

# ON ICE



SCIENCE LIVE

VIRTUAL EDITION

1  
00:00:01,568 --> 00:00:08,007  
[ MUSIC ]

2  
00:00:08,007 --> 00:00:09,275  
>> HELLO AND WELCOME TO

3  
00:00:09,275 --> 00:00:11,111  
"NASA SCIENCE LIVE".

4  
00:00:11,111 --> 00:00:12,078  
TODAY, WE'RE DISCUSSING

5  
00:00:12,078 --> 00:00:12,979  
IMPORTANT SCIENCE

6  
00:00:12,979 --> 00:00:15,382  
AROUND EARTH'S ICY REGIONS

7  
00:00:15,382 --> 00:00:16,549  
AND HOW IT CAN IMPACT

8  
00:00:16,549 --> 00:00:18,251  
THOSE LIVING IN WARMER REGIONS

9  
00:00:18,251 --> 00:00:20,053  
AROUND OUR PLANET.

10  
00:00:20,053 --> 00:00:21,287  
YOU MIGHT HAVE HEARD IN THE NEWS

11  
00:00:21,287 --> 00:00:23,022  
THAT ENOUGH ICE HAS MELTED

12  
00:00:23,022 --> 00:00:23,890  
FROM ANTARCTICA

13  
00:00:23,890 --> 00:00:25,091

AND GREENLAND

14

00:00:25,091 --> 00:00:25,992

TO RISE SEA LEVELS

15

00:00:25,992 --> 00:00:27,127

ABOUT HALF AN INCH

16

00:00:27,127 --> 00:00:29,496

OVER THE PAST 16 YEARS.

17

00:00:29,496 --> 00:00:30,730

WE HAVE THE SCIENTISTS

18

00:00:30,730 --> 00:00:32,298

BEHIND THAT NASA STUDY

19

00:00:32,298 --> 00:00:33,500

TO TALK TO US MORE ABOUT

20

00:00:33,500 --> 00:00:34,334

WHAT WE'VE LEARNED

21

00:00:34,334 --> 00:00:35,001

AND WHAT IT MEANS

22

00:00:35,001 --> 00:00:36,469

FOR OUR PLANET.

23

00:00:36,469 --> 00:00:37,070

WE'LL ALSO TAKE YOU

24

00:00:37,070 --> 00:00:38,505

TO THE COAST OF VIRGINIA

25

00:00:38,505 --> 00:00:39,873

TO SEE THE REAL-WORLD IMPACTS

26

00:00:39,873 --> 00:00:42,442  
OF EARTH'S MELTING ICE.

27

00:00:42,442 --> 00:00:43,543  
BEFORE WE GET STARTED,

28

00:00:43,543 --> 00:00:44,778  
LET'S TAKE A STEP BACK

29

00:00:44,778 --> 00:00:45,311  
AND LEARN ABOUT

30

00:00:45,311 --> 00:00:46,579  
THE CRYOSPHERE.

31

00:00:46,579 --> 00:00:48,281  
THAT'S THE FROZEN WATER PARTS

32

00:00:48,281 --> 00:00:50,850  
ON EARTH'S SYSTEM.

33

00:00:53,453 --> 00:00:54,921  
>> HERE AT THE END OF THE EARTH

34

00:00:54,921 --> 00:00:55,989  
IT STILL FEELS LIKE A PLACE

35

00:00:55,989 --> 00:00:57,190  
FOR RAW EXPLORATION

36

00:00:57,190 --> 00:00:59,559  
AND ADVENTURE.

37

00:00:59,559 --> 00:01:01,461  
IT'S VAST IN ALL DIRECTIONS

38

00:01:01,461 --> 00:01:02,495

AND GROUND ZERO FOR

39

00:01:02,495 --> 00:01:03,696

SOME OF THE BIGGEST QUESTIONS

40

00:01:03,696 --> 00:01:06,900

WE HAVE ABOUT THE CLIMATE.

41

00:01:06,900 --> 00:01:07,834

BUT WHEN WE DECIDED TO

42

00:01:07,834 --> 00:01:08,601

MAKE A SHOW ABOUT

43

00:01:08,601 --> 00:01:10,470

THE FROZEN PLACES ON EARTH,

44

00:01:10,470 --> 00:01:11,204

WE KNEW THERE WOULD BE

45

00:01:11,204 --> 00:01:12,205

ONE HURDLE WE WOULD NEED TO

46

00:01:12,205 --> 00:01:13,706

JUMP OVER FIRST.

47

00:01:17,210 --> 00:01:18,378

>> UHH.

48

00:01:18,378 --> 00:01:19,379

>> THE WHAT?

49

00:01:19,379 --> 00:01:21,381

>> UMM.

50

00:01:21,381 --> 00:01:22,782

>> OH.

51

00:01:22,782 --> 00:01:26,052

>> I HAVE NO IDEA.

52

00:01:26,052 --> 00:01:27,220

>> WHILE I'M AWARE OF

53

00:01:27,220 --> 00:01:28,455

THE CRYOSPHERE,

54

00:01:28,455 --> 00:01:29,556

I DON'T ACTUALLY KNOW

55

00:01:29,556 --> 00:01:30,457

WHAT IT IS.

56

00:01:30,457 --> 00:01:31,524

>> IT HAS SOMETHING TO DO

57

00:01:31,524 --> 00:01:34,727

WITH ICE.

58

00:01:34,727 --> 00:01:37,030

ALL RIGHT, THAT'S ALL I GOT.

59

00:01:46,072 --> 00:02:01,354

[ MUSIC ]

60

00:02:09,496 --> 00:02:09,963

>> HEY!

61

00:02:09,963 --> 00:02:10,630

SO, HERE WE ARE

62

00:02:10,630 --> 00:02:11,464

IN WASHINGTON, DC,

63

00:02:11,464 --> 00:02:12,298

STANDING ON THE ROOF

64

00:02:12,298 --> 00:02:13,500  
OF NASA HEADQUARTERS.

65

00:02:13,500 --> 00:02:14,467  
THAT'S THE CAPITOL BUILDING

66

00:02:14,467 --> 00:02:15,702  
RIGHT BEHIND ME.

67

00:02:15,702 --> 00:02:16,703  
AND WHAT HEADQUARTERS DOES

68

00:02:16,703 --> 00:02:17,504  
IS KIND OF SERVE AS

69

00:02:17,504 --> 00:02:18,404  
THE FOCAL POINT

70

00:02:18,404 --> 00:02:21,941  
TO CONNECT THE DOTS.

71

00:02:21,941 --> 00:02:23,109  
THE CRYOSPHERE IS EVERYTHING

72

00:02:23,109 --> 00:02:24,310  
FROM THE SNOW THAT FALLS

73

00:02:24,310 --> 00:02:25,678  
BY YOUR HOUSE

74

00:02:25,678 --> 00:02:27,180  
TO THE ICY REACHES

75

00:02:27,180 --> 00:02:28,515  
OF THE HIMALAYAS

76  
00:02:28,515 --> 00:02:30,149  
TO THE BIG, BIG, BIG ICE SHEETS

77  
00:02:30,149 --> 00:02:31,084  
OF ANTARCTICA,

78  
00:02:31,084 --> 00:02:32,719  
ALL THE WAY UP THE SOUTH POLE

79  
00:02:32,719 --> 00:02:34,220  
AND ALSO THE FROZEN GROUND

80  
00:02:34,220 --> 00:02:34,921  
OF THE ARCTIC

81  
00:02:34,921 --> 00:02:35,588  
AND EVEN SOME OF

82  
00:02:35,588 --> 00:02:36,389  
THAT FROZEN GROUND

83  
00:02:36,389 --> 00:02:36,956  
THAT'S CURRENTLY

84  
00:02:36,956 --> 00:02:38,958  
UNDER THE OCEAN.

85  
00:02:38,958 --> 00:02:40,159  
>> IF YOU HAD TO BREAK IT DOWN,

86  
00:02:40,159 --> 00:02:41,928  
YOU'D HAVE A MIX OF ...

87  
00:02:50,570 --> 00:02:51,137  
>> RIGHT NOW,

88  
00:02:51,137 --> 00:02:52,038

## OUR BEST PREDICTIONS

- 89  
00:02:52,038 --> 00:02:53,406  
ARE THAT SEA LEVELS WILL RISE
- 90  
00:02:53,406 --> 00:02:54,941  
ANYWHERE FROM ONE TO THREE FEET
- 91  
00:02:54,941 --> 00:02:56,643  
WITHIN THE NEXT HUNDRED YEARS.
- 92  
00:02:56,643 --> 00:02:58,077  
THREE FEET OF SEA LEVEL RISE
- 93  
00:02:58,077 --> 00:02:59,178  
HAS THE POTENTIAL TO DISPLACE
- 94  
00:02:59,178 --> 00:03:00,947  
ABOUT 100 MILLION PEOPLE,
- 95  
00:03:00,947 --> 00:03:01,881  
WHICH IS A LOT OF PEOPLE
- 96  
00:03:01,881 --> 00:03:04,517  
THAT NEED TO FIND NEW HOMES.
- 97  
00:03:04,517 --> 00:03:06,085  
>> OUR CURRENT REALITY PLACES US
- 98  
00:03:06,085 --> 00:03:07,820  
AT A NEAR TIPPING POINT
- 99  
00:03:07,820 --> 00:03:08,655  
AND THE CRYOSPHERE
- 100  
00:03:08,655 --> 00:03:09,756  
IS PLAYING A HUGE PART

101  
00:03:09,756 --> 00:03:12,158  
IN THAT DELICATE BALANCE.

102  
00:03:12,158 --> 00:03:12,792  
>> SO, ONE OF THE THINGS

103  
00:03:12,792 --> 00:03:14,060  
PEOPLE DON'T KNOW ABOUT NASA

104  
00:03:14,060 --> 00:03:15,228  
IS THAT WE STUDY THE EARTH.

105  
00:03:15,228 --> 00:03:16,029  
AND WE'VE BEEN DOING THAT

106  
00:03:16,029 --> 00:03:17,297  
SINCE NASA'S INCEPTION

107  
00:03:17,297 --> 00:03:19,132  
BACK IN THE 1950'S.

108  
00:03:19,132 --> 00:03:20,033  
AND WE STUDY

109  
00:03:20,033 --> 00:03:21,000  
THE FROZEN PART OF THE EARTH

110  
00:03:21,000 --> 00:03:23,836  
IN A VARIETY OF WAYS.

