
On Phone
Questions from Media

1
00:00:08,390 --> 00:00:06,309
well good afternoon my name is duane

2
00:00:10,790 --> 00:00:08,400
brown with the office of public affairs

3
00:00:11,910 --> 00:00:10,800
welcome to nasa headquarters and happy

4
00:00:13,350 --> 00:00:11,920
new year

5
00:00:15,430 --> 00:00:13,360
today's briefing

6
00:00:18,310 --> 00:00:15,440
features information about the crown

7
00:00:20,870 --> 00:00:18,320
jewel in a fleet of nasa missions to

8
00:00:22,390 --> 00:00:20,880
study our sun the solar dynamics

9
00:00:24,310 --> 00:00:22,400
observatory

10
00:00:25,750 --> 00:00:24,320
or sdl

11
00:00:26,950 --> 00:00:25,760
which is currently scheduled to launch

12
00:00:28,630 --> 00:00:26,960
in february

13
00:00:31,509 --> 00:00:28,640

today you'll hear about the advanced

14
00:00:33,190 --> 00:00:31,519
spacecraft and the extraordinary

15
00:00:34,630 --> 00:00:33,200
science expected

16
00:00:36,150 --> 00:00:34,640
we'll start here at nasa headquarters

17
00:00:37,030 --> 00:00:36,160
and then switch to the kennedy space

18
00:00:38,869 --> 00:00:37,040
center

19
00:00:40,869 --> 00:00:38,879
where all the pre-launch

20
00:00:42,549 --> 00:00:40,879
activities are taking place

21
00:00:45,830 --> 00:00:42,559
we'll have brief presentations from both

22
00:00:47,430 --> 00:00:45,840
locations then open it up for questions

23
00:00:49,590 --> 00:00:47,440
before we get started let me introduce

24
00:00:52,630 --> 00:00:49,600
you to our participants first here at

25
00:00:55,110 --> 00:00:52,640
nasa headquarters richard fisher

26
00:00:58,229 --> 00:00:55,120
heliophysics division director

27
00:01:01,189 --> 00:00:58,239
nasa headquarters here in washington

28
00:01:03,110 --> 00:01:01,199
mahulika guhata kurta or as like we like

29
00:01:05,830 --> 00:01:03,120
to call her lika

30
00:01:07,750 --> 00:01:05,840
the sdo program scientist also here at

31
00:01:10,870 --> 00:01:07,760
nasa headquarters

32
00:01:13,910 --> 00:01:10,880
and switching down to kennedy

33
00:01:16,469 --> 00:01:13,920
dean pesnell the sdo project scientist

34
00:01:18,469 --> 00:01:16,479
from nasa's goddess space flight center

35
00:01:22,230 --> 00:01:18,479
in greenbelt maryland

36
00:01:25,109 --> 00:01:22,240
and elizabeth citron the sdo project

37
00:01:27,350 --> 00:01:25,119
manager also edgard

38
00:01:29,510 --> 00:01:27,360

so with that i'll turn it over to

39
00:01:31,429 --> 00:01:29,520
richard

40
00:01:34,069 --> 00:01:31,439
okay thank you very much duane it's a

41
00:01:36,230 --> 00:01:34,079
great pleasure on my part to be with you

42
00:01:38,469 --> 00:01:36,240
here today

43
00:01:41,350 --> 00:01:38,479
let me start at the very center of our

44
00:01:43,190 --> 00:01:41,360
of our issue at the beginning at the

45
00:01:45,350 --> 00:01:43,200
center of our solar system there's a

46
00:01:46,710 --> 00:01:45,360
star and this star is a magnetic

47
00:01:48,950 --> 00:01:46,720
variable star

48
00:01:49,910 --> 00:01:48,960
and it drives the earth and all the

49
00:01:52,710 --> 00:01:49,920
planets

50
00:01:54,870 --> 00:01:52,720
and it also sculptures space and through

51
00:01:56,389 --> 00:01:54,880
that time and place there are also

52
00:01:59,030 --> 00:01:56,399
transients

53
00:02:01,030 --> 00:01:59,040
if i could have the first video please

54
00:02:02,709 --> 00:02:01,040
now at the dawn of the space age when

55
00:02:04,389 --> 00:02:02,719
nasa was born

56
00:02:06,550 --> 00:02:04,399
there were two crucial experiments the

57
00:02:09,510 --> 00:02:06,560
first one the very first science

58
00:02:11,510 --> 00:02:09,520
experiment that nasa had

59
00:02:13,350 --> 00:02:11,520
established that the earth was

60
00:02:15,830 --> 00:02:13,360
enshrouded by a belt of charged

61
00:02:17,190 --> 00:02:15,840
particles a couple of years later

62
00:02:19,030 --> 00:02:17,200
mariner

63
00:02:21,270 --> 00:02:19,040

discovered that there was a solar wind a

64
00:02:23,750 --> 00:02:21,280
wind that was blowing off the star and

65
00:02:25,510 --> 00:02:23,760
at that point we had we had discovered

66
00:02:27,430 --> 00:02:25,520
and codified

67
00:02:29,350 --> 00:02:27,440
two important things one of them is that

68
00:02:30,150 --> 00:02:29,360
particles and fields are ejected by the

69
00:02:32,470 --> 00:02:30,160
sun

70
00:02:34,630 --> 00:02:32,480
and these are two of the ways that the

71
00:02:35,670 --> 00:02:34,640
sun or a star communicates with the

72
00:02:37,509 --> 00:02:35,680
universe

73
00:02:40,309 --> 00:02:37,519
now we've been looking at pictures of an

74
00:02:42,550 --> 00:02:40,319
active sun taken a few years ago

75
00:02:44,790 --> 00:02:42,560
and we'll occasionally see little little

76
00:02:46,390 --> 00:02:44,800
sparky things that look like snow

77
00:02:51,030 --> 00:02:46,400
and those are charged high energy

78
00:02:56,390 --> 00:02:53,990
now the research and the events have led

79
00:02:59,350 --> 00:02:56,400
to the development of a study a formal

80
00:03:02,309 --> 00:02:59,360
study of the interaction of gravity

81
00:03:04,309 --> 00:03:02,319
pressure and magnetic fields

82
00:03:06,949 --> 00:03:04,319
and this is called heliophysics a

83
00:03:09,190 --> 00:03:06,959
relatively new science

84
00:03:11,350 --> 00:03:09,200
the research benefits from this have

85
00:03:13,589 --> 00:03:11,360
proven to be not only a value culturally

86
00:03:15,670 --> 00:03:13,599
and intellectually but they have some

87
00:03:17,430 --> 00:03:15,680
research benefit and value to our

88
00:03:18,550 --> 00:03:17,440

society in the sense that they are

89
00:03:21,910 --> 00:03:18,560
politically

90
00:03:23,270 --> 00:03:21,920
important and they have economic impact

91
00:03:25,509 --> 00:03:23,280
and these impacts are on our modern

92
00:03:27,990 --> 00:03:25,519
society both civil and military

93
00:03:30,229 --> 00:03:28,000
now as a consequence

94
00:03:32,390 --> 00:03:30,239
of our last decade of research in space

95
00:03:35,270 --> 00:03:32,400
we are today poised the beginning of a

96
00:03:37,750 --> 00:03:35,280
new magnetic activity cycle and let me

97
00:03:40,390 --> 00:03:37,760
have the last slide if i could please

98
00:03:43,350 --> 00:03:40,400
and we were able to study the sun and

99
00:03:46,470 --> 00:03:43,360
its activities inside and outside its

100
00:03:48,390 --> 00:03:46,480
ejections as they go forward out of the

101
00:03:49,670 --> 00:03:48,400
sun's atmosphere and then you can see

102
00:03:51,830 --> 00:03:49,680
the earth and shrouded in this

103
00:03:55,030 --> 00:03:51,840
protective blue magnetic field over on

104
00:03:58,830 --> 00:03:57,270
our spacecraft are used to study this

105
00:04:01,110 --> 00:03:58,840
system it's a

106
00:04:02,630 --> 00:04:01,120
systemic investigation

107
00:04:04,630 --> 00:04:02,640
and the sdo

108
00:04:06,149 --> 00:04:04,640
is the cornerstone

109
00:04:08,630 --> 00:04:06,159
foundation mission

110
00:04:11,110 --> 00:04:08,640
for the next decade of solar research

111
00:04:12,789 --> 00:04:11,120
now to tell you more about sdo and its

112
00:04:14,550 --> 00:04:12,799
program i'm going to turn this over to

113
00:04:17,030 --> 00:04:14,560

lika and she's going to talk about

114
00:04:19,270 --> 00:04:17,040
living with a star program and sdo thank

115
00:04:22,710 --> 00:04:19,280
you dick

116
00:04:23,990 --> 00:04:22,720
we live in the extended outer atmosphere

117
00:04:26,790 --> 00:04:24,000
of the sun

118
