850 --> 00:13:58,209  
you could almost if it's a good clear I

358  
00:14:01,470 --> 00:13:59,860  
you could see the ground in the middle

359  
00:14:03,360 --> 00:14:01,480  
of the hurricane it's always interesting

360  
00:14:04,740 --> 00:14:03,370  
one of my missions we were out doing a

361  
00:14:07,139 --> 00:14:04,750  
spacewalk and flew right over a

362  
00:14:14,519 --> 00:14:07,149  
hurricane back in the few years back it

363  
00:14:15,930 --> 00:14:14,529

was pretty impressive um so yeah you

364

00:14:17,730 --> 00:14:15,940

travel the world in 90 minutes when

365

00:14:21,240 --> 00:14:17,740

you're in space is there anywhere that

366

00:14:23,280 --> 00:14:21,250

you thaw from space that that made you

367

00:14:26,670 --> 00:14:23,290

want to visit there when she got back to

368

00:14:27,870 --> 00:14:26,680

her yeah I have that feeling all the

369

00:14:29,730 --> 00:14:27,880

time I don't know about queasy but

370

00:14:31,259 --> 00:14:29,740

whenever whenever I was looking at some

371

00:14:33,300 --> 00:14:31,269

place on the ground and I do this one

372

00:14:35,699 --> 00:14:33,310

flying in an airplane I look down and I

373

00:14:37,050 --> 00:14:35,709

see some interesting land mass or some

374

00:14:38,460 --> 00:14:37,060

something interesting on there I was

375

00:14:40,920 --> 00:14:38,470

wondering was what the people are doing

376

00:14:43,019 --> 00:14:40,930

down there right now and that was not

377

00:14:45,689 --> 00:14:43,029

who's also true when I was on orbit I

378

00:14:47,309 --> 00:14:45,699

took some beautiful pictures of the the

379

00:14:48,809 --> 00:14:47,319

the center of the united states where

380

00:14:50,100 --> 00:14:48,819

there was this beautiful valley and

381

00:14:51,509 --> 00:14:50,110

there's a little house in the middle of

382

00:14:52,559 --> 00:14:51,519

it out in the middle of nowhere and i

383

00:14:54,960 --> 00:14:52,569

was wondering what it would be like to

384

00:14:56,460 --> 00:14:54,970

live there with that great view so yeah

385

00:14:57,929 --> 00:14:56,470

there's a lot of places i think i've

386

00:14:59,670 --> 00:14:57,939

taken pictures of and I remember taking

387

00:15:01,530 --> 00:14:59,680

pictures of the Dominican Republic and

388

00:15:03,420 --> 00:15:01,540

then about two months after I landed we

389

00:15:05,720 --> 00:15:03,430

went down there for a small vacation so

390

00:15:07,920 --> 00:15:05,730

I got to visit actually visit the place

391

00:15:11,579 --> 00:15:07,930

and it's very important to see the

392

00:15:14,790 --> 00:15:11,589

different colors of water I mentioned

393

00:15:17,309 --> 00:15:14,800

that the Bahamas in that area it's

394

00:15:18,990 --> 00:15:17,319

really beautiful but Blake's some of the

395

00:15:21,929 --> 00:15:19,000

links have like a reddish color orange

396

00:15:24,629 --> 00:15:21,939

is yellowish green it it's amazing how

397

00:15:27,680 --> 00:15:24,639

colorful that the color of the water is

398

00:15:36,750 --> 00:15:34,650

um it it's probably a question that that

399

00:15:39,030 --> 00:15:36,760

a lot of those people down there are

400

00:15:41,520 --> 00:15:39,040

asking about about you and you know it

401  
00:15:43,440 --> 00:15:41,530  
there it's the the space station has

402  
00:15:48,900 --> 00:15:43,450  
grown in size over the last several

403  
00:15:51,510 --> 00:15:48,910  
years decade and now it's it's it's kind

404  
00:15:54,150 --> 00:15:51,520  
of routine to be able to see that the

405  
00:15:56,040 --> 00:15:54,160  
space station in the evening sky from

406  
00:15:59,370 --> 00:15:56,050  
from Earth you know as a bright star

407  
00:16:01,500 --> 00:15:59,380  
going past so I'm sure you know if

408  
00:16:02,790 --> 00:16:01,510  
people are out there looking for the

409  
00:16:05,280 --> 00:16:02,800  
space station they're wondering what you

410  
00:16:07,710 --> 00:16:05,290  
guys are doing up there at the same time

411  
00:16:09,480 --> 00:16:07,720  
so it's kind of an interesting thought

412  
00:16:14,370 --> 00:16:09,490  
to know that you guys are thinking the

413  
00:16:17,300 --> 00:16:14,380

same thing about us that down here so um

414

00:16:22,530 --> 00:16:17,310

so we're talking about we have Gail from

415

00:16:24,810 --> 00:16:22,540

who's working on the GPM project um and

416

00:16:28,620 --> 00:16:24,820

it launched back in February I think is

417

00:16:31,920 --> 00:16:28,630

that right so worried were you what were

418

00:16:35,400 --> 00:16:31,930

you in the station in the position to be

419

00:16:39,600 --> 00:16:35,410

able to see that launched on or or soon

420

00:16:42,120 --> 00:16:39,610

after yeah we we exactly a coupon board

421

00:16:44,190 --> 00:16:42,130

when GPM was launched from tanegashima

422

00:16:46,440 --> 00:16:44,200

space center in Japan but unfortunately

423

00:16:48,690 --> 00:16:46,450

we were not able to see the launch of

424

00:16:51,350 --> 00:16:48,700

the GPM itself we saw a trick saw some

425

00:16:55,020 --> 00:16:51,360

of the other launches from french guiana

426  
00:16:57,600 --> 00:16:55,030  
area and five launches but the I was not

427  
00:16:58,950 --> 00:16:57,610  
able to see that then you know but I'm

428  
00:17:00,780 --> 00:16:58,960  
sure it would have been really a

429  
00:17:04,800 --> 00:17:00,790  
spectacular to see the launch from the

430  
00:17:06,960 --> 00:17:04,810  
space station yeah not this is Gail just