111  
00:03:23,836 --> 00:03:25,438  
>> MISSIONS LIKE SNOWEX,

112  
00:03:25,438 --> 00:03:27,273  
AIRBORNE SNOW OBSERVATORY,

113  
00:03:27,273 --> 00:03:28,308

OCEANS MELTING GREENLAND,

114

00:03:28,308 --> 00:03:29,409

OPERATION ICEBRIDGE,

115

00:03:29,409 --> 00:03:30,476

ARCTIC-BOREAL

116

00:03:30,476 --> 00:03:31,411

VULNERABILITY EXPERIMENT

117

00:03:31,411 --> 00:03:32,579

AND COUNTLESS OTHER LABS

118

00:03:32,579 --> 00:03:34,280

AND INDIVIDUAL RESEARCHERS

119

00:03:34,280 --> 00:03:35,381

STAND AT THE FOREFRONT

120

00:03:35,381 --> 00:03:38,551

OF MONITORING THE CRYOSPHERE.

121

00:03:40,186 --> 00:03:41,354

WE'RE TAKING YOU WITH US

122

00:03:41,354 --> 00:03:42,855

AS WE FOLLOW NASA EXPLORERS

123

00:03:42,855 --> 00:03:43,590

ON THEIR JOURNEY

124

00:03:43,590 --> 00:03:45,358

TO THE FROZEN ENDS OF THE EARTH

125

00:03:45,358 --> 00:03:46,025

AS THEY STUDY

126  
00:03:46,025 --> 00:03:47,594  
OUR RAPIDLY CHANGING WORLD

127  
00:03:47,594 --> 00:03:49,562  
FROM SATELLITES, PLANES

128  
00:03:49,562 --> 00:03:52,865  
AND BOOTS ON THE GROUND.

129  
00:03:55,401 --> 00:03:55,902  
>> WOW!

130  
00:03:55,902 --> 00:03:56,636  
SO, IT SOUNDS LIKE

131  
00:03:56,636 --> 00:03:57,837  
THE CRYOSPHERE IS PLACE

132  
00:03:57,837 --> 00:03:59,405  
WE ALL DEPEND ON

133  
00:03:59,405 --> 00:04:01,874  
BUT MANY OF US WILL NEVER GO TO.

134  
00:04:01,874 --> 00:04:02,609  
I'M JOINED TODAY

135  
00:04:02,609 --> 00:04:03,576  
BY ALEX GARDNER,

136  
00:04:03,576 --> 00:04:05,478  
NASA GLACIOLOGIST.

137  
00:04:05,478 --> 00:04:06,713  
ALEX, CAN YOU TELL US MORE ABOUT

138  
00:04:06,713 --> 00:04:10,183

## WHY NASA STUDIES EARTH'S ICE?

139

00:04:10,183 --> 00:04:12,051

>> YEAH, ABSOLUTELY.

140

00:04:12,051 --> 00:04:14,787

NASA STUDIES EARTH'S ICE BECAUSE

141

00:04:14,787 --> 00:04:15,722

IT'S INCREDIBLY IMPORTANT

142

00:04:15,722 --> 00:04:16,322

FOR THE REST OF

143

00:04:16,322 --> 00:04:17,924

THE EARTH'S SYSTEM.

144

00:04:17,924 --> 00:04:19,525

THE POLES COVER A LARGE REGION

145

00:04:19,525 --> 00:04:20,593

OF THE EARTH

146

00:04:20,593 --> 00:04:21,861

AND THEY INTERACT WITH

147

00:04:21,861 --> 00:04:23,496

THE EARTH'S SYSTEM IN WAYS

148

00:04:23,496 --> 00:04:26,099

THAT CAUSE LARGE GLOBAL CHANGES.

149

00:04:26,099 --> 00:04:27,500

THE MELTING OF THE ICE SHEETS

150

00:04:27,500 --> 00:04:28,368

ARE RESPONSIBLE FOR

151  
00:04:28,368 --> 00:04:30,470  
CHANGES IN SEA LEVEL RISE,

152  
00:04:30,470 --> 00:04:32,538  
THE FORMATION OF SEA ICE DRIVES

153  
00:04:32,538 --> 00:04:33,806  
THE THERMOHALINE CIRCULATION,

154  
00:04:33,806 --> 00:04:34,741  
OR THE CIRCULATION

155  
00:04:34,741 --> 00:04:36,242  
OF THE OCEAN.

156  
00:04:36,242 --> 00:04:37,877  
YOU KNOW, CHANGES IN SNOW COVER

157  
00:04:37,877 --> 00:04:39,412  
YEAR-TO-YEAR CAUSE

158  
00:04:39,412 --> 00:04:40,279  
LARGE CHANGES

159  
00:04:40,279 --> 00:04:41,581  
IN THE EARTH'S ENERGY BUDGET.

160  
00:04:41,581 --> 00:04:42,782  
AND SO, IF WE WANT TO

161  
00:04:42,782 --> 00:04:43,683  
UNDERSTAND THE EARTH,

162  
00:04:43,683 --> 00:04:46,386  
WE NEED TO UNDERSTAND THE POLES.

163  
00:04:46,386 --> 00:04:47,553

>> SO, HOW DOES NASA

164

00:04:47,553 --> 00:04:50,757

STUDY EARTH'S ICY REGIONS?

165

00:04:50,757 --> 00:04:51,658

>> YEAH, GREAT QUESTION.

166

00:04:51,658 --> 00:04:53,292

THERE'S A LOT OF DIFFERENT WAYS

167

00:04:53,292 --> 00:04:55,294

THAT NASA STUDIES

168

00:04:55,294 --> 00:04:57,096

THE POLAR REGIONS.

169

00:04:57,096 --> 00:04:58,164

AND NASA IS REALLY WELL-EQUIPPED

170

00:04:58,164 --> 00:04:59,699

TO DO THIS BECAUSE THESE ARE

171

00:04:59,699 --> 00:05:01,267

VERY HARSH ENVIRONMENTS

172

00:05:01,267 --> 00:05:02,669

THAT ARE DARK FOR

173

00:05:02,669 --> 00:05:04,604

UP TO SIX MONTHS OF THE YEAR.

174

00:05:04,604 --> 00:05:05,605

AND SO, NASA HAS A SUITE

175

00:05:05,605 --> 00:05:06,472

OF SATELLITES

176  
00:05:06,472 --> 00:05:08,174  
IN AIRBORNE MISSIONS

177  
00:05:08,174 --> 00:05:09,375  
THAT ARE DESIGNED TO

178  
00:05:09,375 --> 00:05:11,644  
STUDY THE POLAR REGIONS.

179  
00:05:11,644 --> 00:05:14,247  
WE HAVE A SATELLITE

180  
00:05:14,247 --> 00:05:17,650  
THAT LAUNCHED IN 2018, ICESAT-2,

181  
00:05:17,650 --> 00:05:19,185  
THAT'S A VERY ADVANCED

182  
00:05:19,185 --> 00:05:20,119  
LASER ALTIMETER THAT

183  
00:05:20,119 --> 00:05:21,487  
COUNTS INDIVIDUAL PHOTONS

184  
00:05:21,487 --> 00:05:22,522  
THAT BOUNCE OFF OF THE EARTH

185  
00:05:22,522 --> 00:05:24,691  
TO MEASURE HEIGHT CHANGES.

186  
00:05:24,691 --> 00:05:25,625  
WE HAVE ANOTHER SATELLITE

187  
00:05:25,625 --> 00:05:27,226  
THAT LAUNCHED IN 2018,

188  
00:05:27,226 --> 00:05:29,195

## THE GRACE FOLLOW-ON MISSION

189

00:05:29,195 --> 00:05:29,929

AND THIS IS

190

00:05:29,929 --> 00:05:30,930

A FASCINATING MISSION

191

00:05:30,930 --> 00:05:31,931

THAT'S ABLE TO ACTUALLY MEASURE

192

00:05:31,931 --> 00:05:33,099

SUBTLE CHANGES

193

00:05:33,099 --> 00:05:34,033

IN THE EARTH'S GRAVITY.

194

00:05:34,033 --> 00:05:35,368

SO, AS THE ICE SHEETS

195

00:05:35,368 --> 00:05:36,369

GROW OR SHRINK,

196

00:05:36,369 --> 00:05:37,103

WE CAN ACTUALLY SEE

197

00:05:37,103 --> 00:05:38,004

GRAVITY CHANGE

198

00:05:38,004 --> 00:05:40,306

IN RESPONSE TO THOSE CHANGES.

199

00:05:40,306 --> 00:05:41,040

AND WE ALSO HAVE

200

00:05:41,040 --> 00:05:42,075

THE AIRBORNE MISSION.

201  
00:05:42,075 --> 00:05:43,543  
SO, WE HAVE A MISSION CALLED

202  
00:05:43,543 --> 00:05:45,545  
THE OCEAN'S MELTING GREENLAND

203  
00:05:45,545 --> 00:05:47,013  
THAT SURVEYS THE PERIPHERY

204  
00:05:47,013 --> 00:05:48,281  
OF THE GREENLAND ICE SHEET

205  
00:05:48,281 --> 00:05:49,549  
TO MEASURE CHANGES IN OCEANS

206  
00:05:49,549 --> 00:05:50,717  
AND SEE HOW THAT'S IMPACTING

207  
00:05:50,717 --> 00:05:53,019  
THE ICE SHEET.

208  
00:05:53,019 --> 00:05:53,886  
>> WHAT ARE SOME OF

209  
00:05:53,886 --> 00:05:54,554  
THE DISCOVERIES

210  
00:05:54,554 --> 00:05:55,421  
THAT YOUR COLLEAGUES

211  
00:05:55,421 --> 00:05:56,089  
HAVE BEEN MAKING

212  
00:05:56,089 --> 00:05:58,591  
ABOUT THESE REGIONS?

213  
00:05:58,591 --> 00:05:59,092

>> YEAH.

214

00:05:59,092 --> 00:06:00,960

SO, A FEW --

215

00:06:00,960 --> 00:06:01,894

IT WASN'T VERY LONG AGO,

216

00:06:01,894 --> 00:06:03,162

ONLY A FEW DECADES AGO,

217

00:06:03,162 --> 00:06:04,731

WE ASSUMED THAT THE ICE SHEETS

218

00:06:04,731 --> 00:06:06,232

WOULD RESPOND FAIRLY SLOWLY

219

00:06:06,232 --> 00:06:07,867

TO CHANGES IN CLIMATE.

220

00:06:07,867 --> 00:06:08,935

AND WHAT WE'VE DISCOVERED

221

00:06:08,935 --> 00:06:10,036

OVER THE LAST FEW DECADES

222

00:06:10,036 --> 00:06:12,038

IS THAT'S FAR FROM THE TRUTH.