00:04:29,990 --> 00:04:26,800
and in that sense we truly live with

119
00:04:33,189 --> 00:04:30,000
this star even though to the naked eyes

120
00:04:35,510 --> 00:04:33,199
the sun appears to be a constant pale

121
00:04:38,150 --> 00:04:35,520
yellow ball the sun it's only a

122
00:04:40,950 --> 00:04:38,160
limitation of human eyes the sun is

123
00:04:43,189 --> 00:04:40,960
really not a constant in fact modern

124
00:04:46,390 --> 00:04:43,199
telescopes and spacecraft have really

125
00:04:49,110 --> 00:04:46,400
penetrated the blinding glare of the sun

126
00:04:52,390 --> 00:04:49,120
and have found sort of a male storm of

127
00:04:54,469 --> 00:04:52,400
unpredictable turmoil

128
00:04:57,909 --> 00:04:54,479
as dick mentioned and i want to repeat

129
00:05:01,189 --> 00:04:57,919
this the sun is a variable star it is a

130
00:05:04,230 --> 00:05:01,199
magnetic variable star and this magnetic

131
00:05:06,710 --> 00:05:04,240
variability drives every cubic inch of

132
00:05:09,430 --> 00:05:06,720
space in this solar system

133
00:05:12,150 --> 00:05:09,440
while sunlight enables and sustains life

134
00:05:15,189 --> 00:05:12,160
the sun's variability produces streams

135
00:05:18,710 --> 00:05:15,199
of high energy particles and radiation

136
00:05:20,070 --> 00:05:18,720
that can harm life and even alter its

137
00:05:22,950 --> 00:05:20,080
evolution

138
00:05:25,110 --> 00:05:22,960

if i can have the first movie please

139
00:05:28,230 --> 00:05:25,120
what you're going to see here

140
00:05:29,830 --> 00:05:28,240
is a cloud of plasma that's breaking

141
00:05:32,150 --> 00:05:29,840
away from the solar

142
00:05:34,950 --> 00:05:32,160
surface these are called coronal mass

143
00:05:37,670 --> 00:05:34,960
ejections it's really

144
00:05:40,310 --> 00:05:37,680
charged particles that will travel at

145
00:05:42,469 --> 00:05:40,320
tremendous speed sometimes millions of

146
00:05:46,070 --> 00:05:42,479
miles an hour and go through the

147
00:05:48,150 --> 00:05:46,080
interplanetary medium impinge on earth's

148
00:05:51,029 --> 00:05:48,160
magnetosphere the blue lines that you

149
00:05:53,990 --> 00:05:51,039
see are imaginary field lines which

150
00:05:56,629 --> 00:05:54,000
gives you the shape of the cocoon of

151
00:05:58,790 --> 00:05:56,639
earth which is the magnetosphere most of

152
00:06:01,029 --> 00:05:58,800
the time these particles do not

153
00:06:04,469 --> 00:06:01,039
penetrate earth's environment they are

154
00:06:06,790 --> 00:06:04,479
deflected by this shield the cocoon but

155
00:06:09,430 --> 00:06:06,800
every once in a while when the field of

156
00:06:11,990 --> 00:06:09,440
sun and earth are just aligned right

157
00:06:14,309 --> 00:06:12,000
these particles will actually propagate

158
00:06:16,629 --> 00:06:14,319
through the poles of the

159
00:06:19,350 --> 00:06:16,639
north and south poles of the earth and

160
00:06:21,430 --> 00:06:19,360
what you see are these particles going

161
00:06:23,990 --> 00:06:21,440
in and they will create beautiful

162
00:06:26,150 --> 00:06:24,000
aurorae both in the north and in the

163
00:06:28,629 --> 00:06:26,160

south that's the beautiful aspect of

164
00:06:31,110 --> 00:06:28,639
these particles but it can also produce

165
00:06:34,150 --> 00:06:31,120
harmful effect in our space environment

166
00:06:36,629 --> 00:06:34,160
and i'll talk about that just shortly so

167
00:06:40,230 --> 00:06:36,639
what you can see from this movie is that

168
00:06:43,189 --> 00:06:40,240
the origins and fate of life on earth

169
00:06:46,550 --> 00:06:43,199
are intimately connected to the way the

170
00:06:50,150 --> 00:06:46,560
earth responds to the sun's variations

171
00:06:52,550 --> 00:06:50,160
recognizing this importance in 2001

172
00:06:56,070 --> 00:06:52,560
nasa initiated a program called living

173
00:06:59,430 --> 00:06:56,080
with a star whose goal is to study the

174
00:07:01,350 --> 00:06:59,440
sun as a variable star and its impact on

175
00:07:03,510 --> 00:07:01,360
life and society

176
00:07:06,390 --> 00:07:03,520
if i can get the next impact slide

177
00:07:09,430 --> 00:07:06,400
please and and talk about why what is

178
00:07:11,749 --> 00:07:09,440
the rationale behind studying this sun

179
00:07:14,469 --> 00:07:11,759
after all it's an ordinary star

180
00:07:16,950 --> 00:07:14,479
if you look at the upper half of this

181
00:07:19,909 --> 00:07:16,960
slide what you will see is this

182
00:07:22,150 --> 00:07:19,919
variability that we talked about uh what

183
00:07:24,950 --> 00:07:22,160
it does to earth's magnetosphere

184
00:07:27,749 --> 00:07:24,960
ionosphere mesosphere wherever there is

185
00:07:30,390 --> 00:07:27,759
magnetic field uh the sun really

186
00:07:33,189 --> 00:07:30,400
dominates that environment

187
00:07:35,749 --> 00:07:33,199
we also this variability affects every

188
00:07:38,550 --> 00:07:35,759

planetary environment in the solar

189
00:07:41,670 --> 00:07:38,560
system and of course we are really

190
00:07:43,430 --> 00:07:41,680
looking at the basic plasma physical

191
00:07:45,990 --> 00:07:43,440
processes and these are universal

192
00:07:47,670 --> 00:07:46,000
processes of heliophysics that dick

193
00:07:49,909 --> 00:07:47,680
talked about and that's what we're

194
00:07:52,390 --> 00:07:49,919
trying to understand uh it's it's it's

195
00:07:55,589 --> 00:07:52,400
true for everything we do i think in the

196
00:07:59,270 --> 00:07:55,599
universe the lower half of this actually

197
00:08:01,510 --> 00:07:59,280
shows the impact of this variability on

198
00:08:03,749 --> 00:08:01,520
earth what happens there

199
00:08:05,670 --> 00:08:03,759
we have increased dependence on

200
00:08:09,830 --> 00:08:05,680
space-based systems i mean that's very

201
00:08:12,550 --> 00:08:09,840
clear our modern way of life is just

202
00:08:16,150 --> 00:08:12,560
intimately connected to technology

203
00:08:18,230 --> 00:08:16,160
that is driven by the solar variability

204
00:08:21,270 --> 00:08:18,240
solar variability as you can see can

205
00:08:24,390 --> 00:08:21,280
affect a human in space satellite

206
00:08:26,550 --> 00:08:24,400
operations smart power grids gps

207
00:08:29,350 --> 00:08:26,560
navigation emergency radio

208
00:08:32,230 --> 00:08:29,360
communications air travel financial

209
00:08:35,269 --> 00:08:32,240
services you name it and i'm sure we can

210
00:08:39,029 --> 00:08:35,279
find a chain that connects it to the sun

211
00:08:41,589 --> 00:08:39,039
and also terrestrial climate thus

212
00:08:44,550 --> 00:08:41,599
understanding solar variability is

213
00:08:46,710 --> 00:08:44,560

crucial to our modern way of life which

214
00:08:49,670 --> 00:08:46,720
depends on it so i want to say two

215
00:08:51,190 --> 00:08:49,680
things about the mission solar dynamics

216
00:08:54,710 --> 00:08:51,200
observatory

217
00:08:57,190 --> 00:08:54,720
sdo is the solar variability mission it

218
00:09:00,230 --> 00:08:57,200
is going to revolutionize our view of

219
00:09:03,670 --> 00:09:00,240
the sun and it will reveal how solar

220
00:09:06,389 --> 00:09:03,680
activity affects our planet and help us

221
00:09:09,430 --> 00:09:06,399
anticipate what lies ahead

222
00:09:12,230 --> 00:09:09,440
sdo is designed to design to probe solar

223
00:09:15,670 --> 00:09:12,240
variability unlike any other mission at

224
00:09:18,630 --> 00:09:15,680
nasa or even internationally

225
00:09:21,430 --> 00:09:18,640