431  
00:17:09,240 --> 00:17:06,970  
jumping I actually was there for the

432  
00:17:12,540 --> 00:17:09,250  
launch watching it from ground and it

433  
00:17:14,340 --> 00:17:12,550  
was a very fantastic launch soon I was

434  
00:17:17,460 --> 00:17:14,350  
launched from tonic Ashima I'll in Japan

435  
00:17:23,190 --> 00:17:17,470  
as part of our partnership and a picture

436  
00:17:27,720 --> 00:17:23,200  
perfect launch and we so when you were

437  
00:17:29,930 --> 00:17:27,730  
on board were you were you able to

438  
00:17:32,490 --> 00:17:29,940

conduct any earth science that was

439

00:17:35,010 --> 00:17:32,500

complimentary to the GPM when you were

440

00:17:39,330 --> 00:17:35,020

when you were on there on the space

441

00:17:41,100 --> 00:17:39,340

station we use the regular photography

442

00:17:43,380 --> 00:17:41,110

still floating camera

443

00:17:45,960 --> 00:17:43,390

and then the video cameras and also we

444

00:17:48,450 --> 00:17:45,970

have high-definition cameras located

445

00:17:50,310 --> 00:17:48,460

outside along the Columbus module as

446

00:17:52,350 --> 00:17:50,320

well as the Japanese Kibo module and

447

00:17:54,510 --> 00:17:52,360

those are controlled remotely from the

448

00:17:58,500 --> 00:17:54,520

ground you can see the live down link of

449

00:18:01,410 --> 00:17:58,510

the HD image of the earth or down

450

00:18:03,870 --> 00:18:01,420

streaming you know 24-7 from the space

451  
00:18:06,150 --> 00:18:03,880  
station and also from the Marshall Space

452  
00:18:08,820 --> 00:18:06,160  
Center they put together a list of the

453  
00:18:10,830 --> 00:18:08,830  
targets of the earth observation that we

454  
00:18:13,530 --> 00:18:10,840  
take pictures on so every day we have

455  
00:18:15,480 --> 00:18:13,540  
several or sometimes few targets of the

456  
00:18:17,669 --> 00:18:15,490  
earth observation and we use the regular

457  
00:18:20,270 --> 00:18:17,679  
camera to take pictures and some of them

458  
00:18:22,950 --> 00:18:20,280  
are like in response to the disaster

459  
00:18:26,460 --> 00:18:22,960  
correspondence so whenever there is a

460  
00:18:29,370 --> 00:18:26,470  
hurricane volcano eruption flooding and

461  
00:18:31,289 --> 00:18:29,380  
other natural disasters we were asked to

462  
00:18:34,980 --> 00:18:31,299  
take those pictures which will be used

463  
00:18:39,030 --> 00:18:34,990

to show the actual condition that we see

464

00:18:42,870 --> 00:18:39,040

from the space station so it's it's kind

465

00:18:45,720 --> 00:18:42,880

of like science in real time then have a

466

00:18:49,289 --> 00:18:45,730

human up there and kind of looking for

467

00:18:51,830 --> 00:18:49,299

looking for the you thinking you know

468

00:18:56,310 --> 00:18:51,840

high impact events that are going on

469

00:18:58,740 --> 00:18:56,320

every day exactly and then in addition

470

00:19:02,900 --> 00:18:58,750

to the the photo video image that we

471

00:19:05,130 --> 00:19:02,910

take by adding the I don't know the

472

00:19:08,850 --> 00:19:05,140

observational comments or the feeling

473

00:19:11,250 --> 00:19:08,860

that we have when we see these events on

474

00:19:13,740 --> 00:19:11,260

the earth that it has some more and then

475

00:19:16,650 --> 00:19:13,750

obviously this kind of information or

476

00:19:20,490 --> 00:19:16,660

comments really attract lot of attention

477

00:19:22,590 --> 00:19:20,500

from the general public um were you able

478

00:19:26,820 --> 00:19:22,600

to see any active volcanoes when you

479

00:19:28,950 --> 00:19:26,830

were flying over yeah we did I think we

480

00:19:32,640 --> 00:19:28,960

saw one the Central America are very

481

00:19:35,010 --> 00:19:32,650

small active volcano I know there was a

482

00:19:37,350 --> 00:19:35,020

previous cruises I've seen them over to

483

00:19:38,669 --> 00:19:37,360

watch iceland in other places we didn't

484

00:19:40,980 --> 00:19:38,679

have any real big ones we did see a

485

00:19:43,230 --> 00:19:40,990

small a few small ones though five years

486

00:19:46,740 --> 00:19:43,240

ago when i was somebody a space station

487

00:19:50,850 --> 00:19:46,750

there was an eruption of a volcano from

488

00:19:53,130 --> 00:19:50,860

the Far East Russia on one month islands

489

00:19:54,780 --> 00:19:53,140

and space station crew members were the

490

00:19:57,060 --> 00:19:54,790

first of

491

00:20:01,290 --> 00:19:57,070

people who are the instruments that took

492

00:20:03,870 --> 00:20:01,300

pictures of a volcano of the volcano

493

00:20:06,360 --> 00:20:03,880

eruption so Eric this morning we

494

00:20:08,880 --> 00:20:06,370

actually had the opportunity quechee and

495

00:20:11,190 --> 00:20:08,890

Rick and me too we got to go out to

496

00:20:14,610 --> 00:20:11,200

goddard space flight center and see the

497

00:20:15,990 --> 00:20:14,620

the GPM control room out there and talk

498

00:20:20,370 --> 00:20:16,000

a little bit with gail talked a little

499

00:20:22,410 --> 00:20:20,380

bit about her team and and gail love to

500

00:20:24,300 --> 00:20:22,420

ask you you know what did you explain to

501  
00:20:27,050 --> 00:20:24,310  
these guys this morning to tell us all

502  
00:20:29,760 --> 00:20:27,060  
of what they got to see this morning

503  
00:20:32,850 --> 00:20:29,770  
well we had the opportunity this morning

504  
00:20:35,760 --> 00:20:32,860  