223

00:06:12,038 --> 00:06:12,705

THERE ARE ALL THESE REALLY

224

00:06:12,705 --> 00:06:14,407

INTERESTING FEEDBACKS THAT OCCUR

225

00:06:14,407 --> 00:06:15,408

THAT CAUSE THE ICE SHEETS

226  
00:06:15,408 --> 00:06:16,943  
TO RESPOND MUCH MORE RAPIDLY

227  
00:06:16,943 --> 00:06:18,678  
THAN WE HAD ANTICIPATED.

228  
00:06:18,678 --> 00:06:20,079  
SO, THE OCEANS ARE ABLE TO

229  
00:06:20,079 --> 00:06:21,114  
EAT AWAY AT THE EDGE

230  
00:06:21,114 --> 00:06:23,316  
OF THE ICE SHEETS VERY QUICKLY,

231  
00:06:23,316 --> 00:06:24,317  
WHICH CAUSES THE ICE

232  
00:06:24,317 --> 00:06:25,685  
TO FLOW MORE RAPIDLY

233  
00:06:25,685 --> 00:06:27,653  
INTO THE OCEAN.

234  
00:06:27,653 --> 00:06:28,454  
WE'VE DISCOVERED

235  
00:06:28,454 --> 00:06:29,889  
THAT WATER FROM THE SURFACE

236  
00:06:29,889 --> 00:06:31,023  
CAN EASILY REACH THE BED

237  
00:06:31,023 --> 00:06:32,191  
OF THE GLACIER,

238  
00:06:32,191 --> 00:06:33,059

## RAISING THE PRESSURE

239

00:06:33,059 --> 00:06:33,926

AT THE BED OF THE GLACIER

240

00:06:33,926 --> 00:06:34,927

AND REDUCING THE FRICTION

241

00:06:34,927 --> 00:06:38,264

THAT CAUSES IT TO --

242

00:06:38,264 --> 00:06:39,198

THAT RESISTS THE FLOW

243

00:06:39,198 --> 00:06:40,767

INTO THE OCEAN.

244

00:06:40,767 --> 00:06:42,168

AND IN SOME PLACES

245

00:06:42,168 --> 00:06:43,202

WE'VE DISCOVERED THAT

246

00:06:43,202 --> 00:06:44,737

THE GEOMETRY OF THE BED

247

00:06:44,737 --> 00:06:46,773

OF THE GLACIER

248

00:06:46,773 --> 00:06:47,807

CAN CAUSE GLACIERS

249

00:06:47,807 --> 00:06:49,175

TO RETREAT IRREVERSIBLY

250

00:06:49,175 --> 00:06:50,543

ONCE THEY START TO RETREAT.

251  
00:06:50,543 --> 00:06:52,745  
AND SO, THERE'S THESE LARGE

252  
00:06:52,745 --> 00:06:55,047  
ONE-WAY FEEDBACKS IN SOME PLACES

253  
00:06:55,047 --> 00:06:56,349  
THAT CAN CAUSE RAPID CHANGES

254  
00:06:56,349 --> 00:06:59,018  
IN SEA LEVEL RISE.

255  
00:06:59,018 --> 00:06:59,619  
>> IT IS SUCH

256  
00:06:59,619 --> 00:07:01,654  
AN INTERESTING REGION.

257  
00:07:01,654 --> 00:07:03,222  
WE'VE GOT SOME QUESTIONS

258  
00:07:03,222 --> 00:07:04,724  
FROM SOCIAL MEDIA,

259  
00:07:04,724 --> 00:07:09,729  
SO WE HAVE TWITTER,

260  
00:07:09,729 --> 00:07:10,997  
"WHAT KIND OF INFORMATION,

261  
00:07:10,997 --> 00:07:12,365  
CAN WE GET FROM ICE

262  
00:07:12,365 --> 00:07:13,332  
AND HOW CAN THAT INFORMATION

263  
00:07:13,332 --> 00:07:16,035

BE USEFUL TO US?"

264

00:07:16,035 --> 00:07:16,736

>> YEAH, SO THERE'S LOTS OF

265

00:07:16,736 --> 00:07:17,537

DIFFERENT INFORMATION

266

00:07:17,537 --> 00:07:18,104

WE CAN GET.

267

00:07:18,104 --> 00:07:19,005

SOME OF THE MOST INTERESTING

268

00:07:19,005 --> 00:07:19,872

INFORMATION IS ACTUALLY

269

00:07:19,872 --> 00:07:20,940

COMING FROM ICE CORES

270

00:07:20,940 --> 00:07:22,241

THAT GIVE US THESE LONG,

271

00:07:22,241 --> 00:07:23,776

DETAILED RECORDS OF --

272

00:07:23,776 --> 00:07:25,511

OF EARTH'S CLIMATE HISTORY

273

00:07:25,511 --> 00:07:26,279

BECAUSE IT ACTUALLY TRAPS

274

00:07:26,279 --> 00:07:27,480

LITTLE POCKETS OF AIR

275

00:07:27,480 --> 00:07:29,182

IN THE ICE CORES.

276  
00:07:29,182 --> 00:07:30,116  
NASA IS NOT COLLECTING

277  
00:07:30,116 --> 00:07:30,750  
THE ICE CORES,

278  
00:07:30,750 --> 00:07:31,918  
BUT WHAT WE ARE MEASURING IS

279  
00:07:31,918 --> 00:07:33,786  
THE CHANGES IN THE ICE SHEETS.

280  
00:07:33,786 --> 00:07:35,321  
AND SO WHAT WE CAN SEE IS

281  
00:07:35,321 --> 00:07:36,956  
IF WE WARM THE TEMPERATURE

282  
00:07:36,956 --> 00:07:37,623  
OF THE OCEAN

283  
00:07:37,623 --> 00:07:39,225  
BY ONE OR TWO DEGREES,

284  
00:07:39,225 --> 00:07:40,092  
WHAT DOES THAT MEAN FOR

285  
00:07:40,092 --> 00:07:41,027  
HOW QUICKLY

286  
00:07:41,027 --> 00:07:42,495  
THE ICE SHELVES MELT?

287  
00:07:42,495 --> 00:07:44,163  
AND IF WE GENERATE WATER ON

288  
00:07:44,163 --> 00:07:45,765

THE SURFACE OF THE ICE SHEETS,

289

00:07:45,765 --> 00:07:46,499

WHAT DOES THAT MEAN FOR

290

00:07:46,499 --> 00:07:47,266

HOW FAST THAT

291

00:07:47,266 --> 00:07:49,468

THEY CAN SLIDE INTO THE OCEAN?

292

00:07:49,468 --> 00:07:50,670

AND SO, IT'S REALLY ABOUT

293

00:07:50,670 --> 00:07:52,672

DEVELOPING UNDERSTANDING

294

00:07:52,672 --> 00:07:53,606

SO THAT WE CAN PROVIDE

295

00:07:53,606 --> 00:07:54,874

PROJECTIONS INTO THE FUTURE

296

00:07:54,874 --> 00:07:56,342

OF WHAT THE RESPONSE

297

00:07:56,342 --> 00:07:58,845

TO FUTURE CHANGES WILL BE.

298

00:07:58,845 --> 00:07:59,445

>> WOW!

299

00:07:59,445 --> 00:08:00,980

THAT'S FASCINATING!

300

00:08:00,980 --> 00:08:01,981

SO, THANK YOU SO MUCH

301

00:08:01,981 --> 00:08:03,983

FOR THIS INSIGHT, ALEX.

302

00:08:03,983 --> 00:08:04,684

AS WE MENTIONED

303

00:08:04,684 --> 00:08:06,219

AT THE BEGINNING OF THE SHOW,

304

00:08:06,219 --> 00:08:07,220

NASA HAS JUST RELEASED

305

00:08:07,220 --> 00:08:08,654

BRAND NEW SCIENCE RESULTS

306

00:08:08,654 --> 00:08:11,057

ABOUT ACCELERATED ICE MELT.

307

00:08:11,057 --> 00:08:11,824

LET'S TAKE A LOOK ABOUT

308

00:08:11,824 --> 00:08:12,825

SOME OF THOSE DETAILS

309

00:08:12,825 --> 00:08:13,960

ABOUT HOW EARTH'S ICE

310

00:08:13,960 --> 00:08:15,161

IS CHANGING.

311

00:08:15,161 --> 00:08:16,495

>> USING THE MOST ADVANCED

312

00:08:16,495 --> 00:08:18,097

EARTH-OBSERVING LASER INSTRUMENT

313

00:08:18,097 --> 00:08:20,333

NASA HAS EVER FLOWN IN SPACE,

314

00:08:20,333 --> 00:08:21,868

SCIENTISTS HAVE MADE PRECISE

315

00:08:21,868 --> 00:08:22,902

DETAILED MEASUREMENTS

316

00:08:22,902 --> 00:08:23,803

OF HOW THE ELEVATION

317

00:08:23,803 --> 00:08:25,638

OF ICE SHEETS IN GREENLAND

318

00:08:25,638 --> 00:08:26,572

AND ANTARCTICA

319

00:08:26,572 --> 00:08:29,108

HAVE CHANGED OVER 16 YEARS.

320

00:08:29,108 --> 00:08:30,276

>> WE CAN ACTUALLY SEE

321

00:08:30,276 --> 00:08:31,344

SOME PROCESSES AT A SCALE

322

00:08:31,344 --> 00:08:32,912

THAT'S ALMOST LONG ENOUGH

323

00:08:32,912 --> 00:08:34,013

TO TELL US ABOUT THE CLIMATE

324

00:08:34,013 --> 00:08:35,314

IN THOSE TWO PLACES.

325

00:08:35,314 --> 00:08:36,249

>> SCIENTISTS TOOK

326  
00:08:36,249 --> 00:08:37,450  
ICE SHEET ELEVATION

327  
00:08:37,450 --> 00:08:39,252  
MEASUREMENTS FROM 2003,

328  
00:08:39,252 --> 00:08:41,821  
OVERLAID DATA FROM 2019

329  
00:08:41,821 --> 00:08:42,488  
AND ANALYZED

330  
00:08:42,488 --> 00:08:44,257  
WHERE THE DATASETS INTERSECTED

331  
00:08:44,257 --> 00:08:44,991  
IN ORDER TO SEE

332  
00:08:44,991 --> 00:08:47,426  
WHERE ICE WAS LOST OR GAINED.