it will of the absorb the sun faster

226
00:09:23,430 --> 00:09:21,440
deeper and in greater detail than any

227
00:09:26,470 --> 00:09:23,440
previous observations

228
00:09:29,829 --> 00:09:26,480
breaking barriers of time scale and

229
00:09:32,550 --> 00:09:29,839
clarity that have long blocked progress

230
00:09:34,790 --> 00:09:32,560
in solar physics and i'm going to pass

231
00:09:37,190 --> 00:09:34,800
it on to dwayne now thank you

232
00:09:39,269 --> 00:09:37,200
richard and and lika now we'll switch

233
00:09:41,509 --> 00:09:39,279
down to the kennedy space center uh

234
00:09:45,030 --> 00:09:41,519
where dean and liz

235
00:09:48,949 --> 00:09:46,870
right thanks dwayne

236
00:09:52,070 --> 00:09:48,959
i'm dean pesnell the project scientist

237
00:09:53,829 --> 00:09:52,080
of sdo together with our science team

238
00:09:56,150 --> 00:09:53,839

partners at the university of colorado

239
00:09:57,110 --> 00:09:56,160
stanford university and the lockheed

240
00:09:59,430 --> 00:09:57,120
martin

241
00:10:01,750 --> 00:09:59,440
solar and astrophysical laboratory we

242
00:10:04,870 --> 00:10:01,760
will run sdo analyze the data and

243
00:10:06,550 --> 00:10:04,880
produce the science of sdo so i'm here

244
00:10:08,630 --> 00:10:06,560
today to talk about some of the science

245
00:10:10,389 --> 00:10:08,640
we will do with the instruments

246
00:10:11,670 --> 00:10:10,399
first let's look at an image of the

247
00:10:12,949 --> 00:10:11,680
spacecraft

248
00:10:13,750 --> 00:10:12,959
here we see

249
00:10:16,710 --> 00:10:13,760
the

250
00:10:18,949 --> 00:10:16,720
helioseismic and magnetic imager hmi

251
00:10:21,750 --> 00:10:18,959
the atmospheric and imaging

252
00:10:23,750 --> 00:10:21,760
the atmospheric imaging assembly aia

253
00:10:25,269 --> 00:10:23,760
and the extreme ultraviolet variability

254
00:10:27,030 --> 00:10:25,279
experiment

255
00:10:28,710 --> 00:10:27,040
as our sun affects our life more and

256
00:10:32,630 --> 00:10:28,720
more

257
00:10:34,550 --> 00:10:32,640
technology most of these effects come

258
00:10:37,030 --> 00:10:34,560
from the ever-changing magnetic field of

259
00:10:40,150 --> 00:10:37,040
the sun sdo is designed to study that

260
00:10:42,230 --> 00:10:40,160
magnetic field from its creation to its

261
00:10:43,350 --> 00:10:42,240
destruction and how it then can affect

262
00:10:45,430 --> 00:10:43,360
the earth

263
00:10:48,389 --> 00:10:45,440

predicting this magnetic field is one of

264
00:10:50,550 --> 00:10:48,399
the goals of sdo and living with a star

265
00:10:52,630 --> 00:10:50,560
we use helioseismology

266
00:10:55,190 --> 00:10:52,640
to study the movement of material inside

267
00:10:57,509 --> 00:10:55,200
the sun that creates the magnetic field

268
00:11:00,230 --> 00:10:57,519
in the solar dynamo

269
00:11:02,069 --> 00:11:00,240
here we have a picture of small changes

270
00:11:03,990 --> 00:11:02,079
in the rotation of the sun that were

271
00:11:06,069 --> 00:11:04,000
produced by a study of the sound waves

272
00:11:07,750 --> 00:11:06,079
rippling across the sun

273
00:11:09,829 --> 00:11:07,760
one bright band moves towards the

274
00:11:11,750 --> 00:11:09,839
equator in both hemispheres

275
00:11:14,550 --> 00:11:11,760
in the past solar cycle we noticed that

276
00:11:17,190 --> 00:11:14,560
active regions or sunspots appeared only

277
00:11:19,590 --> 00:11:17,200
in and above that band

278
00:11:21,670 --> 00:11:19,600
we will use hmi to make measurements in

279
00:11:23,430 --> 00:11:21,680
the upcoming solar cycle to see if that

280
00:11:25,829 --> 00:11:23,440
allows us to predict

281
00:11:27,350 --> 00:11:25,839
the timing and magnitude of upcoming

282
00:11:29,990 --> 00:11:27,360
solar cycles

283
00:11:32,069 --> 00:11:30,000
we also use hmi to study the surface

284
00:11:33,990 --> 00:11:32,079
magnetic field of the sun

285
00:11:35,590 --> 00:11:34,000
here is an image of the historical

286
00:11:37,509 --> 00:11:35,600
information we have

287
00:11:39,990 --> 00:11:37,519
unlike this image which only shows the

288
00:11:42,630 --> 00:11:40,000

strength of the magnetic field hmi will

289
00:11:44,310 --> 00:11:42,640
also measure the direction of that field

290
00:11:45,990 --> 00:11:44,320
scientists feel that knowing the

291
00:11:48,470 --> 00:11:46,000
direction of the field will help us to

292
00:11:51,590 --> 00:11:48,480
make better predictions of when flares

293
00:11:53,750 --> 00:11:51,600
and coronal mass ejections will occur

294
00:11:56,230 --> 00:11:53,760
once the field is out of the surface we

295
00:11:57,990 --> 00:11:56,240
see the field illuminated by hot gas

296
00:11:59,430 --> 00:11:58,000
that is forced to flow along the field

297
00:12:02,550 --> 00:11:59,440
lines

298
00:12:05,110 --> 00:12:02,560
here we have two images from the soho

299
00:12:07,670 --> 00:12:05,120
spacecraft on the left we see an image

300
00:12:11,990 --> 00:12:07,680
that shows material at a temperature of

301
00:12:13,910 --> 00:12:12,000
1.5 million kelvin on the right we see

302
00:12:16,550 --> 00:12:13,920
three different temperatures combined

303
00:12:18,710 --> 00:12:16,560
using false colors to show the many

304
00:12:20,069 --> 00:12:18,720
temperatures that exist on the surface

305
00:12:21,990 --> 00:12:20,079
of the sun

306
00:12:23,829 --> 00:12:22,000
we hope to use aia

307
00:12:25,750 --> 00:12:23,839
to measure the temperature more

308
00:12:28,629 --> 00:12:25,760
accurately and that will allow us to

309
00:12:30,790 --> 00:12:28,639
determine how much material is glowing

310
00:12:33,990 --> 00:12:30,800
and therefore produce better predictions

311
00:12:37,110 --> 00:12:34,000
of flares and coronal mass ejections

312
00:12:39,750 --> 00:12:37,120
the field changes very rapidly in time

313
00:12:42,310 --> 00:12:39,760

and quite significantly in space from

314
00:12:43,590 --> 00:12:42,320
across the disk to the smallest size we

315
00:12:46,389 --> 00:12:43,600
can measure

316
00:12:48,790 --> 00:12:46,399
here is an animation where we start with

317
00:12:51,430 --> 00:12:48,800
a full disk image from soho

318
00:12:53,990 --> 00:12:51,440
zoom in on a patch of the sun and then

319
00:12:55,910 --> 00:12:54,000
compare the soho view with a higher

320
00:12:57,030 --> 00:12:55,920
resolution image from the trace

321
00:12:59,430 --> 00:12:57,040
satellite

322
00:13:02,389 --> 00:12:59,440
we see far more detail in both time and

323
00:13:05,670 --> 00:13:02,399
space with the high res version

324
00:13:08,470 --> 00:13:05,680
use based on this type of animation aia

325
00:13:11,030 --> 00:13:08,480
was designed to return high-res versions

326
00:13:13,750 --> 00:13:11,040
of the entire disc allowing us to zoom

327
00:13:15,350 --> 00:13:13,760
in on any part we want without having to

328
00:13:17,750 --> 00:13:15,360
sacrifice

329
00:13:19,269 --> 00:13:17,760
the ability to look at all parts of the

330
00:13:21,670 --> 00:13:19,279
sun

331
00:13:24,470 --> 00:13:21,680
the third instrument eve measures the

332
00:13:27,030 --> 00:13:24,480
extreme ultraviolet emissions of the sun

333
00:13:28,629 --> 00:13:27,040
which create the ionosphere and are

334
00:13:30,310 --> 00:13:28,639
involved in many space weather

335
00:13:31,990 --> 00:13:30,320
applications

336
00:13:33,750 --> 00:13:32,000
here is an example of what those

337
00:13:35,750 --> 00:13:33,760
emissions look like during the decline

338
00:13:38,310 --> 00:13:35,760

of solar cycle 23.