to talk about the GPM mission why it's

505  
00:20:37,050 --> 00:20:35,770  
important for science and society you

506  
00:20:38,790 --> 00:20:37,060  
know you've already been talking about

507  
00:20:41,070 --> 00:20:38,800  
hurricanes and seeing them from the

508  
00:20:42,720 --> 00:20:41,080  
International Space Station and pretty

509  
00:20:45,150 --> 00:20:42,730  
much your scene visible what you might

510  
00:20:47,340 --> 00:20:45,160  
see with your eyes but with the GPM

511  
00:20:49,590 --> 00:20:47,350  
spacecraft we have instruments on board

512  
00:20:51,630 --> 00:20:49,600  
but allow you to hear all the way

513  
00:20:53,100 --> 00:20:51,640

through the clouds all the way down to

514

00:20:55,710 --> 00:20:53,110

the air surface so when you're looking

515

00:20:57,900 --> 00:20:55,720

for that I wall you can see exactly

516

00:20:59,610 --> 00:20:57,910

where that is based on the observations

517

00:21:01,050 --> 00:20:59,620

from the mushrooms you don't have to

518

00:21:03,540 --> 00:21:01,060

look at the white clouds and try to

519

00:21:05,490 --> 00:21:03,550

guess exactly where that is so that's

520

00:21:08,370 --> 00:21:05,500

some of the fantastic data we can use

521

00:21:11,010 --> 00:21:08,380

also because um the global precipitation

522

00:21:14,940 --> 00:21:11,020

measurement is actually quite a similar

523

00:21:17,760 --> 00:21:14,950

orbit as to the ISS were able to see

524

00:21:21,000 --> 00:21:17,770

hurricanes as a transition from tropical

525

00:21:23,400 --> 00:21:21,010

regions the mid-latitudes so if GPM were

526  
00:21:26,310 --> 00:21:23,410  
off during Hurricane sandy we would have

527  
00:21:28,530 --> 00:21:26,320  
been able to see it go over and into the

528  
00:21:30,480 --> 00:21:28,540  
network in New Jersey region which is

529  
00:21:32,670 --> 00:21:30,490  
really important because before the

530  
00:21:34,500 --> 00:21:32,680  
satellites with our capabilities they

531  
00:21:37,890 --> 00:21:34,510  
only saw storms it went maybe as far

532  
00:21:40,380 --> 00:21:37,900  
north as on Tennessee so we want to be

533  
00:21:43,080 --> 00:21:40,390  
able to see this detailed structure all

534  
00:21:46,770 --> 00:21:43,090  
the way for them or not some of the

535  
00:21:48,420 --> 00:21:46,780  
things doing um neck 10 I was just going

536  
00:21:51,810 --> 00:21:48,430  
to say Gail this is an improvement over

537  
00:21:54,030 --> 00:21:51,820  
the the previous satellite so GPM was

538  
00:21:56,190 --> 00:21:54,040

replacing the tropical rainfall

539

00:21:58,560 --> 00:21:56,200

measuring mission which was also a

540

00:22:03,030 --> 00:21:58,570

partnership between the japan's space

541

00:22:05,730 --> 00:22:03,040

agency and nasa in i think one of the

542

00:22:08,340 --> 00:22:05,740

one of the biggest improvements like you

543

00:22:10,380 --> 00:22:08,350

said for GPM is that now

544

00:22:15,029 --> 00:22:10,390

can we can see almost all the way up to

545

00:22:17,480 --> 00:22:15,039

the Arctic Circle in NC we can see we

546

00:22:19,950 --> 00:22:17,490

can see snow we can see those

547

00:22:25,020 --> 00:22:19,960

transitioning extra extra-tropical

548

00:22:29,340 --> 00:22:25,030

cyclones to a to that that are impacting

549

00:22:31,830 --> 00:22:29,350

you know more of the countries Japan and

550

00:22:38,010 --> 00:22:31,840

the United States that that are the main

551

00:22:40,770 --> 00:22:38,020

partners on this mission so and i'll

552

00:22:44,220 --> 00:22:40,780

just add you know for me I think three

553

00:22:46,529 --> 00:22:44,230

main contributions from GPM beyond that

554

00:22:48,180 --> 00:22:46,539

of tramore one more the already

555

00:22:50,299 --> 00:22:48,190

mentioned were able to get light rain

556

00:22:53,190 --> 00:22:50,309

and falling snow and this is the first

557

00:22:55,350 --> 00:22:53,200

NASA satellite mission that was

558

00:22:58,020 --> 00:22:55,360

specifically designed to measure rain

559

00:23:00,630 --> 00:22:58,030

writes down 2.2 millimeters an hour all

560

00:23:03,090 --> 00:23:00,640

the way up to 110 millimeters an hour so

561

00:23:05,190 --> 00:23:03,100

that's a fraction of an inch to about 5

562

00:23:08,580 --> 00:23:05,200

inches an hour and to be able to measure

563

00:23:11,720 --> 00:23:08,590

phones now the other major contribution

564

00:23:19,320 --> 00:23:11,730

is that our footprint which is basically

565

00:23:21,570 --> 00:23:19,330

comment Oh what Frank do you see with

566

00:23:24,500 --> 00:23:21,580

each measurement is down to five

567

00:23:27,840 --> 00:23:24,510

kilometers so that's a three-mile radius

568

00:23:30,630 --> 00:23:27,850

it's above trend that we're doing beyond

569

00:23:33,779 --> 00:23:30,640

trim is it because our space practice

570

00:23:36,990 --> 00:23:33,789

civil design we can use it to basically

571

00:23:38,340 --> 00:23:37,000

unify measurements from all sorts of

572

00:23:40,649 --> 00:23:38,350

other domestic and international

573

00:23:42,930 --> 00:23:40,659

satellite partners they're already

574

00:23:44,970 --> 00:23:42,940

measuring precipitation what they do

575

00:23:47,279 --> 00:23:44,980

with slightly different capabilities so

576

00:23:49,770 --> 00:23:47,289

we can unify that so that we get these

577

00:23:51,720 --> 00:23:49,780

global precipitation measurements on

578

00:23:54,180 --> 00:23:51,730

like i said earlier every three hours

579