333  
00:08:47,426 --> 00:08:48,361  
FOR EXAMPLE,

334  
00:08:48,361 --> 00:08:49,829  
THE STUDY DEFINITELY SHOWS

335  
00:08:49,829 --> 00:08:51,063  
THAT THE EAST ANTARCTIC

336  
00:08:51,063 --> 00:08:51,797  
ICE SHEET,

337  
00:08:51,797 --> 00:08:52,498  
THE LARGEST

338  
00:08:52,498 --> 00:08:54,100

OF ALL THE ICE SHEETS,

339

00:08:54,100 --> 00:08:55,001  
IS GROWING.

340

00:08:55,001 --> 00:08:57,003  
>> BUT MORE IMPORTANTLY,

341

00:08:57,003 --> 00:08:57,904  
WHAT WE FIND IS THAT GROWING

342

00:08:57,904 --> 00:08:59,305  
IS MORE THAN OFFSET

343

00:08:59,305 --> 00:09:00,740  
BY INCREASED LOSSES COMING FROM

344

00:09:00,740 --> 00:09:02,375  
THE WEST ANTARCTIC ICE SHEET

345

00:09:02,375 --> 00:09:04,343  
WHICH IS THINNING VERY RAPIDLY

346

00:09:04,343 --> 00:09:05,211  
AS IT RESPONDS TO

347

00:09:05,211 --> 00:09:06,746  
WARMER OCEAN TEMPERATURES,

348

00:09:06,746 --> 00:09:08,414  
SPECIFICALLY IN THE AMANSON SEA

349

00:09:08,414 --> 00:09:09,649  
AND BAUMAN AREA.

350

00:09:09,649 --> 00:09:11,584  
>> THE WEST ANTARCTIC SIDE

351  
00:09:11,584 --> 00:09:13,319  
WE ARE SEEING STRONG THINNING

352  
00:09:13,319 --> 00:09:14,153  
ON THE ICE SHELVES

353  
00:09:14,153 --> 00:09:16,455  
WHICH IS CAUSING DRAWDOWN

354  
00:09:16,455 --> 00:09:18,324  
ON THE INLAND ICE,

355  
00:09:18,324 --> 00:09:20,092  
ON THE GROUNDED ICE UPSTREAM.

356  
00:09:20,092 --> 00:09:21,794  
MOST OF THAT IS BEING CAUSED

357  
00:09:21,794 --> 00:09:23,062  
BECAUSE OF CHANGES

358  
00:09:23,062 --> 00:09:24,397  
IN OCEAN HEAT FLUX

359  
00:09:24,397 --> 00:09:25,364  
UNDERNEATH THE ICE SHELVES

360  
00:09:25,364 --> 00:09:27,033  
WHICH IS CAUSING THEM TO THIN

361  
00:09:27,033 --> 00:09:28,301  
AND THEN CONSEQUENTLY

362  
00:09:28,301 --> 00:09:29,702  
THE BUTTRESSING FORCE

363  
00:09:29,702 --> 00:09:30,870

IS BEING LOST

364

00:09:30,870 --> 00:09:32,338  
AGAINST THE GROUNDED ICE

365

00:09:32,338 --> 00:09:33,205  
AND THE GROUNDED ICE

366

00:09:33,205 --> 00:09:34,707  
IS THEN FLOWING FASTER

367

00:09:34,707 --> 00:09:35,441  
INTO THE OCEAN

368

00:09:35,441 --> 00:09:37,810  
AND CAUSING SEA LEVEL RISE.

369

00:09:37,810 --> 00:09:39,445  
IN GREENLAND WE'RE SEEING

370

00:09:39,445 --> 00:09:40,613  
DIFFERENT SIGNATURES.

371

00:09:40,613 --> 00:09:41,814  
AGAIN, IN THE CENTER OF

372

00:09:41,814 --> 00:09:42,982  
THE ICE SHEET IN THE PLATEAU

373

00:09:42,982 --> 00:09:43,549  
WE'RE SEEING

374

00:09:43,549 --> 00:09:44,717  
INCREASED ACCUMULATION.

375

00:09:44,717 --> 00:09:46,218  
SO, THERE IS A SLIGHT INCREASE

376  
00:09:46,218 --> 00:09:47,820  
IN MASS IN THE CENTER,

377  
00:09:47,820 --> 00:09:49,021  
BUT THE OVERALL SIGNAL

378  
00:09:49,021 --> 00:09:49,655  
FOR GREENLAND

379  
00:09:49,655 --> 00:09:51,123  
IS ONE OF THINNING,

380  
00:09:51,123 --> 00:09:52,692  
AND THAT IS BEING CAUSED BY

381  
00:09:52,692 --> 00:09:55,161  
OCEAN AND ATMOSPHERIC SIGNALS

382  
00:09:55,161 --> 00:09:55,928  
ACTING ALL AROUND

383  
00:09:55,928 --> 00:09:57,396  
THE EDGES OF GREENLAND.

384  
00:09:57,396 --> 00:09:59,465  
>> SO, WE'RE SEEING 200 GIGATONS

385  
00:09:59,465 --> 00:10:00,666  
PER YEAR OF ICE

386  
00:10:00,666 --> 00:10:01,934  
FLOWING INTO THE OCEANS,

387  
00:10:01,934 --> 00:10:03,102  
WHICH IS ENOUGH

388  
00:10:03,102 --> 00:10:04,370

TO RAISE SEA LEVEL

389

00:10:04,370 --> 00:10:05,304  
BY ABOUT TWO-THIRDS

390

00:10:05,304 --> 00:10:06,772  
OF A MILLIMETER PER YEAR.

391

00:10:06,772 --> 00:10:07,673  
>> COMBINE THAT WITH

392

00:10:07,673 --> 00:10:09,642  
THE ALMOST 118-GIGATONS

393

00:10:09,642 --> 00:10:11,344  
LOST IN ANTARCTICA,

394

00:10:11,344 --> 00:10:12,478  
AND SEA LEVEL HAS RISEN

395

00:10:12,478 --> 00:10:14,246  
A TOTAL OF 14 MILLIMETERS

396

00:10:14,246 --> 00:10:15,781  
OVER THE 16-YEAR PERIOD

397

00:10:15,781 --> 00:10:17,717  
DUE TO ICE SHEET MELT.

398

00:10:17,717 --> 00:10:19,185  
IT MAY SEEM SMALL,

399

00:10:19,185 --> 00:10:21,120  
BUT THE SMALL CHANGES ADD UP.

400

00:10:21,120 --> 00:10:22,188  
>> WHAT WE EXPECT

401  
00:10:22,188 --> 00:10:24,090  
BY THE END OF THE CENTURY IS,

402  
00:10:24,090 --> 00:10:25,858  
YOU KNOW, ON THE ORDER OF TWO,

403  
00:10:25,858 --> 00:10:27,326  
THREE, MAYBE FOUR FEET

404  
00:10:27,326 --> 00:10:28,694  
OF SEA LEVEL RISE.

405  
00:10:28,694 --> 00:10:29,729  
AND BECAUSE WE HAVE

406  
00:10:29,729 --> 00:10:31,530  
ALL OF OUR INFRASTRUCTURE

407  
00:10:31,530 --> 00:10:34,266  
THAT IS BUILT AROUND THE COASTS,

408  
00:10:34,266 --> 00:10:35,801  
WE HAVE A LOT OF VULNERABILITY

409  
00:10:35,801 --> 00:10:36,936  
TO A METER CHANGE

410  
00:10:36,936 --> 00:10:38,704  
IN SEA LEVEL RISE.

411  
00:10:38,704 --> 00:10:39,939  
>> THE POTENTIAL IMPACT

412  
00:10:39,939 --> 00:10:40,940  
FROM SEA LEVEL RISE

413  
00:10:40,940 --> 00:10:42,508

IS ONE CRITICAL MOTIVATION

414

00:10:42,508 --> 00:10:43,776  
FOR THE CONTINUED STUDY

415

00:10:43,776 --> 00:10:44,477  
OF THE MECHANICS

416

00:10:44,477 --> 00:10:45,745  
DRIVING THE CHANGES

417

00:10:45,745 --> 00:10:47,046  
IN THE ICE SHEETS.

418

00:10:47,046 --> 00:10:47,780  
>> IF WE CAN UNDERSTAND

419

00:10:47,780 --> 00:10:48,547  
THOSE MECHANISMS

420

00:10:48,547 --> 00:10:49,448  
AND HOW THEY'VE PLAYED OUT

421

00:10:49,448 --> 00:10:51,450  
OVER THE LAST 30 YEARS,

422

00:10:51,450 --> 00:10:53,019  
WELL THEN WE CAN START TO LOOK

423

00:10:53,019 --> 00:10:53,953  
AND THINK ABOUT

424

00:10:53,953 --> 00:10:55,121  
HOW WILL THOSE ICE SHEETS

425

00:10:55,121 --> 00:10:55,855  
RESPOND TO

426  
00:10:55,855 --> 00:10:56,789  
WHAT WE PROJECT THE CLIMATE

427  
00:10:56,789 --> 00:11:00,493  
TO BE INTO THE FUTURE.

428  
00:11:00,493 --> 00:11:02,561  
>> THAT IS JUST INCREDIBLE.

429  
00:11:02,561 --> 00:11:04,530  
IT SOUNDS LIKE WITH THESE TOOLS,

430  
00:11:04,530 --> 00:11:05,331  
SCIENTISTS ARE ABLE TO

431  
00:11:05,331 --> 00:11:06,599  
BE MORE CONFIDENT THAT

432  
00:11:06,599 --> 00:11:07,466  
THE CHANGES WE'RE SEEING

433  
00:11:07,466 --> 00:11:08,367  
IN THE ICE

434  
00:11:08,367 --> 00:11:09,001  
HAVE TO DO WITH

435  
00:11:09,001 --> 00:11:10,236  
THE LONG-TERM CHANGES

436  
00:11:10,236 --> 00:11:11,670  
IN THE CLIMATE.

437  
00:11:11,670 --> 00:11:12,471  
LET'S LEARN SOME MORE

438  
00:11:12,471 --> 00:11:13,739

ABOUT THAT SCIENCE.

439

00:11:13,739 --> 00:11:15,441

I'M JOINED BY BEN SMITH,

440

00:11:15,441 --> 00:11:16,342

LEAD AUTHOR

441

00:11:16,342 --> 00:11:18,310

OF THE ICESAT-2 STUDY.

442

00:11:18,310 --> 00:11:19,512

BEN, CAN YOU TAKE US THROUGH

443

00:11:19,512 --> 00:11:22,448

THESE RESULTS WE JUST LEARNED?

444

00:11:22,448 --> 00:11:24,450

>> SO, WE ARE MAKING

445

00:11:24,450 --> 00:11:25,818

OUR FIRST SET OF MEASUREMENTS

446

00:11:25,818 --> 00:11:27,319

WITH ICESAT-2.