339
00:13:42,310 --> 00:13:38,320
the c instrument on timed measured these

340
00:13:43,750 --> 00:13:42,320
since 2002 but only every 90 minutes we

341
00:13:46,550 --> 00:13:43,760
now know that we should measure them

342
00:13:48,949 --> 00:13:46,560
much more quickly at a pace that matches

343
00:13:51,269 --> 00:13:48,959
more what we want to understand for

344
00:13:53,189 --> 00:13:51,279
these important emissions

345
00:13:56,110 --> 00:13:53,199
our data will be made available through

346
00:13:58,150 --> 00:13:56,120
our website at

347
00:13:59,189 --> 00:13:58,160
sdo.gsfc.nasa.gov which we encourage you

348
00:14:01,910 --> 00:13:59,199
to visit

349
00:14:05,189 --> 00:14:01,920
and now thank you liz citron will tell

350
00:14:06,870 --> 00:14:05,199
us about our preparations for lunch

351
00:14:09,030 --> 00:14:06,880
thank you dean

352
00:14:10,710 --> 00:14:09,040
after completing more than six months of

353
00:14:12,629 --> 00:14:10,720
environmental testing and performance

354
00:14:14,710 --> 00:14:12,639
verification at goddard

355
00:14:17,430 --> 00:14:14,720
sdo was packed up and shipped to the

356
00:14:20,150 --> 00:14:17,440
launch site processing facility by truck

357
00:14:22,150 --> 00:14:20,160
we arrived in the rain

358
00:14:24,150 --> 00:14:22,160
sdo is processing at astrotech a

359
00:14:26,790 --> 00:14:24,160
commercial processing facility about 10

360
00:14:29,590 --> 00:14:26,800
miles from kennedy space center

361
00:14:31,509 --> 00:14:29,600
after arrival and waiting out the storm

362
00:14:33,670 --> 00:14:31,519
sdos moved into a clean room at

363
00:14:35,189 --> 00:14:33,680

astrotech for final testing

364
00:14:37,350 --> 00:14:35,199
you see we need to make sure that the

365
00:14:39,829 --> 00:14:37,360
observatory survived the trip down to

366
00:14:41,910 --> 00:14:39,839
florida without any problems to do this

367
00:14:44,310 --> 00:14:41,920
we repeat what we call our comprehensive

368
00:14:46,710 --> 00:14:44,320
performance test it's a seven day test

369
00:14:49,590 --> 00:14:46,720
where all elements and components of sdo

370
00:14:52,870 --> 00:14:49,600
are verified to be operating correctly

371
00:14:55,350 --> 00:14:52,880
this next photo shows sdo in its

372
00:14:57,030 --> 00:14:55,360
test configuration or horizontal so that

373
00:14:58,550 --> 00:14:57,040
we can shine light into the instrument

374
00:15:01,269 --> 00:14:58,560
telescopes

375
00:15:03,670 --> 00:15:01,279
another step in our testing is is

376
00:15:05,829 --> 00:15:03,680
testing our deployment mechanisms here

377
00:15:08,710 --> 00:15:05,839
you see our high gain antennas being

378
00:15:10,470 --> 00:15:08,720
deployed we also deploy the solar arrays

379
00:15:11,990 --> 00:15:10,480
and we pop the doors on the instrument

380
00:15:13,750 --> 00:15:12,000
telescopes

381
00:15:16,230 --> 00:15:13,760
after we've confirmed that everything is

382
00:15:18,550 --> 00:15:16,240
okay with sdo we fuel

383
00:15:20,389 --> 00:15:18,560
this is a six-day hazardous operation

384
00:15:22,389 --> 00:15:20,399
performed by trained personnel in scape

385
00:15:23,990 --> 00:15:22,399
suits protective suits with their own

386
00:15:25,829 --> 00:15:24,000
air supplies

387
00:15:27,670 --> 00:15:25,839
and at this point we're ready to start

388
00:15:30,230 --> 00:15:27,680

our integrated flow with the rocket

389
00:15:32,389 --> 00:15:30,240
we're launching on an atlas v rocket

390
00:15:34,310 --> 00:15:32,399
this photo shows the atlas rocket

391
00:15:36,629 --> 00:15:34,320
already stacked at the vif the vertical

392
00:15:39,110 --> 00:15:36,639
integration facility the photo shows the

393
00:15:41,910 --> 00:15:39,120
centaur second stage being lifted onto

394
00:15:45,030 --> 00:15:44,069
and that's where we are right now in the

395
00:15:47,590 --> 00:15:45,040
flow

396
00:15:52,389 --> 00:15:47,600
the next step for sdo is encapsulation

397
00:15:56,949 --> 00:15:54,389
then protected by the fairing

398
00:15:58,870 --> 00:15:56,959
sdo will be transported to the vif and

399
00:16:00,629 --> 00:15:58,880
lifted on top of the atlas stack and

400
00:16:02,550 --> 00:16:00,639
made it to the rocket

401
00:16:04,949 --> 00:16:02,560
after a couple of weeks of testing and

402
00:16:06,150 --> 00:16:04,959
final close-out activities

403
00:16:08,710 --> 00:16:06,160
we launch

404
00:16:11,430 --> 00:16:08,720
sdo's launch date is february 9th at 10

405
00:16:13,030 --> 00:16:11,440
26 in the morning if we can't launch on

406
00:16:15,030 --> 00:16:13,040
that day for weather or some other

407
00:16:17,030 --> 00:16:15,040
reason we'll try the next day

408
00:16:18,389 --> 00:16:17,040
seo can launch pretty much any day of

409
00:16:20,949 --> 00:16:18,399
the year

410
00:16:23,749 --> 00:16:20,959
let's watch this animation of launch in

411
00:16:25,829 --> 00:16:23,759
early orbit

412
00:16:29,269 --> 00:16:25,839
here's sdo in the fairing on the rocket

413
00:16:31,749 --> 00:16:29,279

the rocket's on the pad ignition liftoff

414
00:16:34,790 --> 00:16:31,759
the atlas first stage takes us through

415
00:16:36,710 --> 00:16:34,800
the boost phase and then falls away

416
00:16:38,629 --> 00:16:36,720
the second stage centaur barn starts

417
00:16:40,470 --> 00:16:38,639
right before fairing jettison about four

418
00:16:42,150 --> 00:16:40,480
minutes into flight

419
00:16:44,230 --> 00:16:42,160
we stay on the rocket for almost two

420
00:16:46,470 --> 00:16:44,240
hours then the centaur points us in the

421
00:16:48,389 --> 00:16:46,480
right direction burns again and we

422
00:16:51,269 --> 00:16:48,399
separate from the rocket this is a

423
00:16:53,829 --> 00:16:51,279
critical time for sdo we must deploy our

424
00:16:56,470 --> 00:16:53,839
solar rays and point to the sun quickly

425
00:16:58,230 --> 00:16:56,480
to get power to our spacecraft then we

426
00:17:00,230 --> 00:16:58,240
breathe a sigh of relief

427
00:17:02,150 --> 00:17:00,240
we have a two-month commissioning period

428
00:17:04,069 --> 00:17:02,160
where we methodically test all of the

429
00:17:07,189 --> 00:17:04,079
spacecraft components and our

430
00:17:09,189 --> 00:17:07,199
instruments also at this time sdo is

431
00:17:11,029 --> 00:17:09,199
using its propulsion system to move into

432
00:17:12,470 --> 00:17:11,039
our geosync orbit

433
00:17:14,549 --> 00:17:12,480
finally

434
00:17:16,630 --> 00:17:14,559
sdo is fully checked out

435
00:17:19,510 --> 00:17:16,640
we're on station we're pointed at the

436
00:17:21,990 --> 00:17:19,520
sun and we're sending back amazing data

437
00:17:23,909 --> 00:17:22,000
and images of the sun at the rate of one

438
00:17:25,350 --> 00:17:23,919

and a half terabytes per day

439
00:17:26,870 --> 00:17:25,360
unbelievable

440
00:17:29,110 --> 00:17:26,880
and we're going to do this for five

441
00:17:32,070 --> 00:17:29,120
years or more we can't wait for this

442
00:17:33,669 --> 00:17:32,080
data to start flowing

443
00:17:37,190 --> 00:17:33,679
thank you

444
00:17:38,710 --> 00:17:37,200
gonna

445
00:17:41,990 --> 00:17:38,720
open up for questions but i would like

446
00:17:44,630 --> 00:17:42,000
to make one one statement uh

447
00:17:46,950 --> 00:17:44,640
we talk about diversity here at nasa and

448
00:17:48,789 --> 00:17:46,960
we certainly take that very seriously

449
00:17:50,950 --> 00:17:48,799
and i've had the pleasure to work with

450
00:17:52,310 --> 00:17:50,960
some incredible science teams and

451
00:17:54,150 --> 00:17:52,320
project teams

452
00:17:57,830 --> 00:17:54,160
at the science mission directorate and

453
00:17:59,669 --> 00:17:57,840
the sdo team is extremely diverse and

454
00:18:00,870 --> 00:17:59,679
probably one of the more diverse

455
00:18:03,190 --> 00:18:00,880
teams

456
00:18:06,070 --> 00:18:03,200
for nasa project of course you've met

457
00:18:08,470 --> 00:18:06,080
lika and liz i also want to acknowledge

458
00:18:11,110 --> 00:18:08,480
in the audience the program executive

459
00:18:13,190 --> 00:18:11,120
sdo dana brewer

460
00:18:15,430 --> 00:18:13,200
sitting here at nasa headquarters and

461
00:18:17,270 --> 00:18:15,440
certainly as we move forward to launch

462
00:18:18,710 --> 00:18:17,280
you will get to hear more from this

463
00:18:19,590 --> 00:18:18,720

incredible team

464
00:18:22,390 --> 00:18:19,600
and

465
00:18:23,909 --> 00:18:22,400
i am looking forward to the diversity

466
00:18:25,830 --> 00:18:23,919
and also the incredible science with

467
00:18:27,190 --> 00:18:25,840
this mission so with that

468
00:18:28,710 --> 00:18:27,200
we're going to open up for questions on

469
00:18:30,549 --> 00:18:28,720
our phone lines

470
00:18:31,669 --> 00:18:30,559
and we will

471
00:18:37,590 --> 00:18:31,679
see

472
00:18:40,510 --> 00:18:38,950
i have

473
00:18:42,870 --> 00:18:40,520
on my screen here from the one of the

474
00:18:44,870 --> 00:18:42,880
space.coms and i believe this is for

475
00:18:47,270 --> 00:18:44,880
dick

476
00:18:49,990 --> 00:18:47,280
for you after sdo

477
00:18:51,750 --> 00:18:50,000
what's up next in the heliophysics

478
00:18:54,630 --> 00:18:51,760
portfolio

479
00:18:56,630 --> 00:18:54,640
well that's a a good question for me uh

480
00:18:59,990 --> 00:18:56,640
thank you for asking me

481
00:19:02,870 --> 00:19:00,000
after sdo we have a second mission

482
00:19:05,830 --> 00:19:02,880
for the lws program called radiation

483
00:19:06,950 --> 00:19:05,840
belt storm probes rbsp

484
00:19:09,430 --> 00:19:06,960
and that's a

485
00:19:11,270 --> 00:19:09,440
back to the van allen belts

486
00:19:13,110 --> 00:19:11,280
mission we're going to try and resolve

487
00:19:14,630 --> 00:19:13,120
some of the ambiguities

488
00:19:16,310 --> 00:19:14,640

of space and time with the two

489
00:19:17,270 --> 00:19:16,320
spacecraft mission

490
00:19:19,590 --> 00:19:17,280
that will be going through the

491
00:19:22,230 --> 00:19:19,600
magnetosphere at the same time sdo is

492
00:19:24,710 --> 00:19:22,240
observing so our hope is to see cause

493
00:19:26,390 --> 00:19:24,720
and effect now beyond that that's to be

494
00:19:28,549 --> 00:19:26,400
launched in 2012.