00:23:57,510 --> 00:23:54,190

and sometimes even less than every three

580

00:23:59,399 --> 00:23:57,520

hours which is vital for application

581

00:24:02,279 --> 00:23:59,409

users people that might be trying to

582

00:24:05,760 --> 00:24:02,289

track hurricanes or start to predict

583

00:24:09,510 --> 00:24:05,770

floods and lancets so it's a Rick was

584

00:24:11,190 --> 00:24:09,520

talking earlier about the about his his

585

00:24:14,190 --> 00:24:11,200

pictures of the Dominican Republic and

586

00:24:17,100 --> 00:24:14,200

then having going visited there after he

587

00:24:20,039 --> 00:24:17,110

got back you know the Caribbean is one

588

00:24:23,500 --> 00:24:20,049

of the places on on earth that's most

589

00:24:30,290 --> 00:24:27,040

so one at one of the biggest benefits of

590

00:24:34,250 --> 00:24:30,300

GPM that I'm excited for also as a

591

00:24:37,100 --> 00:24:34,260

scientist is that we have now a you know

592

00:24:39,560 --> 00:24:37,110

near near global coverage of for a

593

00:24:41,060 --> 00:24:39,570

weather weather radar so there are a lot

594

00:24:43,970 --> 00:24:41,070

of countries that can't afford a

595

00:24:46,640 --> 00:24:43,980

nationwide weather weather radar system

596

00:24:49,010 --> 00:24:46,650

like the United States has an and GPM is

597

00:24:54,260 --> 00:24:49,020

kind of giving them that that that

598

00:24:56,900 --> 00:24:54,270

capability to to have regular monitoring

599

00:24:59,060 --> 00:24:56,910

of rainfall especially in extreme events

600

00:25:02,750 --> 00:24:59,070

like like if there was a hurricane

601  
00:25:05,480 --> 00:25:02,760  
hitting the Dominican Republic that's

602  
00:25:07,700 --> 00:25:05,490  
right Eric alone as you said if you try

603  
00:25:10,040 --> 00:25:07,710  
to measure for measure precipitation

604  
00:25:12,380 --> 00:25:10,050  
from the Earth from the brown in the

605  
00:25:14,150 --> 00:25:12,390  
u.s. we have a very strong network of

606  
00:25:16,520 --> 00:25:14,160  
ground radar data that you might see on

607  
00:25:18,830 --> 00:25:16,530  
your nightly news but if you go to other

608  
00:25:21,650 --> 00:25:18,840  
countries you go over the oceans you

609  
00:25:23,270 --> 00:25:21,660  
just cannot put enough weather radars or

610  
00:25:25,400 --> 00:25:23,280  
a little a rain buckets to actually

611  
00:25:27,590 --> 00:25:25,410  
measure the ring so from the vantage

612  
00:25:30,050 --> 00:25:27,600  
point of space you can measure the

613  
00:25:32,030 --> 00:25:30,060

global precipitation and that data the

614

00:25:34,190 --> 00:25:32,040

data that NASA provides is freely

615

00:25:36,500 --> 00:25:34,200

available to anybody anywhere in the

616

00:25:38,780 --> 00:25:36,510

world that wants to use it and the other

617

00:25:42,050 --> 00:25:38,790

thing that GPM is doing which is fairly

618

00:25:45,230 --> 00:25:42,060

unique as we have we get then we release

619

00:25:48,440 --> 00:25:45,240

the data to the public anywhere from one

620

00:25:52,850 --> 00:25:48,450

to three hours after its collective this

621

00:25:55,010 --> 00:25:52,860

is really important for emergency

622

00:25:58,310 --> 00:25:55,020

management that might want to evacuate a

623

00:26:00,340 --> 00:25:58,320

coastline for hurricane or evacuating

624

00:26:04,220 --> 00:26:00,350

risk event all those slides with lots

625

00:26:06,880 --> 00:26:04,230

mm-hmm so I've done some work in the

626  
00:26:13,160 --> 00:26:06,890  
past since I sends my internship at NASA

627  
00:26:15,560 --> 00:26:13,170  
we I I did a project in Ethiopia working

628  
00:26:18,650 --> 00:26:15,570  
with farmers on drought and and

629  
00:26:21,410 --> 00:26:18,660  
preparing for possible future future

630  
00:26:23,600 --> 00:26:21,420  
droughts with climate change and is

631  
00:26:26,630 --> 00:26:23,610  
there a way that GPM is helping also i

632  
00:26:28,820 --> 00:26:26,640  
know that it's talking about we talk

633  
00:26:30,890 --> 00:26:28,830  
about extreme rainfall and hurricanes a

634  
00:26:33,920 --> 00:26:30,900  
lot but what about the other end of that

635  
00:26:38,430 --> 00:26:33,930  
spectrum of lingering drought sore or

636  
00:26:43,240 --> 00:26:41,890  
yes so GPM can tell us when is

637  
00:26:45,480 --> 00:26:43,250  
precipitating and when it's not

638  
00:26:47,980 --> 00:26:45,490

precipitating so we can start to

639

00:26:52,840 --> 00:26:47,990

determine when droughts occur and also

640

00:26:54,610 --> 00:26:52,850

to too if needs send food in advance of

641

00:26:56,320 --> 00:26:54,620

those well I think one of the best

642

00:26:59,350 --> 00:26:56,330

things in full play our video we have a

643

00:27:01,590 --> 00:26:59,360

video here of a snowstorm as I mentioned

644

00:27:04,030 --> 00:27:01,600

this is one of the person missions

645

00:27:06,220 --> 00:27:04,040

specifically designed to measure falling

646

00:27:07,960 --> 00:27:06,230

snow and so when this video should be

647

00:27:10,150 --> 00:27:07,970

playing what you're going to see us this

648

00:27:13,270 --> 00:27:10,160

is a March 17 snow storm over the

649

00:27:15,580 --> 00:27:13,280

Washington DC area and with the

650

00:27:18,040 --> 00:27:15,590

snowstorm this is less than three weeks

651  
00:27:22,470 --> 00:27:18,050  
after GPM is launched and you can see

652  
00:27:25,690 --> 00:27:22,480  
that over the Atlantic Ocean there is

653  
00:27:27,760 --> 00:27:25,700  