447

00:11:27,319 --> 00:11:29,088

AND WHAT'S EXCITING ABOUT THESE

448

00:11:29,088 --> 00:11:30,189

IS THAT THEY CONTINUE

449

00:11:30,189 --> 00:11:30,956

A SET OF MEASUREMENTS

450

00:11:30,956 --> 00:11:32,425

THAT WERE FIRST TAKEN

451  
00:11:32,425 --> 00:11:34,994  
IN MOSTLY THE EARLY 2000'S.

452  
00:11:34,994 --> 00:11:37,229  
SO, THOSE MEASUREMENTS ARE --

453  
00:11:37,229 --> 00:11:38,798  
WERE DONE WITH ICESAT-1.

454  
00:11:38,798 --> 00:11:39,365  
THEY WERE

455  
00:11:39,365 --> 00:11:40,533  
LASER ALTIMETRY MEASUREMENTS

456  
00:11:40,533 --> 00:11:42,868  
OF BOTH ICE SHEETS AND THEY --

457  
00:11:42,868 --> 00:11:43,769  
THE DIFFERENCES

458  
00:11:43,769 --> 00:11:45,304  
BETWEEN THOSE TWO LET US SEE

459  
00:11:45,304 --> 00:11:46,672  
HOW THE ICE IS CHANGING

460  
00:11:46,672 --> 00:11:48,074  
OVER THE 16-YEAR PERIOD

461  
00:11:48,074 --> 00:11:48,808  
BETWEEN THE START OF

462  
00:11:48,808 --> 00:11:50,342  
THE ICESAT-1 MISSION

463  
00:11:50,342 --> 00:11:51,410

## AND THE BEGINNING

464

00:11:51,410 --> 00:11:53,345  
OF THE ICESAT-2 MISSION.

465

00:11:53,345 --> 00:11:55,548  
SO, WITH THOSE MEASUREMENTS

466

00:11:55,548 --> 00:11:56,749  
WE CAN SEE A LOT OF

467

00:11:56,749 --> 00:11:58,651  
SORT OF EXCITING THINGS.

468

00:11:58,651 --> 00:12:00,286  
WE CAN SEE AROUND THE EDGES

469

00:12:00,286 --> 00:12:01,220  
OF GREENLAND

470

00:12:01,220 --> 00:12:02,555  
AND THE EDGES

471

00:12:02,555 --> 00:12:04,256  
OF PARTS OF ANTARCTICA

472

00:12:04,256 --> 00:12:05,324  
THAT THE ICE IS THINNING

473

00:12:05,324 --> 00:12:06,392  
VERY QUICKLY.

474

00:12:06,392 --> 00:12:07,226  
THERE ARE AREAS

475

00:12:07,226 --> 00:12:08,761  
WHERE THE ICE SHEET SURFACE

476  
00:12:08,761 --> 00:12:11,063  
IS DROPPING BY

477  
00:12:11,063 --> 00:12:12,665  
MORE THAN SEVERAL METERS

478  
00:12:15,601 --> 00:12:13,365  
PER YEAR.

479  
00:12:15,601 --> 00:12:16,869  
AS YOU GO FARTHER INLAND

480  
00:12:16,869 --> 00:12:17,470  
FROM THERE,

481  
00:12:17,470 --> 00:12:19,171  
YOU SEE LESS AND LESS THINNING,

482  
00:12:19,171 --> 00:12:20,239  
IN GENERAL,

483  
00:12:20,239 --> 00:12:22,641  
UNTIL IN THE VERY INTERIOR

484  
00:12:22,641 --> 00:12:23,542  
OF THE ICE SHEETS

485  
00:12:23,542 --> 00:12:24,243  
WE ACTUALLY SEE

486  
00:12:24,243 --> 00:12:27,079  
SMALL AMOUNTS OF THICKENING.

487  
00:12:27,079 --> 00:12:29,648  
SO, WHAT THIS MEANS TO US

488  
00:12:29,648 --> 00:12:32,084

IS THAT THERE ARE

489

00:12:32,084 --> 00:12:33,819  
RAPID THINNING PROCESSES

490

00:12:33,819 --> 00:12:35,187  
THAT ARE HAPPENING

491

00:12:35,187 --> 00:12:36,455  
IN ASSOCIATION WITH CHANGES

492

00:12:36,455 --> 00:12:38,057  
THAT ARE HAPPENING IN THE OCEAN

493

00:12:38,057 --> 00:12:39,825  
AND THE CLIMATE.

494

00:12:39,825 --> 00:12:41,160  
AND THOSE ARE AFFECTING

495

00:12:41,160 --> 00:12:42,428  
THE LOW ELEVATION PARTS

496

00:12:42,428 --> 00:12:43,062  
OF THE ICE SHEET

497

00:12:43,062 --> 00:12:44,997  
THAT ARE CLOSEST TO THE OCEAN.

498

00:12:44,997 --> 00:12:46,031  
FARTHER INLAND,

499

00:12:46,031 --> 00:12:49,468  
THERE'S MORE SNOW FALLING

500

00:12:49,468 --> 00:12:50,436  
THAN CAN BE TAKEN AWAY

501  
00:12:50,436 --> 00:12:51,704  
BY ICE FLOW.

502  
00:12:51,704 --> 00:12:52,671  
AND SO, THE ICE SHEET

503  
00:12:52,671 --> 00:12:54,874  
IS THICKENING A LITTLE BIT.

504  
00:12:54,874 --> 00:12:56,942  
THE MISSION ALSO LET'S US

505  
00:12:56,942 --> 00:12:58,511  
ADD UP THOSE DIFFERENCES.

506  
00:12:58,511 --> 00:12:59,512  
SO, WE CAN ADD UP

507  
00:12:59,512 --> 00:13:00,479  
HOW MUCH THICKENING WE SEE

508  
00:13:00,479 --> 00:13:02,448  
AND HOW MUCH THINNING WE SEE.

509  
00:13:02,448 --> 00:13:04,517  
AND WE FIND THAT THE THICKENING,

510  
00:13:04,517 --> 00:13:06,952  
IT IS, AT THIS POINT,

511  
00:13:06,952 --> 00:13:08,087  
VERY, VERY SMALL

512  
00:13:08,087 --> 00:13:08,721  
COMPARED TO

513  
00:13:08,721 --> 00:13:09,755

THE THINNING THAT WE SEE.

514

00:13:09,755 --> 00:13:11,323

SO, THE RAPID THINNING

515

00:13:11,323 --> 00:13:12,658

THAT WE SEE AROUND THE COAST

516

00:13:12,658 --> 00:13:15,494

DOMINATES THE THICKENING

517

00:13:15,494 --> 00:13:17,096

THAT WE SEE IN THE INTERIOR.

518

00:13:17,096 --> 00:13:18,397

AND SO, BOTH ICE SHEETS

519

00:13:18,397 --> 00:13:18,898

ARE LOSING

520

00:13:18,898 --> 00:13:21,467

QUITE A BIT OF MASS.

521

00:13:21,467 --> 00:13:22,935

>> AND WHY ARE THESE RESULTS

522

00:13:22,935 --> 00:13:25,204

SO SIGNIFICANT?

523

00:13:25,204 --> 00:13:26,805

>> SO, THIS IS KIND OF

524

00:13:26,805 --> 00:13:28,073

A DEFINITIVE STUDY.

525

00:13:28,073 --> 00:13:29,108

SO, WE'RE MAKING

526  
00:13:29,108 --> 00:13:30,543  
LASER ALTIMETRY MEASUREMENTS.

527  
00:13:30,543 --> 00:13:31,610  
WE KNOW THAT THESE MEASUREMENTS

528  
00:13:31,610 --> 00:13:32,678  
ARE MEASURING EXACTLY

529  
00:13:32,678 --> 00:13:35,414  
THE SURFACE OF THE SNOW.

530  
00:13:35,414 --> 00:13:36,849  
WE HAVE VERY HIGH PRECISION

531  
00:13:36,849 --> 00:13:38,017  
SO WE CAN MEASURE

532  
00:13:38,017 --> 00:13:40,452  
AT THE SORT OF INCH LEVEL

533  
00:13:40,452 --> 00:13:41,720  
HOW MUCH THE ICE SHEET

534  
00:13:41,720 --> 00:13:43,155  
HAS CHANGED.

535  
00:13:43,155 --> 00:13:45,157  
AND WE HAVE A LONG TIME PERIOD,

536  
00:13:45,157 --> 00:13:45,758  
SO WE HAVE

537  
00:13:45,758 --> 00:13:47,126  
A 16-YEAR TIME PERIOD,

538  
00:13:47,126 --> 00:13:48,260

SO IT'S NOT JUST THAT

539

00:13:48,260 --> 00:13:50,462

WE HAD A SNOWY YEAR ONE YEAR

540

00:13:50,462 --> 00:13:52,097

OR WE JUST HAD A LITTLE BIT

541

00:13:52,097 --> 00:13:53,799

OF EXTRA MELT ONE YEAR,

542

00:13:53,799 --> 00:13:55,000

WE'RE SEEING PROCESSES

543

00:13:55,000 --> 00:13:56,502

THAT HAVE BEEN GOING ON

544

00:13:56,502 --> 00:13:58,137

CONSISTENTLY FOR A LONG TIME

545

00:13:58,137 --> 00:13:58,837

AND WE CAN SEE

546

00:13:58,837 --> 00:13:59,705

THE EFFECT OF THAT

547

00:13:59,705 --> 00:14:02,308

ADDED UP OVER A NUMBER OF YEARS.

548

00:14:02,308 --> 00:14:05,144

>> AND WHY IS THE ICE MELTING?

549

00:14:05,144 --> 00:14:06,779

>> SO, WE'RE SEEING

550

00:14:06,779 --> 00:14:08,247

TWO DIFFERENT EFFECTS HERE

551

00:14:08,247 --> 00:14:09,915  
IN COMBINATION WITH

552

00:14:09,915 --> 00:14:10,549  
ONE ANOTHER.

553

00:14:10,549 --> 00:14:11,917  
WE MEASURE THE NET EFFECT

554

00:14:11,917 --> 00:14:13,719  
OF THESE TWO THINGS.

555

00:14:13,719 --> 00:14:14,353  
WE'RE SEEING

556

00:14:14,353 --> 00:14:16,222  
AROUND THE EDGE OF ANTARCTICA

557

00:14:16,222 --> 00:14:17,389  
AND THE EDGE OF GREENLAND

558

00:14:17,389 --> 00:14:19,024  
THAT THE OCEAN IS WARMER

559

00:14:19,024 --> 00:14:21,126  
AND THAT'S MELTING ICE DIRECTLY.