495
00:19:31,110 --> 00:19:28,559
beyond that in 2014 we're going to have

496
00:19:32,710 --> 00:19:31,120
a physics investigation

497
00:19:40,390 --> 00:19:32,720
of the

498
00:19:43,029 --> 00:19:40,400
and there's a process there that we

499
00:19:44,950 --> 00:19:43,039
think may be a universal process

500
00:19:47,029 --> 00:19:44,960
throughout the universe that we may be

501
00:19:49,270 --> 00:19:47,039
able to test there because that's the

502
00:19:50,630 --> 00:19:49,280
laboratory we have and this is called

503
00:19:53,590 --> 00:19:50,640
reconnection

504
00:19:55,909 --> 00:19:53,600
touch

505
00:19:57,909 --> 00:19:55,919
and you turn magnetic energy into heat

506
00:19:59,990 --> 00:19:57,919
and light all of a sudden

507
00:20:02,710 --> 00:20:00,000
and so this is what we're interested in

508
00:20:05,270 --> 00:20:02,720
up for uh after uh this mission and uh

509
00:20:07,270 --> 00:20:05,280
heliophysics as as duane says science

510
00:20:08,710 --> 00:20:07,280
never sleeps

511
00:20:13,510 --> 00:20:08,720
this is a

512
00:20:15,830 --> 00:20:13,520
study which has not only knowledge at

513
00:20:18,070 --> 00:20:15,840

the output but also utility

514
00:20:20,789 --> 00:20:18,080
and uh i'd like to remind the audience

515
00:20:24,549 --> 00:20:20,799
that heliophysics is the science of

516
00:20:29,990 --> 00:20:27,990
and i just want to take us beyond 2014

517
00:20:32,390 --> 00:20:30,000
that we have some other missions

518
00:20:34,390 --> 00:20:32,400
actually in planning stages right now

519
00:20:37,590 --> 00:20:34,400
they are not quite in development stage

520
00:20:41,029 --> 00:20:37,600
like radiation bill storm probe or

521
00:20:43,110 --> 00:20:41,039
mms we have a nasa or nasa mission

522
00:20:45,590 --> 00:20:43,120
called solar probe plus

523
00:20:47,350 --> 00:20:45,600
and this is a mission that's actually

524
00:20:50,470 --> 00:20:47,360
going to visit

525
00:20:52,950 --> 00:20:50,480
the sun it will be in the corona the

526
00:20:55,669 --> 00:20:52,960
eclipse pictures that we see it will be

527
00:20:59,029 --> 00:20:55,679
in that vicinity to actually really

528
00:21:01,750 --> 00:20:59,039
sample the material there instead of

529
00:21:02,470 --> 00:21:01,760
doing remote sensing observation we also

530
00:21:04,549 --> 00:21:02,480
have

531
00:21:06,870 --> 00:21:04,559
a notional mission right now which is in

532
00:21:09,750 --> 00:21:06,880
partnership uh with european space

533
00:21:13,830 --> 00:21:09,760
agency called solar arbiter which will

534
00:21:15,110 --> 00:21:13,840
be out of the ecliptic and about 0.25 um

535
00:21:18,070 --> 00:21:15,120
au

536
00:21:19,909 --> 00:21:18,080
really giving us a different perspective

537
00:21:21,750 --> 00:21:19,919
of the sun

538
00:21:23,350 --> 00:21:21,760

okay i have a couple more space top

539
00:21:25,270 --> 00:21:23,360
column questions on my screen but we're

540
00:21:26,710 --> 00:21:25,280
going to go to the phone lines now and

541
00:21:28,390 --> 00:21:26,720
first up will be

542
00:21:32,789 --> 00:21:28,400
rachel cortland from new scientists

543
00:21:36,549 --> 00:21:35,110
yeah hi uh i'm sorry if you're going to

544
00:21:38,149 --> 00:21:36,559
be repeating yourself but the phone line

545
00:21:39,510 --> 00:21:38,159
cut out for a while i was wondering if

546
00:21:41,190 --> 00:21:39,520
you could

547
00:21:42,630 --> 00:21:41,200
see what the overall cost of the mission

548
00:21:45,990 --> 00:21:42,640
is and also

549
00:21:47,830 --> 00:21:46,000
if you could explain in more detail what

550
00:21:49,750 --> 00:21:47,840
seo will be looking at and its

551
00:21:51,190 --> 00:21:49,760
capabilities compared to previous

552
00:21:53,190 --> 00:21:51,200
orbiters

553
00:21:54,470 --> 00:21:53,200
how it's going to improve things

554
00:21:56,390 --> 00:21:54,480
okay dick you want to start that and

555
00:21:58,950 --> 00:21:56,400
then maybe dean and others can chime in

556
00:22:01,110 --> 00:21:58,960
with the science well i can take a a

557
00:22:03,350 --> 00:22:01,120
cut at your costs

558
00:22:07,430 --> 00:22:03,360
the sdo mission

559
00:22:10,470 --> 00:22:07,440
had a final confirmed price of i think

560
00:22:13,190 --> 00:22:10,480
about 808 million dollars

561
00:22:15,270 --> 00:22:13,200
we've had a slight delay and uh was a

562
00:22:17,270 --> 00:22:15,280
considerable delay and that's we've put

563
00:22:20,230 --> 00:22:17,280

money into maintaining that so i think

564
00:22:22,070 --> 00:22:20,240
that the cost to complete plus the

565
00:22:23,310 --> 00:22:22,080
science investigation is going to be

566
00:22:27,750 --> 00:22:23,320
around uh

567
00:22:29,909 --> 00:22:27,760
848 million dollars now dean

568
00:22:32,789 --> 00:22:29,919
dean really needs to comment about the

569
00:22:38,870 --> 00:22:32,799
comparison because the comparison of sdo

570
00:22:43,430 --> 00:22:41,190
um yes uh thanks rachel for your

571
00:22:45,190 --> 00:22:43,440
question uh let me talk about the

572
00:22:47,029 --> 00:22:45,200
ultraviolet the extreme ultraviolet

573
00:22:48,390 --> 00:22:47,039
images that's probably the the place

574
00:22:49,830 --> 00:22:48,400
where we make

575
00:22:52,149 --> 00:22:49,840
an uh

576
00:22:54,470 --> 00:22:52,159
largest impact on a difference

577
00:22:57,510 --> 00:22:54,480
when we look at the soho instrument

578
00:23:00,789 --> 00:22:57,520
we measured things on a certain size

579
00:23:02,390 --> 00:23:00,799
detector 1000 by 1000 pixels

580
00:23:04,630 --> 00:23:02,400
we're going to be measuring them on a

581
00:23:06,470 --> 00:23:04,640
4000 by 4000

582
00:23:07,909 --> 00:23:06,480
pixel detector so that's the first

583
00:23:09,110 --> 00:23:07,919
difference is we're going to be able to

584
00:23:10,630 --> 00:23:09,120
see

585
00:23:12,789 --> 00:23:10,640
smaller features

586
00:23:14,630 --> 00:23:12,799
within the full disk images

587
00:23:16,870 --> 00:23:14,640
but the most significant change is

588
00:23:19,590 --> 00:23:16,880

simply going to be we're sending down

589
00:23:21,350 --> 00:23:19,600
so many more images of the sun

590
00:23:24,230 --> 00:23:21,360
we're going to send down an image from

591
00:23:27,029 --> 00:23:24,240
aia every one and a quarter seconds

592
00:23:30,390 --> 00:23:27,039
if we look at the the comparison with

593
00:23:32,470 --> 00:23:30,400
soho the best was about every 12 minutes

594
00:23:35,110 --> 00:23:32,480
and if we look at the stereo spacecraft

595
00:23:37,190 --> 00:23:35,120
which is orbiting the sun now it would

596
00:23:39,430 --> 00:23:37,200
be about every three minutes so we're

597
00:23:41,510 --> 00:23:39,440
looking at things in a much higher time

598
00:23:43,350 --> 00:23:41,520
cadence and what we've noticed with

599
00:23:46,149 --> 00:23:43,360
other spacecraft that ran at these

600
00:23:48,390 --> 00:23:46,159
higher cadences is that the sun changes

601
00:23:50,950 --> 00:23:48,400
every time we look at it the sun's never

602
00:23:53,350 --> 00:23:50,960
the same so when we take these pictures

603
00:23:54,870 --> 00:23:53,360
every one and a quarter seconds apart

604
00:23:57,029 --> 00:23:54,880
and we compare them with the same

605
00:23:59,430 --> 00:23:57,039
wavelength every 10 seconds we're going

606
00:24:00,549 --> 00:23:59,440
to see that the sun changed in in the

607
00:24:02,149 --> 00:24:00,559
pictures

608
00:24:05,110 --> 00:24:02,159
we'll also be able to start with the

609
00:24:07,750 --> 00:24:05,120
full size of the sun and then go down to

610
00:24:09,590 --> 00:24:07,760
the smaller scales without having to get

611
00:24:12,310 --> 00:24:09,600
rid of the information from the full

612
00:24:14,310 --> 00:24:12,320
disk so when we look at such as

613
00:24:16,470 --> 00:24:14,320

satellites such as the trace satellite

614
00:24:18,149 --> 00:24:16,480
the trace was able to look at very high

615
00:24:20,710 --> 00:24:18,159
resolution pictures matter of fact we

616
00:24:22,950 --> 00:24:20,720
used that in the animation i showed

617
00:24:24,470 --> 00:24:22,960
but it only could look at one small part