precipitation as a showing okay well

654  
00:27:29,740 --> 00:27:27,770  
sauce on them but basically the the

655  
00:27:31,419 --> 00:27:29,750  
precipitation will be over the Atlantic

656  
00:27:35,049 --> 00:27:31,429  
Ocean and you'll see these very tall

657  
00:27:36,760 --> 00:27:35,059  
cloud talks and there will be rain

658  
00:27:40,260 --> 00:27:36,770  
falling out underneath and that rain is

659  
00:27:44,080 --> 00:27:40,270  
shown will be shown in reds and greens

660  
00:27:46,060 --> 00:27:44,090  
and then over the land there will be

661  
00:27:48,040 --> 00:27:46,070  
this really shallow snow storm which is

662  
00:27:50,290 --> 00:27:48,050  
shown in blue cones and what's really

663  
00:27:52,390 --> 00:27:50,300

important about this snow is that we

664

00:27:54,549 --> 00:27:52,400

weren't able to measure falling snow

665

00:27:57,700 --> 00:27:54,559

from space before this mission in many

666

00:28:00,430 --> 00:27:57,710

places in the world rely on snow packs

667

00:28:03,490 --> 00:28:00,440

for their spring and more summer by

668

00:28:05,440 --> 00:28:03,500

freshwater resources sewing be so being

669

00:28:07,750 --> 00:28:05,450

able to measure both the liquid part of

670

00:28:10,270 --> 00:28:07,760

the precipitation and the frozen part of

671

00:28:11,890 --> 00:28:10,280

the precipitation is important and then

672

00:28:16,450 --> 00:28:11,900

getting back to this list or more mark

673

00:28:19,030 --> 00:28:16,460

17 I was just told today that yeah this

674

00:28:21,490 --> 00:28:19,040

was so early in the mission and in the

675

00:28:23,860 --> 00:28:21,500

DC area Sam and it was the snow shuts

676  
00:28:26,440 --> 00:28:23,870  
down everything and people were sold

677  
00:28:28,840 --> 00:28:26,450  
don't come into work so some of the GPM

678  
00:28:30,669 --> 00:28:28,850  
on mission operators actually had to

679  
00:28:32,919 --> 00:28:30,679  
spend the night the night before and the

680  
00:28:34,840 --> 00:28:32,929  
night after in the mission operations

681  
00:28:39,070 --> 00:28:34,850  
building on what their sleeping bags

682  
00:28:42,520 --> 00:28:39,080  
because the falling snow really impacts

683  
00:28:45,130 --> 00:28:42,530  
us in a different way than precipitation

684  
00:28:47,980 --> 00:28:45,140  
falling snow is harder to remove and

685  
00:28:50,640 --> 00:28:47,990  
ended and things like that so if we get

686  
00:28:54,550 --> 00:28:50,650  
that video will show it later

687  
00:28:57,220 --> 00:28:54,560  
so I'm thinking of a place where snow is

688  
00:28:59,050 --> 00:28:57,230

really important this is maybe in a

689

00:29:02,350 --> 00:28:59,060

place like northern India or something

690

00:29:04,900 --> 00:29:02,360

where a lot of people rely on on water

691

00:29:08,080 --> 00:29:04,910

for for irrigation and growing growing

692

00:29:13,360 --> 00:29:08,090

food that water from the Ganges River

693

00:29:16,360 --> 00:29:13,370

comes from melting glaciers in in the

694

00:29:19,150 --> 00:29:16,370

Himalayas so it is GP I'm going to be

695

00:29:23,880 --> 00:29:19,160

able to kind of better help places like

696

00:29:28,960 --> 00:29:27,160

yeah it is I have to admit it is more

697

00:29:31,480 --> 00:29:28,970

difficult to marshal precipitation over

698

00:29:34,150 --> 00:29:31,490

here in mountainous regions but we are

699

00:29:35,830 --> 00:29:34,160

improving those and so yes we because

700

00:29:38,820 --> 00:29:35,840

we're able to get and measure the

701  
00:29:42,400 --> 00:29:38,830  
precipitation within the column of the

702  
00:29:44,080 --> 00:29:42,410  
data within the GPM measurements and

703  
00:29:46,120 --> 00:29:44,090  
I'll get back to that a second we are

704  
00:29:50,500 --> 00:29:46,130  
able to see the precipitation before it

705  
00:29:52,150 --> 00:29:50,510  
falls now as I mentioned earlier it

706  
00:29:53,590 --> 00:29:52,160  
being has two instruments and the way I

707  
00:29:55,090 --> 00:29:53,600  
like to describe why the instruments

708  
00:29:57,460 --> 00:29:55,100  
it's kind of like taking an x-ray

709  
00:29:59,800 --> 00:29:57,470  
through the cloud and just like a doctor

710  
00:30:02,260 --> 00:29:59,810  
might take an x-ray of a human body and

711  
00:30:04,480 --> 00:30:02,270  
sit bones and some of the bones might be

712  
00:30:08,950 --> 00:30:04,490  
thinner and more translucent words other

713  
00:30:10,810 --> 00:30:08,960

ones might be thicker and more dense the

714

00:30:12,930 --> 00:30:10,820

same kind of thing happens with one of

715

00:30:16,180 --> 00:30:12,940

the GPM instruments is that you see

716

00:30:18,070 --> 00:30:16,190

where there's lots of heavy liquid rain

717

00:30:20,680 --> 00:30:18,080

and where there's lots of ice and so I

718

00:30:22,210 --> 00:30:20,690

kind of compressed through the cloud we

719

00:30:23,920 --> 00:30:22,220

also get the frozen part of the

720

00:30:25,240 --> 00:30:23,930

precipitation in that instrument

721

00:30:27,040 --> 00:30:25,250

measurement and then the other

722

00:30:30,160 --> 00:30:27,050

instrument which was actually provided

723

00:30:32,890 --> 00:30:30,170

by the Japanese allows us to seed layer

724

00:30:35,050 --> 00:30:32,900

by layer within the clown and so you can

725

00:30:37,390 --> 00:30:35,060

use that information later by layer to

726

00:30:40,840 --> 00:30:37,400

see what's in the column before it hits