560

00:14:21,126 --> 00:14:22,294  
SO, THE ICE SHELVES

561

00:14:22,294 --> 00:14:23,028  
AROUND ANTARCTICA,

562

00:14:23,028 --> 00:14:24,630  
WHICH ARE FLOATING ICE,

563

00:14:24,630 --> 00:14:26,966

ARE THINNING QUITE A BIT.

564

00:14:26,966 --> 00:14:28,634

AND THE ICE

565

00:14:28,634 --> 00:14:30,169

AT THE DOWNSTREAM ENDS OF

566

00:14:30,169 --> 00:14:30,869

THE OUTLYING GLACIERS

567

00:14:30,869 --> 00:14:31,503

IN GREENLAND

568

00:14:31,503 --> 00:14:33,272

ARE MELTING QUITE A BIT.

569

00:14:33,272 --> 00:14:35,474

THAT LETS THE ICE FLOW FASTER

570

00:14:35,474 --> 00:14:37,142

BECAUSE THERE'S LESS RESISTANCE

571

00:14:37,142 --> 00:14:38,777

TO ITS FLOW.

572

00:14:38,777 --> 00:14:39,511

AND SO, AS THE ICE

573

00:14:39,511 --> 00:14:40,079

FLOWS FASTER,

574

00:14:40,079 --> 00:14:41,247

THE GLACIERS GO FASTER

575

00:14:41,247 --> 00:14:42,681

AND ICE CAN FLOW

576  
00:14:42,681 --> 00:14:43,382  
FROM THE ICE SHEETS

577  
00:14:43,382 --> 00:14:45,351  
INTO THE OCEAN MORE QUICKLY.

578  
00:14:45,351 --> 00:14:48,153  
SO, AT THE SAME TIME,

579  
00:14:48,153 --> 00:14:48,988  
IN GREENLAND

580  
00:14:48,988 --> 00:14:50,289  
WE'RE ALSO SEEING THE EFFECTS

581  
00:14:50,289 --> 00:14:51,290  
OF SURFACE MELT.

582  
00:14:51,290 --> 00:14:52,024  
SO, THE WEATHER

583  
00:14:52,024 --> 00:14:53,525  
HAS GOTTEN WARMER IN GREENLAND

584  
00:14:53,525 --> 00:14:55,027  
BY QUITE A BIT

585  
00:14:55,027 --> 00:14:56,262  
AND A LOT LARGER PART

586  
00:14:56,262 --> 00:14:59,431  
OF THE ICE SHEET IS MELTING.

587  
00:14:59,431 --> 00:15:00,399  
AND IT'S MELTING MORE

588  
00:15:00,399 --> 00:15:01,267

EVERY SUMMER.

589

00:15:01,267 --> 00:15:04,069

SO, WE'RE SEEING MELT --

590

00:15:04,069 --> 00:15:05,070

SURFACE MELT

591

00:15:05,070 --> 00:15:07,039

AND FASTER ICE FLOW IN GREENLAND

592

00:15:07,039 --> 00:15:09,775

AND WE'RE SEEING FASTER ICE FLOW

593

00:15:09,775 --> 00:15:10,843

AND ICE SHELF MELT

594

00:15:10,843 --> 00:15:13,479

IN ANTARCTICA.

595

00:15:13,479 --> 00:15:14,346

>> THANK YOU.

596

00:15:14,346 --> 00:15:15,381

SO, I THINK WE HAVE TIME FOR

597

00:15:15,381 --> 00:15:16,382

ONE QUESTION

598

00:15:16,382 --> 00:15:17,950

FROM SOCIAL MEDIA.

599

00:15:17,950 --> 00:15:19,852

OUR QUESTION FROM TUMBLR IS

600

00:15:19,852 --> 00:15:20,719

"HOW DO YOU GUYS HELP

601  
00:15:20,719 --> 00:15:23,088  
WITH CLIMATE CHANGE?"

602  
00:15:23,088 --> 00:15:24,690  
>> SO, WE ARE OBSERVING

603  
00:15:24,690 --> 00:15:26,659  
THE EFFECTS OF CLIMATE CHANGE.

604  
00:15:26,659 --> 00:15:28,527  
WE ARE PRESENTING THE FACT

605  
00:15:28,527 --> 00:15:30,963  
THAT WE'RE SEEING THESE CHANGES

606  
00:15:30,963 --> 00:15:32,164  
AND WE ARE SHOWING THAT

607  
00:15:32,164 --> 00:15:34,667  
THEY ARE PRETTY SIGNIFICANT.

608  
00:15:34,667 --> 00:15:36,268  
WHAT ACTUALLY HELPS IS

609  
00:15:36,268 --> 00:15:37,136  
WHAT PEOPLE DO

610  
00:15:37,136 --> 00:15:38,537  
IN RESPONSE TO THIS.

611  
00:15:38,537 --> 00:15:41,273  
SO, WHEN PEOPLE SEE THAT

612  
00:15:41,273 --> 00:15:42,107  
WE'VE PRODUCED

613  
00:15:42,107 --> 00:15:43,709

ABOUT 14-MILLIMETERS

614

00:15:43,709 --> 00:15:45,244  
OF SEA LEVEL RISE

615

00:15:45,244 --> 00:15:46,812  
BETWEEN THESE TWO MISSIONS,

616

00:15:46,812 --> 00:15:47,613  
WE MIGHT THINK ABOUT

617

00:15:47,613 --> 00:15:48,380  
WHAT WE NEED TO DO

618

00:15:48,380 --> 00:15:51,517  
IN RESPONSE TO THAT.

619

00:15:51,517 --> 00:15:52,518  
>> WELL, THANK YOU SO MUCH

620

00:15:52,518 --> 00:15:53,719  
FOR JOINING US TODAY, BEN,

621

00:15:53,719 --> 00:15:54,753  
AND WALKING US THROUGH

622

00:15:54,753 --> 00:15:56,388  
THESE AMAZING SCIENCE RESULTS

623

00:15:56,388 --> 00:15:58,757  
ON EARTH'S ICE.

624

00:15:58,757 --> 00:15:59,391  
FOR THOSE OF YOU

625

00:15:59,391 --> 00:16:00,192  
JUST JOINING US,

626  
00:16:00,192 --> 00:16:01,193  
WE'RE LEARNING ABOUT

627  
00:16:01,193 --> 00:16:02,194  
JUST RELEASED FINDINGS

628  
00:16:02,194 --> 00:16:04,129  
ABOUT EARTH'S ICE.

629  
00:16:04,129 --> 00:16:04,830  
ONE OF THE THINGS

630  
00:16:04,830 --> 00:16:05,931  
WE'VE HEARD OUR EXPERTS MENTION

631  
00:16:05,931 --> 00:16:08,334  
A FEW TIMES IS SEA LEVEL RISE.

632  
00:16:08,334 --> 00:16:10,436  
I'M JOINED BY DR. HELEN FRICKER,

633  
00:16:10,436 --> 00:16:11,804  
GLACIOLOGIST,

634  
00:16:11,804 --> 00:16:12,504  
WHO IS GOING TO GIVE US

635  
00:16:12,504 --> 00:16:13,305  
A BETTER IDEA

636  
00:16:13,305 --> 00:16:15,341  
OF HOW SEA LEVEL RISE WORKS.

637  
00:16:15,341 --> 00:16:17,142  
HELEN, THANK YOU FOR JOINING US.

638  
00:16:17,142 --> 00:16:17,676

>> YOU'RE WELCOME.

639

00:16:17,676 --> 00:16:19,278

THANK YOU FOR HAVING ME.

640

00:16:19,278 --> 00:16:20,012

>> SO, I UNDERSTAND

641

00:16:20,012 --> 00:16:20,579

IT'S NOT JUST

642

00:16:20,579 --> 00:16:21,914

WARMER AIR TEMPERATURES

643

00:16:21,914 --> 00:16:23,515

THAT ARE MELTING ICE,

644

00:16:23,515 --> 00:16:24,950

BUT WARMER OCEAN TEMPERATURES

645

00:16:24,950 --> 00:16:25,951

AS WELL.

646

00:16:25,951 --> 00:16:26,819

HOW DOES THE OCEAN

647

00:16:26,819 --> 00:16:29,788

HAVE AN IMPACT ON ANTARCTIC ICE?

648

00:16:29,788 --> 00:16:30,689

>> THAT'S RIGHT.

649

00:16:30,689 --> 00:16:31,623

SO, ALL AROUND

650

00:16:31,623 --> 00:16:34,560

THE EDGES OF ANTARCTICA

651  
00:16:34,560 --> 00:16:37,229  
THERE ARE PARTS OF THE ICE SHEET

652  
00:16:37,229 --> 00:16:38,897  
THAT REACH THE OCEAN.

653  
00:16:38,897 --> 00:16:40,499  
AND IN THESE PLACES,

654  
00:16:40,499 --> 00:16:42,935  
WE HAVE VERY LARGE AREAS

655  
00:16:42,935 --> 00:16:43,869  
OF THICK ICE

656  
00:16:43,869 --> 00:16:45,170  
THAT'S FLOATING ON TOP OF

657  
00:16:45,170 --> 00:16:46,271  
THE OCEAN.

658  
00:16:46,271 --> 00:16:48,273  
WE CALL THESE ICE SHELVES.

659  
00:16:48,273 --> 00:16:49,141  
NOW SOME OF THESE ICE SHELVES

660  
00:16:49,141 --> 00:16:49,975  
ARE SO BIG

661  
00:16:49,975 --> 00:16:52,811  
THAT THEY'RE THE SIZE OF TEXAS

662  
00:16:52,811 --> 00:16:54,313  
OR FRANCE.

663  
00:16:54,313 --> 00:16:56,582

SOME OF THEM ARE MUCH SMALLER.

664

00:16:56,582 --> 00:16:57,816

BUT WHAT THEY DO IS

665

00:16:57,816 --> 00:17:00,119

THEY HOLD BACK THE ICE,

666

00:17:00,119 --> 00:17:02,020

THE GROUNDED ICE ON --

667

00:17:02,020 --> 00:17:03,655

SITTING ON THE MAIN PART

668

00:17:03,655 --> 00:17:05,224

OF THE CONTINENT.