618
00:24:26,070 --> 00:24:24,480
of the sun

619
00:24:28,470 --> 00:24:26,080
with aia we'll be able to look at the

620
00:24:29,830 --> 00:24:28,480
whole sun and zoom in on the interesting

621
00:24:32,230 --> 00:24:29,840
bits

622
00:24:35,029 --> 00:24:32,240
now we also have an instrument called

623
00:24:37,590 --> 00:24:35,039
hmi which is a helioseismic magnetic

624
00:24:40,070 --> 00:24:37,600
imager and that builds on the soho

625
00:24:42,470 --> 00:24:40,080
spacecraft mdi instrument

626
00:24:44,830 --> 00:24:42,480
and it also builds on stuff that we've

627
00:24:49,110 --> 00:24:44,840
derived from the gong network on the

628
00:24:52,630 --> 00:24:49,120
ground what we learned from mdi was we

629
00:24:55,350 --> 00:24:52,640
can't do the on-board processing of the

630
00:24:57,350 --> 00:24:55,360
data to do a data compression to make it

631
00:24:59,350 --> 00:24:57,360
easier to send it to the ground we

632
00:25:02,149 --> 00:24:59,360
really need to get all of the filter

633
00:25:04,710 --> 00:25:02,159
grams the the the actual pictures of the

634
00:25:07,029 --> 00:25:04,720
sun so that we can send them down and

635
00:25:09,350 --> 00:25:07,039
study the sound waves from scratch and

636
00:25:11,669 --> 00:25:09,360
that is why we're in the special orbit

637
00:25:14,149 --> 00:25:11,679
we're in so that we can maintain the

638
00:25:16,630 --> 00:25:14,159

constant contact with the spacecraft

639
00:25:19,350 --> 00:25:16,640
then the third instrument builds on the

640
00:25:21,990 --> 00:25:19,360
eve instrument builds on the fact that

641
00:25:24,149 --> 00:25:22,000
the the sea instrument on time

642
00:25:27,110 --> 00:25:24,159
was designed more or less to make daily

643
00:25:28,390 --> 00:25:27,120
measurements of the extreme ultraviolet

644
00:25:29,909 --> 00:25:28,400
irradiance of the sun

645
00:25:31,990 --> 00:25:29,919
and we learned very quickly that that

646
00:25:34,230 --> 00:25:32,000
was just not adequate we really needed a

647
00:25:35,990 --> 00:25:34,240
much higher time cadence for those

648
00:25:37,750 --> 00:25:36,000
measurements as well so eve is going to

649
00:25:39,269 --> 00:25:37,760
make a measurement about every 10

650
00:25:40,230 --> 00:25:39,279
seconds

651
00:25:47,909 --> 00:25:40,240
does that

652
00:25:50,789 --> 00:25:49,190
i believe it does

653
00:25:53,029 --> 00:25:50,799
thanks dean we'll we'll take the other

654
00:25:59,909 --> 00:25:53,039
question uh next question is from clara

655
00:26:03,430 --> 00:26:01,190
yes hi

656
00:26:05,909 --> 00:26:03,440
you all mentioned that sdo will help

657
00:26:07,510 --> 00:26:05,919
predict solar flares and i'm wondering

658
00:26:09,669 --> 00:26:07,520
just what are some of the specific

659
00:26:12,549 --> 00:26:09,679
unanswered questions scientists have

660
00:26:14,230 --> 00:26:12,559
about what causes solar flares and which

661
00:26:18,390 --> 00:26:14,240
part of the data from sdo will help

662
00:26:22,470 --> 00:26:20,630
well you've got a situation here where

663
00:26:24,149 --> 00:26:22,480

you've got three scientists

664
00:26:26,230 --> 00:26:24,159
and so you're going to get a batch of

665
00:26:28,630 --> 00:26:26,240
answers but i think that the

666
00:26:30,950 --> 00:26:28,640
circumstance that i would remark about

667
00:26:32,470 --> 00:26:30,960
is that we have temporal and spatial

668
00:26:34,470 --> 00:26:32,480
resolution

669
00:26:35,590 --> 00:26:34,480
that i i have never seen before

670
00:26:37,350 --> 00:26:35,600
available

671
00:26:39,110 --> 00:26:37,360
and i think as far as unresolved

672
00:26:41,110 --> 00:26:39,120
questions go we're going to add some

673
00:26:43,350 --> 00:26:41,120
physics to that by having a vector

674
00:26:45,510 --> 00:26:43,360
magnetic field along with it

675
00:26:46,789 --> 00:26:45,520
so i'm going to i'm going to toss this

676
00:26:48,630 --> 00:26:46,799
toward lika

677
00:26:51,110 --> 00:26:48,640
i think it'll take all the instruments

678
00:26:52,950 --> 00:26:51,120
to do a better job on flare prediction

679
00:26:54,149 --> 00:26:52,960
and flare fx and i that's why they've

680
00:26:57,029 --> 00:26:54,159
been chosen

681
00:26:59,269 --> 00:26:57,039
so they work in concert

682
00:27:01,909 --> 00:26:59,279
then toss it down to dean to get the

683
00:27:05,110 --> 00:27:01,919
third scientist view okay and it's not

684
00:27:08,630 --> 00:27:05,120
just sdo instruments i would add as

685
00:27:10,310 --> 00:27:08,640
dick had noted earlier i think we need

686
00:27:13,029 --> 00:27:10,320
all our observatories to make

687
00:27:15,269 --> 00:27:13,039
fundamental progress on the system

688
00:27:17,750 --> 00:27:15,279

science of heliophysics i think the

689
00:27:20,070 --> 00:27:17,760
vector magnetic field is going to

690
00:27:21,750 --> 00:27:20,080
provide provide tremendous insight

691
00:27:23,669 --> 00:27:21,760
because we really need to understand the

692
00:27:25,510 --> 00:27:23,679
geometry when we are modeling that

693
00:27:28,070 --> 00:27:25,520
geometry is critical

694
00:27:31,430 --> 00:27:28,080
i think uh with hmi we are actually

695
00:27:33,909 --> 00:27:31,440
going to be penetrating deeper into the

696
00:27:37,029 --> 00:27:33,919
magneto convection zone which is kind of

697
00:27:37,990 --> 00:27:37,039
the seat of dynamo the heartbeat of sun

698
00:27:39,750 --> 00:27:38,000
and and

699
00:27:42,070 --> 00:27:39,760
you know understanding the dynamo being

700
00:27:45,350 --> 00:27:42,080
able to predict uh that is sort of the

701
00:27:47,430 --> 00:27:45,360
holy grail of solar physics and i think

702
00:27:49,269 --> 00:27:47,440
sdu is going to make a tremendous

703
00:27:52,710 --> 00:27:49,279
progress on that i mean that's why we

704
00:27:55,909 --> 00:27:52,720
have this huge amount of data

705
00:27:59,110 --> 00:27:55,919
being beamed back to us almost 24 7

706
00:28:00,710 --> 00:27:59,120
and we want all of it all the time

707
00:28:03,269 --> 00:28:00,720
these are just some of the ideas i'm

708
00:28:05,350 --> 00:28:03,279
going to pass it on to dean who's been

709
00:28:10,950 --> 00:28:05,360
managing all these science issues for

710
00:28:16,070 --> 00:28:13,350
okay thank you lika

711
00:28:17,830 --> 00:28:16,080
we have all three instruments on sdo

712
00:28:20,070 --> 00:28:17,840
we'll be involved in trying to

713
00:28:22,710 --> 00:28:20,080

understand how to predict flares and

714
00:28:24,389 --> 00:28:22,720
also coronal mass ejections

715
00:28:26,710 --> 00:28:24,399
it's been an outstanding question for

716
00:28:28,470 --> 00:28:26,720
quite some time in solar physics and

717
00:28:31,669 --> 00:28:28,480
we've made some progress we have people

718
00:28:33,990 --> 00:28:31,679
that can predict flares some of the time

719
00:28:36,310 --> 00:28:34,000
but we we need to do a better job

720
00:28:39,190 --> 00:28:36,320
we're going to use the magnetic field

721
00:28:40,470 --> 00:28:39,200
from hmi is one component of that and

722
00:28:42,389 --> 00:28:40,480
especially because we'll have the

723
00:28:44,310 --> 00:28:42,399
direction so we'll be able to see that

724
00:28:45,990 --> 00:28:44,320
the magnetic field not just its strength

725
00:28:48,549 --> 00:28:46,000
but we'll be able to see how much it's

726
00:28:50,789 --> 00:28:48,559
gotten twisted up is that part of of

727
00:28:52,549 --> 00:28:50,799
predicting flares we'll be able to

728
00:28:55,110 --> 00:28:52,559
measure the temperature of the gas and

729
00:28:56,870 --> 00:28:55,120
the aia images and from that know

730
00:28:58,950 --> 00:28:56,880
whether or not there's a lot of material

731
00:29:01,269 --> 00:28:58,960
is it the amount of material that's

732
00:29:03,590 --> 00:29:01,279
showing up that is one of the

733
00:29:06,389 --> 00:29:03,600
significant parameters we need to look

734
00:29:08,149 --> 00:29:06,399
at and we'll also have eve evil tell us

735
00:29:10,789 --> 00:29:08,159
how much energy came out of each of the

736
00:29:12,389 --> 00:29:10,799
flares and we already know from the the

737
00:29:15,350 --> 00:29:12,399