727

00:30:43,300 --> 00:30:40,850

its ground and furthermore jumping ahead

728

00:30:45,700 --> 00:30:43,310

and answer and pushing it may not have

729

00:30:47,580 --> 00:30:45,710

been answered yet we can use that or ask

730

00:30:50,050 --> 00:30:47,590

that you can use that layer by layer

731

00:30:52,870 --> 00:30:50,060

information to improve weather

732

00:30:54,700 --> 00:30:52,880

forecasting models and climate change

733

00:30:58,600 --> 00:30:54,710

moms because those models have really

734

00:31:00,760 --> 00:30:58,610

simplistic on representations of the

735

00:31:03,100 --> 00:31:00,770

precipitation layer by layer within the

736

00:31:06,700 --> 00:31:03,110

clouds and so we can use that to

737

00:31:09,460 --> 00:31:06,710

not only for a short short term weather

738

00:31:11,799 --> 00:31:09,470

forecasting for our long-term future in

739

00:31:15,549 --> 00:31:11,809

terms of humans it's happening within

740

00:31:18,039 --> 00:31:15,559

climate change so so we can have a 3d

741

00:31:20,740 --> 00:31:18,049

view basically in a way that we've never

742

00:31:25,240 --> 00:31:20,750

had before that will help scientists

743

00:31:29,169 --> 00:31:25,250

understand clouds and in how clouds

744

00:31:31,510 --> 00:31:29,179

convert the moisture into rainfall yeah

745

00:31:33,669 --> 00:31:31,520

that's correct side so the moisture into

746

00:31:35,530 --> 00:31:33,679

rainfall we measure the rainfall part of

747

00:31:37,870 --> 00:31:35,540

that and we have a three-dimensional

748

00:31:42,520 --> 00:31:37,880

view of it and earlier you were talking

749

00:31:44,380 --> 00:31:42,530

about climate change and most people

750

00:31:47,140 --> 00:31:44,390

most humans are not really going to be

751  
00:31:51,430 --> 00:31:47,150  
impacted by one degree change change

752  
00:31:53,440 --> 00:31:51,440  
okay so put onto the plaza but really

753  
00:31:54,880 --> 00:31:53,450  
one of the things that I'm not climbing

754  
00:31:57,340 --> 00:31:54,890  
signs for the climate scientists are

755  
00:31:59,620 --> 00:31:57,350  
saying the precipitation extremes are

756  
00:32:01,000 --> 00:31:59,630  
they can become more extreme yeah so

757  
00:32:02,470 --> 00:32:01,010  
where there's drought will be more

758  
00:32:05,049 --> 00:32:02,480  
drought for those heavy precipitation

759  
00:32:07,419 --> 00:32:05,059  
will be more precipitation and we as

760  
00:32:10,390 --> 00:32:07,429  
humans because water is essential for

761  
00:32:13,570 --> 00:32:10,400  
our life you're going to probably feel

762  
00:32:15,730 --> 00:32:13,580  
the effects of climate change more in

763  
00:32:19,659 --> 00:32:15,740

precipitation patterns and in

764

00:32:25,480 --> 00:32:19,669

temperature powers the GPM is is kind of

765

00:32:30,100 --> 00:32:25,490

the GM GPM is the start of a whole suite

766

00:32:31,930 --> 00:32:30,110

of NASA's new NASA satellites this year

767

00:32:38,110 --> 00:32:31,940

that are helping to answer that question

768

00:32:44,470 --> 00:32:38,120

of how is just exactly how is the width

769

00:32:47,650 --> 00:32:44,480

with global warming yeah that's right

770

00:32:49,000 --> 00:32:47,660

nASA has a bunch of many satellites that

771

00:32:52,000 --> 00:32:49,010

are looking down at orrick to measure

772

00:32:54,820 --> 00:32:52,010

all sorts of things that tells causal as

773

00:32:56,770 --> 00:32:54,830

many different aspects of how our system

774

00:32:58,720 --> 00:32:56,780

works as a whole well you know without

775

00:33:00,970 --> 00:32:58,730

this satellite measurements it's like

776

00:33:03,190 --> 00:33:00,980

maybe having the edge of a puzzle filled

777

00:33:04,659 --> 00:33:03,200

out from brown measurements but we can

778

00:33:06,640 --> 00:33:04,669

start to fill in the middle of the

779

00:33:07,960 --> 00:33:06,650

puzzle by using all these different

780

00:33:10,299 --> 00:33:07,970

satellites to tell us different

781

00:33:14,049 --> 00:33:10,309

components of the Earth system and how

782

00:33:16,390 --> 00:33:14,059

it works together so we have it so we

783

00:33:21,250 --> 00:33:16,400

have a question

784

00:33:23,230 --> 00:33:21,260

from twitter from Samantha Walter how

785

00:33:26,710 --> 00:33:23,240

much free time did the astronauts have

786

00:33:28,930 --> 00:33:26,720

to sit and look at the view of the earth

787

00:33:31,390 --> 00:33:28,940

on the space station and kind of watch

788

00:33:34,660 --> 00:33:31,400

watch these changes or watch watch the

789

00:33:38,830 --> 00:33:34,670

weather watch watch these on you know

790

00:33:41,740 --> 00:33:38,840

fascinating aspects of of nature by

791

00:33:43,900 --> 00:33:41,750

below you you know we don't get a lot of

792

00:33:45,610 --> 00:33:43,910

free time our work day is pretty packed

793

00:33:47,800 --> 00:33:45,620

and we exercise for a couple of two and

794

00:33:49,780 --> 00:33:47,810

a half hours a day we work for many

795

00:33:52,150 --> 00:33:49,790

hours a day and we have to eat of course

796

00:33:53,620 --> 00:33:52,160

usually there's about maybe two hours at

797

00:33:55,300 --> 00:33:53,630

the end of the day that they call our

798

00:33:56,770 --> 00:33:55,310

priests leave time this is where we'll

799

00:33:58,750 --> 00:33:56,780

eat dinner this is where we'll kind of

800

00:34:00,640 --> 00:33:58,760

wind down do a few emails from home

801  
00:34:02,200 --> 00:34:00,650  