669

00:17:05,224 --> 00:17:06,592

AND SO, IT'S KIND OF LIKE

670

00:17:06,592 --> 00:17:07,726

A BUFFER REGION

671

00:17:07,726 --> 00:17:10,362

WHERE IF THIS ICE SHELF

672

00:17:10,362 --> 00:17:11,697

WASN'T THERE,

673

00:17:11,697 --> 00:17:13,799

THE ICE WOULD FLOW MUCH FASTER

674

00:17:13,799 --> 00:17:14,867

INTO THE OCEAN.

675

00:17:14,867 --> 00:17:15,601

YOU COULD THINK OF THEM

676

00:17:15,601 --> 00:17:16,468

LIKE A BUTTRESS,

677

00:17:16,468 --> 00:17:18,070

AN ARCHITECTURAL BUTTRESS

678

00:17:18,070 --> 00:17:18,804

SITTING THERE

679

00:17:18,804 --> 00:17:20,339

HOLDING THE GROUNDED ICE

680

00:17:20,339 --> 00:17:22,875

BACK ONTO THE ICE SHEET.

681

00:17:22,875 --> 00:17:23,842

>> SO, WHEN ICE THAT IS

682

00:17:23,842 --> 00:17:25,210

ALREADY FLOATING MELTS,

683

00:17:25,210 --> 00:17:28,480

HOW DOES THAT RAISE SEA LEVELS?

684

00:17:28,480 --> 00:17:29,081

>> RIGHT.

685

00:17:29,081 --> 00:17:30,516

SO, THE ICE THAT'S FLOATING

686

00:17:30,516 --> 00:17:31,183

THE ICE SHELVES,

687

00:17:31,183 --> 00:17:32,718

WHEN IT MELTS

688

00:17:32,718 --> 00:17:34,086

IT DOESN'T RAISE SEA LEVEL

689

00:17:34,086 --> 00:17:35,087

STRAIGHTAWAY BECAUSE

690

00:17:35,087 --> 00:17:37,022

THAT ICE IS ALREADY FLOATING.

691

00:17:37,022 --> 00:17:37,723

YOU CAN THINK OF IT

692

00:17:37,723 --> 00:17:41,226

A BIT LIKE YOUR GLASS OF WATER.

693

00:17:41,226 --> 00:17:43,195

I HAVE A DEMONSTRATION HERE.

694

00:17:43,195 --> 00:17:44,696

THIS IS A GLASS WHICH HAPPENS

695

00:17:44,696 --> 00:17:47,199

TO HAVE ANTARCTICA ON IT.

696

00:17:47,199 --> 00:17:49,635

IF I PUT ICE CUBES IN THE GLASS,

697

00:17:49,635 --> 00:17:50,502

IF YOU WATCH

698

00:17:50,502 --> 00:17:52,438

THE LEVEL OF THE WATER,

699

00:17:52,438 --> 00:17:54,573

IT WILL GO UP.

700

00:17:54,573 --> 00:17:55,274

THIS IS BECAUSE

701  
00:17:55,274 --> 00:17:59,077  
I'M ADDING MORE ICE TO MY GLASS.

702  
00:17:59,077 --> 00:18:01,146  
AND SO, THE LEVEL

703  
00:18:01,146 --> 00:18:01,947  
HAS GONE UP ABOVE,

704  
00:18:01,947 --> 00:18:02,681  
SO NOW YOU CAN'T SEE

705  
00:18:02,681 --> 00:18:04,049  
ANTARCTICA ANYMORE.

706  
00:18:04,049 --> 00:18:06,151  
BUT IF THIS ICE MELTS,

707  
00:18:06,151 --> 00:18:07,519  
THEN THE LEVEL OF THE LIQUID

708  
00:18:07,519 --> 00:18:09,755  
IN THE GLASS STAYS THE SAME.

709  
00:18:09,755 --> 00:18:11,290  
AND THIS IS LIKE AN ICE SHELF.

710  
00:18:11,290 --> 00:18:12,925  
WHEN AN ICE SHELF MELTS,

711  
00:18:12,925 --> 00:18:14,726  
THE LEVEL STAYS THE SAME;

712  
00:18:14,726 --> 00:18:16,728  
HOWEVER, WHAT IT'S DOING IS

713  
00:18:16,728 --> 00:18:17,796

IT'S REDUCING

714

00:18:17,796 --> 00:18:19,531

THIS BUTTRESSING FORCE

715

00:18:19,531 --> 00:18:20,232

THAT I JUST TALKED ABOUT

716

00:18:20,232 --> 00:18:21,300

THAT THE ICE SHELVES PLAY

717

00:18:21,300 --> 00:18:22,367

IN THE ICE SHEET.

718

00:18:22,367 --> 00:18:23,735

AND IF YOU REDUCE THAT

719

00:18:23,735 --> 00:18:25,704

BUTTRESSING FORCE AND MAKE --

720

00:18:25,704 --> 00:18:26,605

IF THE ICE SHELF

721

00:18:26,605 --> 00:18:27,673

BECOMES THINNER,

722

00:18:27,673 --> 00:18:30,442

ITS BUTTRESSING FORCE IS LESS

723

00:18:30,442 --> 00:18:32,711

AND THE GROUNDED ICE BEHIND IT

724

00:18:32,711 --> 00:18:34,313

WILL BE ADDED TO THE OCEAN.

725

00:18:34,313 --> 00:18:35,447

AND THAT'S JUST LIKE THE ICE

726  
00:18:35,447 --> 00:18:38,984  
THAT I ADDED TO THE GLASS.

727  
00:18:38,984 --> 00:18:39,585  
>> THAT'S A GREAT

728  
00:18:39,585 --> 00:18:41,019  
DEMONSTRATION.

729  
00:18:41,019 --> 00:18:42,187  
SO, WHAT IS THAT MADE YOU

730  
00:18:42,187 --> 00:18:45,724  
WANT TO STUDY ICE?

731  
00:18:45,724 --> 00:18:47,292  
>> I WANTED TO STUDY ICE

732  
00:18:47,292 --> 00:18:49,194  
AND, IN PARTICULAR ANTARCTICA,

733  
00:18:49,194 --> 00:18:50,796  
WHEN I STARTED MY PH.D.

734  
00:18:50,796 --> 00:18:53,198  
I JUST FOUND IT SO FASCINATING

735  
00:18:53,198 --> 00:18:54,967  
TO THINK ABOUT THIS.

736  
00:18:54,967 --> 00:18:55,601  
FIRST OF ALL,

737  
00:18:55,601 --> 00:18:56,401  
THIS CONTINENT

738  
00:18:56,401 --> 00:18:59,238

AT THE BOTTOM OF THE EARTH

739

00:18:59,238 --> 00:19:00,472

THAT'S SO FAR AWAY

740

00:19:00,472 --> 00:19:01,707

FROM EVERYWHERE ELSE

741

00:19:01,707 --> 00:19:04,243

BUT IT'S SO IMPORTANT TO US ALL.

742

00:19:04,243 --> 00:19:06,645

THIS INTERCONNECTION OF

743

00:19:06,645 --> 00:19:08,146

THE ENTIRE EARTH SYSTEM

744

00:19:08,146 --> 00:19:10,115

WITH THESE DIFFERENT FORCINGS,

745

00:19:10,115 --> 00:19:12,251

THE ATMOSPHERE, THE OCEAN

746

00:19:12,251 --> 00:19:13,552

AND JUST ALSO THE THRILL

747

00:19:13,552 --> 00:19:16,021

OF ANTARCTIC EXPLORATION.

748

00:19:16,021 --> 00:19:18,023

AND THEN LATER IN MY CAREER,

749

00:19:18,023 --> 00:19:19,124

I'VE ALSO GOT INTERESTED

750

00:19:19,124 --> 00:19:20,058

IN GREENLAND.

751  
00:19:20,058 --> 00:19:21,059  
THE ICE SHEET

752  
00:19:21,059 --> 00:19:22,461  
IN THE NORTHERN HEMISPHERE,

753  
00:19:22,461 --> 00:19:23,495  
VERY SIMILAR PROCESSES

754  
00:19:23,495 --> 00:19:24,363  
ACTING THERE,

755  
00:19:24,363 --> 00:19:26,465  
BUT IN DIFFERENT-

756  
00:19:26,465 --> 00:19:27,666  
DIFFERENT AMOUNTS.

757  
00:19:27,666 --> 00:19:28,667  
SO TOGETHER,

758  
00:19:28,667 --> 00:19:29,668  
ALL OF THE ICE SHEETS

759  
00:19:29,668 --> 00:19:31,470  
ARE JUST SO FASCINATING TO ME.

760  
00:19:31,470 --> 00:19:34,106  
I MEAN, I THINK WE SIT HERE IN,

761  
00:19:34,106 --> 00:19:35,641  
WELL, AT HOME AT THE MOMENT,

762  
00:19:35,641 --> 00:19:38,377  
BUT IN OUR, YOU KNOW,

763  
00:19:38,377 --> 00:19:40,145

## INHABITED PLACES THAT WE LIVE

764

00:19:40,145 --> 00:19:41,280

AND WE DON'T REALLY THINK

765

00:19:41,280 --> 00:19:43,248

THAT THESE CONTINENTS

766

00:19:43,248 --> 00:19:44,349

THAT ARE SO FAR AWAY

767

00:19:44,349 --> 00:19:45,384

ARE GOING TO AFFECT US.

768

00:19:45,384 --> 00:19:46,285

BUT ACTUALLY, THEY DO

769

00:19:46,285 --> 00:19:47,886

BECAUSE SEA LEVEL

770

00:19:47,886 --> 00:19:49,288

IS GOING TO AFFECT MANY,

771

00:19:49,288 --> 00:19:50,522

MANY PEOPLE

772

00:19:50,522 --> 00:19:52,424

ALL AROUND THE WORLD.

773

00:19:52,424 --> 00:19:53,425

>> YEAH.

774

00:19:53,425 --> 00:19:54,192

THANK YOU SO MUCH FOR

775

00:19:54,192 --> 00:19:55,160

EXPLAINING THAT TO US, HELEN.

776

00:19:55,160 --> 00:19:56,194

I KNOW IT REALLY HELPED ME

777

00:19:56,194 --> 00:19:56,995

GRASP THE CONCEPT OF

778

00:19:56,995 --> 00:19:58,830

HOW SEA LEVEL RISE WORKS

779

00:19:58,830 --> 00:19:59,798

AND HOW ALL OF THESE THINGS

780

00:19:59,798 --> 00:20:00,832

ARE INTERCONNECTED.

781

00:20:00,832 --> 00:20:01,500

THANK YOU SO MUCH

782

00:20:01,500 --> 00:20:03,435

FOR JOINING US.

783

00:20:03,435 --> 00:20:04,836

>> OH, YOU'RE WELCOME.