c instrument on time

738
00:29:16,710 --> 00:29:15,360

that not all flares are the x-ray flares

739
00:29:18,310 --> 00:29:16,720
that everybody's familiar with there's

740
00:29:20,310 --> 00:29:18,320
other types of flares that are a little

741
00:29:23,510 --> 00:29:20,320
less energetic are those the ones that

742
00:29:25,430 --> 00:29:23,520
we really need to study is that the the

743
00:29:27,909 --> 00:29:25,440
the real background that we need to

744
00:29:30,549 --> 00:29:27,919
understand so all three instruments

745
00:29:33,830 --> 00:29:30,559
working in concert will allow us to

746
00:29:36,070 --> 00:29:33,840
understand the onset and energy release

747
00:29:38,470 --> 00:29:36,080
inside of flares

748
00:29:40,710 --> 00:29:38,480
thank you dean now we will go to the

749
00:29:47,269 --> 00:29:40,720
next caller which is james dean from

750
00:29:50,710 --> 00:29:49,269
hi thank you very much

751
00:29:52,230 --> 00:29:50,720
for i think for our headquarters

752
00:29:54,470 --> 00:29:52,240
panelist i was wondering if you could

753
00:29:57,110 --> 00:29:54,480
just talk a little bit more about the

754
00:29:58,070 --> 00:29:57,120
vulnerability of spacecraft and some of

755
00:29:59,510 --> 00:29:58,080
the other

756
00:30:01,350 --> 00:29:59,520
modern systems you mentioned like the

757
00:30:02,549 --> 00:30:01,360
power grid to these these high energy

758
00:30:04,789 --> 00:30:02,559
particles

759
00:30:06,789 --> 00:30:04,799
um could you cite any incidents where

760
00:30:08,389 --> 00:30:06,799
this type of damage has occurred and how

761
00:30:10,870 --> 00:30:08,399
common it is and

762
00:30:12,710 --> 00:30:10,880
also is it something that generally can

763
00:30:14,549 --> 00:30:12,720

be protected against in in some

764
00:30:16,230 --> 00:30:14,559
effective way or how

765
00:30:19,350 --> 00:30:16,240
how would sdo's investigation help

766
00:30:22,070 --> 00:30:19,360
reduce that vulnerability

767
00:30:24,070 --> 00:30:22,080
well i can i can start on that uh but i

768
00:30:26,789 --> 00:30:24,080
think that uh it may take some help from

769
00:30:27,510 --> 00:30:26,799
uh from dean or from lika

770
00:30:28,870 --> 00:30:27,520
um

771
00:30:31,590 --> 00:30:28,880
in the past

772
00:30:32,870 --> 00:30:31,600
the uh issue has been uh charging of

773
00:30:35,350 --> 00:30:32,880
spacecraft

774
00:30:36,870 --> 00:30:35,360
uh from the standpoint of

775
00:30:39,350 --> 00:30:36,880
collect a lot of electrons on the

776
00:30:41,350 --> 00:30:39,360
outside and you get a charged spacecraft

777
00:30:43,669 --> 00:30:41,360
it discharges through it

778
00:30:45,590 --> 00:30:43,679
and so you can partially mitigate that

779
00:30:47,830 --> 00:30:45,600
by construction you can also partially

780
00:30:49,830 --> 00:30:47,840
mitigate that by shutting it down so if

781
00:30:51,430 --> 00:30:49,840
you have knowledge this is a case where

782
00:30:53,350 --> 00:30:51,440
you can take action on the basis of

783
00:30:55,350 --> 00:30:53,360
knowledge this is actually fundamental

784
00:30:57,590 --> 00:30:55,360
space weather

785
00:30:58,630 --> 00:30:57,600
the other place that that there are

786
00:31:01,509 --> 00:30:58,640
impacts

787
00:31:03,110 --> 00:31:01,519
are in communications and navigation

788
00:31:05,190 --> 00:31:03,120

half of the communications the earth are

789
00:31:07,590 --> 00:31:05,200
still in high frequency

790
00:31:09,909 --> 00:31:07,600
radio transmissions and these are

791
00:31:12,230 --> 00:31:09,919
modulated by the

792
00:31:14,789 --> 00:31:12,240
ionosphere flapping up and down

793
00:31:16,149 --> 00:31:14,799
and it changes the path length

794
00:31:18,710 --> 00:31:16,159
and this has been known since the

795
00:31:19,509 --> 00:31:18,720
beginning of radio and

796
00:31:21,509 --> 00:31:19,519
the

797
00:31:23,269 --> 00:31:21,519
communicating from some place to some

798
00:31:24,789 --> 00:31:23,279
place down on the equator

799
00:31:26,710 --> 00:31:24,799
has this problem

800
00:31:28,389 --> 00:31:26,720
and if you can forecast that you can

801
00:31:30,630 --> 00:31:28,399
choose some other other thing you can do

802
00:31:31,990 --> 00:31:30,640
it now power grids

803
00:31:33,669 --> 00:31:32,000
are something have grown up

804
00:31:35,669 --> 00:31:33,679
intercontinental

805
00:31:38,389 --> 00:31:35,679
uh energy transmission lines or things

806
00:31:40,070 --> 00:31:38,399
that have grown up over the past uh 50

807
00:31:41,669 --> 00:31:40,080
to 100 years

808
00:31:43,269 --> 00:31:41,679
and they're conductors that are on top

809
00:31:46,149 --> 00:31:43,279
of a magnetic field

810
00:31:47,830 --> 00:31:46,159
so when we have a big blast of particles

811
00:31:48,789 --> 00:31:47,840
a conductor moving through a magnetic

812
00:31:50,789 --> 00:31:48,799
field

813
00:31:53,190 --> 00:31:50,799

generates a current and there are

814
00:31:56,310 --> 00:31:53,200
currents that are generated which are so

815
00:31:58,870 --> 00:31:56,320
large that they will damage transformers

816
00:32:01,350 --> 00:31:58,880
now we have so many power systems linked

817
00:32:03,430 --> 00:32:01,360
together at the present time that they

818
00:32:05,350 --> 00:32:03,440
run uh

819
00:32:06,950 --> 00:32:05,360
dependently upon each other and if one

820
00:32:08,549 --> 00:32:06,960
goes down the other one tries to pick up

821
00:32:11,029 --> 00:32:08,559
the load no one picks the

822
00:32:11,830 --> 00:32:11,039
bomb and somewhere you have a little

823
00:32:12,870 --> 00:32:11,840
little

824
00:32:15,509 --> 00:32:12,880
glitch

825
00:32:17,350 --> 00:32:15,519
that shorts out a transformer

826
00:32:19,990 --> 00:32:17,360
and it takes down a great big part of

827
00:32:21,509 --> 00:32:20,000
the power system and there's this has

828
00:32:24,549 --> 00:32:21,519
been studied by the national academy of

829
00:32:26,710 --> 00:32:24,559
sciences and it's thought to be that it

830
00:32:28,630 --> 00:32:26,720
is a certain likelihood that a couple

831
00:32:30,470 --> 00:32:28,640
times during solar cycle will have

832
00:32:31,990 --> 00:32:30,480
something called a gick

833
00:32:34,710 --> 00:32:32,000
and this is kind of a funny word but

834
00:32:36,710 --> 00:32:34,720
it's a ground under induced current

835
00:32:40,070 --> 00:32:36,720
and uh they're solar induced on the

836
00:32:42,789 --> 00:32:40,080
earth and uh these if you have knowledge

837
00:32:44,950 --> 00:32:42,799
that such a thing as likely you can

838
00:32:46,310 --> 00:32:44,960

adjust the power system to avoid

839
00:32:47,830 --> 00:32:46,320
difficulties

840
00:32:49,990 --> 00:32:47,840
i'm sure i've thought about i left out

841
00:32:51,350 --> 00:32:50,000
other things um

842
00:32:54,310 --> 00:32:51,360
why don't you turn that you can toss it

843
00:32:56,070 --> 00:32:54,320
today actually you covered a lot i think

844
00:32:56,710 --> 00:32:56,080
i was just thinking you know what have

845
00:32:59,750 --> 00:32:56,720
you

846
00:33:01,909 --> 00:32:59,760
aircraft so uh high altitude aircraft

847
00:33:03,830 --> 00:33:01,919
you know polar routes these particles

848
00:33:05,830 --> 00:33:03,840
that you see when these particles

849
00:33:07,750 --> 00:33:05,840
actually enter earth's magnetosphere i

850
00:33:09,669 --> 00:33:07,760
mean if these are high energy particles

851
00:33:12,470 --> 00:33:09,679
they'll have radiation effect or you

852
00:33:14,870 --> 00:33:12,480
know single even upset or it causes

853
00:33:19,190 --> 00:33:14,880
communication disruption so your high

854
00:33:22,310 --> 00:33:19,200
altitude um aircraft uh can get

855
00:33:24,230 --> 00:33:22,320
will be affected uh by these particles

856
00:33:26,470 --> 00:33:24,240
the other effect of this high energy

857
00:33:28,789 --> 00:33:26,480
particles galactic cosmic rays which is

858
00:33:31,430 --> 00:33:28,799
again kind of varies with the solar

859
00:33:34,789 --> 00:33:31,440
cycle is of course it uh directly

860
00:33:37,590 --> 00:33:34,799
affects um human in space especially

861
00:33:39,590 --> 00:33:37,600