maybe phone home and that's where I

802  
00:34:03,640 --> 00:34:02,210  
always like to spend time looking out

803  
00:34:05,590 --> 00:34:03,650  
the window it always seemed to help

804  
00:34:07,270 --> 00:34:05,600  
relax me so we get a couple hours to

805  
00:34:08,860 --> 00:34:07,280  
look out the window of course it's very

806  
00:34:10,450 --> 00:34:08,870  
dependent on our trajectory we may be

807  
00:34:13,899 --> 00:34:10,460  
over going spending a lot of time over

808  
00:34:15,520 --> 00:34:13,909  
the Pacific Ocean at that specific time

809  
00:34:20,169 --> 00:34:15,530  
of the year so it really depends on a

810  
00:34:22,690 --> 00:34:20,179  
trajectory what you get to see um so

811  
00:34:28,270 --> 00:34:22,700  
another very important related question

812  
00:34:31,690 --> 00:34:28,280  
is from twitter is if there is there

813  
00:34:33,850 --> 00:34:31,700

coffee available you guys going there

814

00:34:37,540 --> 00:34:33,860

during all these um you know marathon

815

00:34:41,320 --> 00:34:37,550

work work days yeah definitely we have

816

00:34:44,070 --> 00:34:41,330

tea and coffee and even and I love green

817

00:34:46,840 --> 00:34:44,080

tea and then we have different kinds of

818

00:34:49,540 --> 00:34:46,850

beverages so it's just water orange

819

00:34:52,120 --> 00:34:49,550

juice so uh and it's it's really good

820

00:34:54,340 --> 00:34:52,130

and then more the space station as I

821

00:35:00,400 --> 00:34:54,350

always say we turn yesterday's coffee

822

00:35:03,760 --> 00:35:00,410

into tomorrow's coffee water for the

823

00:35:06,160 --> 00:35:03,770

usage on both the space station water is

824

00:35:10,690 --> 00:35:06,170

a very precious thing on board the space

825

00:35:14,470 --> 00:35:10,700

station not only on the ground yeah and

826

00:35:15,940 --> 00:35:14,480

that's that's one of the one of the

827

00:35:18,630 --> 00:35:15,950

challenges and you know now with the

828

00:35:20,650 --> 00:35:18,640

drought in California and other other

829

00:35:23,530 --> 00:35:20,660

impacts of climate change that we're

830

00:35:25,900 --> 00:35:23,540

seeing this year we're starting to think

831

00:35:29,590 --> 00:35:25,910

I think about water as a more precious

832

00:35:29,900 --> 00:35:29,600

resource than maybe before so in that

833

00:35:31,069 --> 00:35:29,910

there's

834

00:35:32,450 --> 00:35:31,079

actually some of the places in

835

00:35:35,089 --> 00:35:32,460

California that are starting to

836

00:35:39,289 --> 00:35:35,099

implement this kind of water recycling

837

00:35:42,380 --> 00:35:39,299

on a citywide scale that that you know

838

00:35:47,359 --> 00:35:42,390

nASA has helped to pioneer some of this

839

00:35:50,770 --> 00:35:47,369

technology so so they'll get to drink

840

00:35:54,710 --> 00:35:50,780

their their coffee the second day too

841

00:35:56,359 --> 00:35:54,720

maybe but um so we're going to take a

842

00:35:58,430 --> 00:35:56,369

few more questions we've only got about

843

00:35:59,660 --> 00:35:58,440

another five minutes or so so maybe we

844

00:36:01,700 --> 00:35:59,670

can do something like lightning around

845

00:36:03,829 --> 00:36:01,710

questions from from twitter and google+

846

00:36:05,660 --> 00:36:03,839

so we make sure to to get to everybody's

847

00:36:10,069 --> 00:36:05,670

questions here great so we have another

848

00:36:12,500 --> 00:36:10,079

question from from Twitter that and i

849

00:36:17,539 --> 00:36:12,510

think this this question is for her gail

850

00:36:20,599 --> 00:36:17,549

as well as as brick in quechee but but

851

00:36:23,289 --> 00:36:20,609

this this twitter is from this this

852

00:36:27,670 --> 00:36:23,299

tweet is from savannah and she says um

853

00:36:30,589 --> 00:36:27,680

her dream is to work at NASA and

854

00:36:32,289 --> 00:36:30,599

specifically on the ISS so so what's the

855

00:36:34,400 --> 00:36:32,299

best way to make that dream possible

856

00:36:36,920 --> 00:36:34,410

well you know I think Leach and I kind

857

00:36:38,210 --> 00:36:36,930

of tell folks who want to work for NASA

858

00:36:39,980 --> 00:36:38,220

or become astronauts we tell them the

859

00:36:42,200 --> 00:36:39,990

same thing you have to find something

860

00:36:43,819 --> 00:36:42,210

you really enjoy you have to find

861

00:36:46,880 --> 00:36:43,829

whether it's being an engineer being a

862

00:36:49,430 --> 00:36:46,890

scientist or being a doctor or being a

863

00:36:50,660 --> 00:36:49,440

pilot or a test pilot some kind find

864

00:36:52,190 --> 00:36:50,670

something you really enjoy and get

865

00:36:53,930 --> 00:36:52,200

really good at it and if you're if you

866

00:36:55,339 --> 00:36:53,940

enjoy you're going to going to become

867

00:36:57,079 --> 00:36:55,349

very good at it because you enjoy doing

868

00:36:58,430 --> 00:36:57,089

it and you're going to practice it and

869

00:37:00,349 --> 00:36:58,440

you're going to become great at it and

870

00:37:03,230 --> 00:37:00,359

then of course apply to NASA NASA needs

871

00:37:05,000 --> 00:37:03,240

all kinds of folks I worked as net at

872

00:37:06,559 --> 00:37:05,010

NASA as an engineer I worked as a flight

873

00:37:07,940 --> 00:37:06,569

controller Mission Control now I work as

874

00:37:09,529 --> 00:37:07,950

an astronaut so there's all kinds of

875

00:37:11,510 --> 00:37:09,539

great opportunities at NASA and I never

876  
00:37:15,319 --> 00:37:11,520  
thought I would get to where I am so if

877  
00:37:17,839 --> 00:37:15,329  
I can do it many folks can but this is

878  
00:37:20,000 --> 00:37:17,849  
Gail I'll just jump in I take the

879  
00:37:22,130 --> 00:37:20,010  
hardest math you can or if you don't

880  
00:37:24,710 --> 00:37:22,140  
like math I tell some middle school

881  
00:37:27,650 --> 00:37:24,720  
girls and our astronauts will confirm

882  
00:37:30,109 --> 00:37:27,660  
this that they need seamstresses to come

883  
00:37:33,500 --> 00:37:30,119  
up with better astronaut suits and they

884  
00:37:34,849 --> 00:37:33,510  
need a chef come up with better meals so

885  
00:37:38,960 --> 00:37:34,859  
you know there's all sorts of ways to

886  
00:37:41,329 --> 00:37:38,970  
work for NASA yeah it's not but it's not

887  
00:37:43,610 --> 00:37:41,339  
just about math and physics i think that

888  
00:37:46,730 --> 00:37:43,620

NASA does so many things now about

889

00:37:48,560 --> 00:37:46,740

uh I mean I met when I was an intern at

890

00:37:51,380 --> 00:37:48,570

NASA I met an archaeologist that was

891

00:37:54,560 --> 00:37:51,390

working for NASA so it almost anything

892

00:37:59,540 --> 00:37:54,570

that you can imagine NASA is is working

893

00:38:02,140 --> 00:37:59,550

on it so so what about you caliche what

894

00:38:05,330 --> 00:38:02,150

was your path to become an astronaut

895

00:38:07,280 --> 00:38:05,340

yeah I am I dreamed them going to space

896

00:38:09,050 --> 00:38:07,290

when I was five years old when I saw the

897

00:38:10,880 --> 00:38:09,060

pole lunar landing but at the time I

898

00:38:12,890 --> 00:38:10,890

thought it was beyond my dream because

899

00:38:14,750 --> 00:38:12,900

there was no Japanese astronaut at the

900

00:38:16,640 --> 00:38:14,760

time only American astronauts and the

901  
00:38:19,250 --> 00:38:16,650  
former Soviet Union cosmonauts were

902  
00:38:22,160 --> 00:38:19,260  
working in space but I had a strong

903  
00:38:23,810 --> 00:38:22,170  
desire to build or fly airplanes and

904  
00:38:26,690 --> 00:38:23,820  
then they became an engineer of an

905  
00:38:28,700 --> 00:38:26,700  
aircraft structure and then I saw on the

906  
00:38:30,830 --> 00:38:28,710  
newspaper that japanese space agency was

907  
00:38:33,320 --> 00:38:30,840  
selecting astronaut candidates in an

908  
00:38:35,840 --> 00:38:33,330  
applied I was luckily selected so if you

909  
00:38:38,270 --> 00:38:35,850  
dream and if you try to to reach the

910  
00:38:41,060 --> 00:38:38,280  
goal by studying harder there is a way

911  
00:38:45,080 --> 00:38:41,070  
to go beyond what you think that you can

912  
00:38:47,630 --> 00:38:45,090  
dream of and so I think everyone I

913  
00:38:50,660 --> 00:38:47,640

watching this I mean all the students

914

00:38:53,120 --> 00:38:50,670

each mom you has something that you can

915

00:38:55,640 --> 00:38:53,130

very well and do probably better than

916

00:38:58,550 --> 00:38:55,650

anybody else and then and then from that

917

00:39:00,920 --> 00:38:58,560

the you know please continue your dream

918

00:39:02,660 --> 00:39:00,930

and then in time and then probably you

919

00:39:05,540 --> 00:39:02,670

will be working with us on board the

920

00:39:07,970 --> 00:39:05,550

spacecraft well I think that's a great

921

00:39:10,100 --> 00:39:07,980

place to leave it thanks Lauren for for

922

00:39:13,550 --> 00:39:10,110

organizing this and I think it was a

923

00:39:15,520 --> 00:39:13,560

really amazing for me personally dream

924

00:39:18,170 --> 00:39:15,530

come true to have this conversation

925

00:39:20,870 --> 00:39:18,180

thank you Eric and thank you everyone

926  
00:39:22,820 --> 00:39:20,880  
who joined us today on NASA's Google+

927  
00:39:26,030 --> 00:39:22,830  
Hangout observing Earth from space I

928  
00:39:29,140 --> 00:39:26,040  
want to thank our celebrity questioner

929  
00:39:31,400 --> 00:39:29,150  
Eric Holthaus from slate com and Gail

930  
00:39:34,370 --> 00:39:31,410  
giggles whose middle name I will never

931  
00:39:35,570 --> 00:39:34,380  
get right as Gail citronic Jackson who's

932  
00:39:38,600 --> 00:39:35,580  
the global precipitation measurement

933  
00:39:39,650 --> 00:39:38,610  
mission program manager from the Goddard

934  
00:39:42,140 --> 00:39:39,660  
Space Flight Center in Greenbelt

935  
00:39:43,820 --> 00:39:42,150  
Maryland and of course my esteemed

936  
00:39:46,100 --> 00:39:43,830  
panelists here and NASA headquarters

937  
00:39:48,410 --> 00:39:46,110  
Koichi Wakata from the japanese space

938  
00:39:51,800 --> 00:39:48,420

agency and rick mastracchio from NASA

939

00:39:53,750 --> 00:39:51,810

who just returned from 188 days on the

940

00:39:55,160 --> 00:39:53,760

International Space Station you don't

941

00:39:56,250 --> 00:39:55,170

have to leave the conversation here

942

00:39:58,890 --> 00:39:56,260

though you can continue

943

00:40:00,720 --> 00:39:58,900

engage with us follow follow up on this

944

00:40:03,450 --> 00:40:00,730

discussion on our twitter account at

945

00:40:05,460 --> 00:40:03,460

NASA and the hashtag at NASA questions

946

00:40:09,150 --> 00:40:05,470

and of course we're online we're on

947

00:40:11,760 --> 00:40:09,160

facebook or on Google+ and on a NASA

948

00:40:13,950 --> 00:40:11,770

television channel near you so on behalf

949

00:40:15,540 --> 00:40:13,960

of everybody here at NASA and these guys