human if they are not protected by

862
00:33:43,029 --> 00:33:39,600
earth's magnetosphere so when we are

863
00:33:45,350 --> 00:33:43,039

thinking of voyages to moon or beyond to

864
00:33:48,149 --> 00:33:45,360
mars i think

865
00:33:53,110 --> 00:33:48,159
prediction of these high z particles

866
00:33:54,710 --> 00:33:53,120
becomes really very very important um

867
00:33:57,830 --> 00:33:54,720
you want to add before we take the next

868
00:34:03,110 --> 00:34:00,310
um yes i would like to just add one one

869
00:34:05,110 --> 00:34:03,120
area of interest especially here at nasa

870
00:34:07,750 --> 00:34:05,120
and that is satellite drag

871
00:34:09,829 --> 00:34:07,760
the the sun when it's more active causes

872
00:34:11,750 --> 00:34:09,839
the drag the at the upper atmosphere of

873
00:34:13,909 --> 00:34:11,760
the earth to expand increasing the drag

874
00:34:15,510 --> 00:34:13,919
on satellites and and basically bringing

875
00:34:18,230 --> 00:34:15,520
them out of orbit

876
00:34:19,990 --> 00:34:18,240
uh in this past minimum that we've had

877
00:34:21,589 --> 00:34:20,000
the earth's atmosphere has actually

878
00:34:24,790 --> 00:34:21,599
contracted so much

879
00:34:27,510 --> 00:34:24,800
that we're in a period of time unlike

880
00:34:30,069 --> 00:34:27,520
any before we're not seeing any drag on

881
00:34:34,149 --> 00:34:30,079
the satellites and worse than that we've

882
00:34:36,389 --> 00:34:34,159
had major amounts of debris left in our

883
00:34:38,790 --> 00:34:36,399
low earth orbit satellites and we're not

884
00:34:41,030 --> 00:34:38,800
cleaning that debris out so the

885
00:34:43,430 --> 00:34:41,040
satellite drag is very important for

886
00:34:45,510 --> 00:34:43,440
nasa and for other people that that

887
00:34:47,430 --> 00:34:45,520
operate satellites especially in low

888
00:34:51,030 --> 00:34:47,440

earth orbit and i think that would be

889
00:34:55,030 --> 00:34:53,349
okay i'll go to the uh

890
00:34:57,190 --> 00:34:55,040
my screen here i believe this is for

891
00:34:58,790 --> 00:34:57,200
dean uh question

892
00:35:01,109 --> 00:34:58,800
when do you expect the first data or

893
00:35:06,069 --> 00:35:01,119
images uh if any to come down from the

894
00:35:11,589 --> 00:35:08,870
we uh get about 30 days to move the

895
00:35:14,550 --> 00:35:11,599
orbit into geosynchronous orbit we're in

896
00:35:17,430 --> 00:35:14,560
an inclined geosynchronous orbit

897
00:35:19,750 --> 00:35:17,440
at the longitude of new mexico

898
00:35:22,069 --> 00:35:19,760
and so we are in constant contact with

899
00:35:23,829 --> 00:35:22,079
the spacecraft and it takes about three

900
00:35:26,230 --> 00:35:23,839
weeks to four weeks to get into that

901
00:35:28,870 --> 00:35:26,240
orbit at that point we start opening the

902
00:35:30,870 --> 00:35:28,880
doors on the on the instruments and

903
00:35:33,030 --> 00:35:30,880
start doing our tests of the instruments

904
00:35:35,750 --> 00:35:33,040
to make sure that they made it into

905
00:35:37,750 --> 00:35:35,760
orbit and and are doing fine and it we

906
00:35:40,150 --> 00:35:37,760
get about another four weeks so about 60

907
00:35:42,870 --> 00:35:40,160
days after launch is when we expect to

908
00:35:44,550 --> 00:35:42,880
be able to release science data

909
00:35:46,230 --> 00:35:44,560
okay um

910
00:35:47,829 --> 00:35:46,240
my last question here on the screen and

911
00:35:49,750 --> 00:35:47,839
this is a question for everyone so we're

912
00:35:52,790 --> 00:35:49,760
going to start with liz dean and then

913
00:35:55,030 --> 00:35:52,800

come up with lika and let uh dick have

914
00:35:58,230 --> 00:35:55,040
the final words but the question is what

915
00:36:00,950 --> 00:35:58,240
are each of you all's personal thoughts

916
00:36:03,349 --> 00:36:00,960
after waiting for the launch and feeling

917
00:36:05,510 --> 00:36:03,359
that you're very close to launching the

918
00:36:06,870 --> 00:36:05,520
crown jewel of heliophysics your

919
00:36:12,710 --> 00:36:06,880
personal thoughts on that then we'll

920
00:36:16,790 --> 00:36:14,230
okay

921
00:36:19,750 --> 00:36:16,800
well duane i have mixed feelings this is

922
00:36:24,150 --> 00:36:19,760
my baby and and it's very hard for me to

923
00:36:26,150 --> 00:36:24,160
push it out on its own so but i'm proud

924
00:36:27,829 --> 00:36:26,160
that it's my baby i know it's going to

925
00:36:30,550 --> 00:36:27,839
perform i know it's just going to be

926
00:36:36,790 --> 00:36:30,560
wonderful so as i say mixed feelings

927
00:36:40,550 --> 00:36:38,069
dean okay

928
00:36:42,710 --> 00:36:40,560
um well we're just um

929
00:36:44,630 --> 00:36:42,720
just just waiting

930
00:36:45,910 --> 00:36:44,640
we know how much soho and other

931
00:36:48,710 --> 00:36:45,920
spacecraft

932
00:36:51,030 --> 00:36:48,720
have revolutionized solar physics

933
00:36:52,870 --> 00:36:51,040
uh sdo has been designed to take

934
00:36:55,430 --> 00:36:52,880
advantage of what we learned from those

935
00:36:57,990 --> 00:36:55,440
missions and i i see this as a

936
00:37:00,470 --> 00:36:58,000
revolutionary mission and the data that

937
00:37:02,870 --> 00:37:00,480
sdo produces in five to ten years we're

938
00:37:04,710 --> 00:37:02,880

going to be looking back and just amazed

939
00:37:06,550 --> 00:37:04,720
at what we learned from it so i'm

940
00:37:08,630 --> 00:37:06,560
waiting to be amazed

941
00:37:11,030 --> 00:37:08,640
and lika

942
00:37:15,430 --> 00:37:11,040
well i think my emotions are also kind

943
00:37:17,829 --> 00:37:15,440
of mixed like uh liz's i think i have

944
00:37:19,910 --> 00:37:17,839
been part of living with the star from

945
00:37:22,790 --> 00:37:19,920
its uh inception

946
00:37:25,510 --> 00:37:22,800
and uh to to see actually the first

947
00:37:27,670 --> 00:37:25,520
mission of this program um

948
00:37:30,150 --> 00:37:27,680
you know happen is just

949
00:37:32,630 --> 00:37:30,160
exciting and i think i feel really

950
00:37:35,270 --> 00:37:32,640
fortunate it's not very often that it

951
00:37:38,550 --> 00:37:35,280
happens in one's career that you can be

952
00:37:39,990 --> 00:37:38,560
part of a concept and then actually go

953
00:37:43,829 --> 00:37:40,000
through the process of building the

954
00:37:47,109 --> 00:37:43,839
spacecraft launch it wait for data and

955
00:37:49,589 --> 00:37:47,119
and see the results of exciting signs

956
00:37:52,069 --> 00:37:49,599
and really entering the next generation

957
00:37:54,069 --> 00:37:52,079
i think of heliophysics

958
00:37:55,910 --> 00:37:54,079
and dick well i'd have to echo the

959
00:37:57,270 --> 00:37:55,920
things that people said but i i think it

960
00:37:59,990 --> 00:37:57,280
should be noted

961
00:38:02,069 --> 00:38:00,000
that uh this team in my opinion is the

962
00:38:04,390 --> 00:38:02,079
very best in the world and for me it's

963
00:38:06,790 --> 00:38:04,400

been an enormous privilege to be

964
00:38:09,190 --> 00:38:06,800
involved from the beginning and i'm very

965
00:38:10,630 --> 00:38:09,200
grateful for that opportunity

966
00:38:12,950 --> 00:38:10,640
and that's going to wrap it up it's

967
00:38:15,510 --> 00:38:12,960
always good to end on really

968
00:38:16,870 --> 00:38:15,520
passionate personal feelings on the sdo

969
00:38:18,470 --> 00:38:16,880
launch in this mission i want to thank

970
00:38:20,630 --> 00:38:18,480
you all for joining us i also want to

971
00:38:22,630 --> 00:38:20,640
mention that there are some incredible

972
00:38:24,150 --> 00:38:22,640
education and outreach activities that

973
00:38:25,990 --> 00:38:24,160
will be taking place

974
00:38:27,630 --> 00:38:26,000
before the launch so we can check your

975
00:38:31,109 --> 00:38:27,640
website at

976
00:38:33,750 --> 00:38:31,119
www.nasa.gov this is an incredible team

977
00:38:36,230 --> 00:38:33,760
stay tuned for the crown jewel

978
00:38:37,829 --> 00:38:36,240
and dick already said it but i've gotta

979
00:38:39,030 --> 00:38:37,839
end it here when it comes to studying

980
00:38:41,190 --> 00:38:39,040
the sun