784

00:20:04,836 --> 00:20:06,038

>> SO, ANOTHER WAY TO UNDERSTAND

785

00:20:06,038 --> 00:20:06,972

SEA LEVEL RISE

786

00:20:06,972 --> 00:20:07,606

IS TO GO INTO

787

00:20:07,606 --> 00:20:08,607

SOME OF THE COMMUNITIES

788

00:20:08,607 --> 00:20:09,875

THAT ARE BEING IMPACTED

789

00:20:09,875 --> 00:20:11,777  
BY RISING WATERS.

790

00:20:11,777 --> 00:20:12,978  
RECENTLY, OUR TEAM VISITED

791

00:20:12,978 --> 00:20:14,346  
THE CITY OF NORFOLK

792

00:20:14,346 --> 00:20:15,380  
AND THE VIRGINIA INSTITUTE

793

00:20:15,380 --> 00:20:17,049  
OF MARINE SCIENCE TO SEE

794

00:20:17,049 --> 00:20:18,850  
HOW THE HAMPTON ROADS REGION

795

00:20:18,850 --> 00:20:20,619  
IS RESPONDING TO SEA LEVEL RISE

796

00:20:20,619 --> 00:20:21,520  
AND THE EFFECTS

797

00:20:21,520 --> 00:20:22,421  
OF CLIMATE CHANGE.

798

00:20:22,421 --> 00:20:23,722  
LET'S TAKE A LOOK.

799

00:20:23,722 --> 00:20:24,523  
>> SEA LEVEL RISE IS

800

00:20:24,523 --> 00:20:26,391  
A MEASUREABLE DIFFERENCE

801  
00:20:26,391 --> 00:20:27,259  
IN WATER LEVEL OVER TIME.

802  
00:20:27,259 --> 00:20:28,226  
AND DIRECTLY CONTRIBUTING

803  
00:20:28,226 --> 00:20:29,194  
TO THAT IS, OF COURSE,

804  
00:20:29,194 --> 00:20:30,095  
CLIMATE CHANGE.

805  
00:20:30,095 --> 00:20:32,030  
SO, AS THE TEMPERATURES RISE,

806  
00:20:32,030 --> 00:20:33,332  
POLAR ICECAPS MELT AND

807  
00:20:33,332 --> 00:20:35,267  
SLOWLY THE WATER LEVEL RISES

808  
00:20:35,267 --> 00:20:36,702  
THROUGHOUT THE GLOBE.

809  
00:20:36,702 --> 00:20:38,003  
AND THERE ARE LOCALIZED IMPACTS

810  
00:20:38,003 --> 00:20:39,204  
OF SEA LEVEL RISE.

811  
00:20:39,204 --> 00:20:39,938  
>> IN HAMPTON ROADS

812  
00:20:39,938 --> 00:20:41,707  
WE ARE PARTICULARLY VULNERABLE

813  
00:20:41,707 --> 00:20:43,976

TO COASTAL FLOODING.

814

00:20:43,976 --> 00:20:44,943

>> THE HAMPTON ROADS REGION

815

00:20:44,943 --> 00:20:46,678

OF VIRGINIA IS THE SECOND MOST

816

00:20:46,678 --> 00:20:48,180

HEAVILY-IMPACTED REGION

817

00:20:48,180 --> 00:20:49,181

IN THE UNITED STATES

818

00:20:49,181 --> 00:20:49,815

WHEN WE TALK ABOUT

819

00:20:49,815 --> 00:20:51,083

SEA LEVEL RISE AFTER,

820

00:20:51,083 --> 00:20:52,284

OF COURSE, NEW ORLEANS.

821

00:20:52,284 --> 00:20:53,018

>> WE'RE STANDING HERE

822

00:20:53,018 --> 00:20:53,852

AT THE HAGUE,

823

00:20:53,852 --> 00:20:54,987

PART OF NORFOLK, VIRGINIA,

824

00:20:54,987 --> 00:20:56,355

WHICH IS IN THE MOUTH

825

00:20:56,355 --> 00:20:57,356

OF THE CHESAPEAKE BAY

826  
00:20:57,356 --> 00:20:58,724  
IN SOUTHEAST VIRGINIA.

827  
00:20:58,724 --> 00:20:59,925  
THIS AREA WILL SEE

828  
00:20:59,925 --> 00:21:01,360  
WHAT WE CALL BLUE SKY FLOODING

829  
00:21:01,360 --> 00:21:02,127  
QUITE REGULARLY

830  
00:21:02,127 --> 00:21:03,962  
WHERE THERE'S NO STORM EVENT.

831  
00:21:03,962 --> 00:21:05,297  
AND SO, THIS WATER COMES UP

832  
00:21:05,297 --> 00:21:06,965  
OVER ONTO THIS SIDE,

833  
00:21:06,965 --> 00:21:08,500  
WATER BREACHES THE BULKHEAD,

834  
00:21:08,500 --> 00:21:10,035  
FLOODS THE AREA AROUND IT

835  
00:21:10,035 --> 00:21:11,770  
AND THE ROAD BEHIND ME, AS WELL.

836  
00:21:11,770 --> 00:21:12,771  
>> A LOT OF MY RESEARCH

837  
00:21:12,771 --> 00:21:13,739  
AT THE VIRGINIA INSTITUTE

838  
00:21:13,739 --> 00:21:14,740

OF MARINE SCIENCE

839

00:21:14,740 --> 00:21:16,008

INVOLVES THE DEVELOPMENT

840

00:21:16,008 --> 00:21:16,942

OF PHYSICS-BASED

841

00:21:16,942 --> 00:21:18,744

HYDRODYNAMIC MODELS.

842

00:21:18,744 --> 00:21:19,845

THESE MODELS TELL US

843

00:21:19,845 --> 00:21:20,379

WHERE FLOODING

844

00:21:20,379 --> 00:21:20,979

IS GOING TO HAPPEN

845

00:21:20,979 --> 00:21:21,847

BEFORE IT DOES,

846

00:21:21,847 --> 00:21:23,315

WHEN, AND FOR HOW LONG.

847

00:21:23,315 --> 00:21:24,349

BUT YOU'LL SEE ALL OF THESE

848

00:21:24,349 --> 00:21:25,684

INDIVIDUAL STRUCTURES HERE,

849

00:21:25,684 --> 00:21:27,119

MOST OF THEM NEAR THE WATERFRONT

850

00:21:27,119 --> 00:21:28,420

ARE INUNDATED.

851  
00:21:28,420 --> 00:21:29,788  
INFORMATION PROVIDED BY

852  
00:21:29,788 --> 00:21:30,856  
NASA SATELLITES

853  
00:21:30,856 --> 00:21:31,790  
MOSTLY ALLOWS US

854  
00:21:31,790 --> 00:21:33,125  
TO VALIDATE THE ACCURACY

855  
00:21:33,125 --> 00:21:33,825  
OF OUR MODEL

856  
00:21:33,825 --> 00:21:34,593  
IN TERMS OF TELLING US

857  
00:21:34,593 --> 00:21:35,394  
WHERE THE FLOODING

858  
00:21:35,394 --> 00:21:37,396  
ACTUALLY HAPPENED FROM SPACE.

859  
00:21:37,396 --> 00:21:38,363  
>> THE MAPS THAT COME OUT

860  
00:21:38,363 --> 00:21:39,731  
OF THE MODELS ARE REALLY USEFUL

861  
00:21:39,731 --> 00:21:41,099  
AT SHOWING THE DEPTH OF WATER

862  
00:21:41,099 --> 00:21:41,867  
THROUGHOUT THE CITY

863  
00:21:41,867 --> 00:21:42,734

AT THE STREET LEVEL

864

00:21:42,734 --> 00:21:43,935  
SO THAT WE CAN, YOU KNOW,

865

00:21:43,935 --> 00:21:44,736  
JUST MAKE BETTER

866

00:21:44,736 --> 00:21:45,637  
DATA-DRIVEN DECISIONS

867

00:21:45,637 --> 00:21:46,638  
AROUND THE CITY.

868

00:21:46,638 --> 00:21:47,739  
>> THESE ARE TWO STANDARD

869

00:21:47,739 --> 00:21:49,474  
ACTIVE REMOTE SENSORS.

870

00:21:49,474 --> 00:21:50,442  
>> THIS IS AN EXAMPLE OF

871

00:21:50,442 --> 00:21:52,010  
A PRESSURE TRANSDUCER

872

00:21:52,010 --> 00:21:53,245  
WATER SENSOR.

873

00:21:53,245 --> 00:21:54,346  
AND WHAT WE'VE BEEN TRYING TO DO

874

00:21:54,346 --> 00:21:55,747  
IS COMPARE DATA

875

00:21:55,747 --> 00:21:57,315  
LIKE NASA SATELLITE IMAGERY

876  
00:21:57,315 --> 00:21:58,884  
TO SEE HOW IT COMPARES TO

877  
00:21:58,884 --> 00:21:59,818  
THE ACCURACY

878  
00:21:59,818 --> 00:22:00,519  
THAT WE'RE GETTING

879  
00:22:00,519 --> 00:22:01,253  
AT THE STREET LEVEL.

880  
00:22:01,253 --> 00:22:01,953  
SO, WHEN YOU

881  
00:22:01,953 --> 00:22:02,521  
PUT IT ALL TOGETHER,

882  
00:22:02,521 --> 00:22:03,388  
IT'S VERY VALUABLE.

883  
00:22:03,388 --> 00:22:04,890  
>> ONE OF THE MAIN APPLICATIONS,

884  
00:22:04,890 --> 00:22:06,525  
LIKE IT'S REALLY TRYING TO SEE,

885  
00:22:06,525 --> 00:22:07,793  
BEFORE THESE EVENTS HAPPEN,

886  
00:22:07,793 --> 00:22:08,493  
WHERE IS GOING TO BE

887  
00:22:08,493 --> 00:22:09,327  
THE PROBLEM AREAS

888  
00:22:09,327 --> 00:22:10,562

IN OUR COMMUNITIES.

889

00:22:10,562 --> 00:22:11,430

>> DETERMINE WHAT ROADS

890

00:22:11,430 --> 00:22:12,431

NEED TO BE CLOSED

891

00:22:12,431 --> 00:22:13,131

OR INTERSECTIONS

892

00:22:13,131 --> 00:22:14,499

NEED TO BE CLOSED WHEN.

893

00:22:14,499 --> 00:22:15,400

>> WHERE THESE PROJECTS

894

00:22:15,400 --> 00:22:16,635

SHOULD BE PERMITTED.

895

00:22:16,635 --> 00:22:17,903

WILL THIS BUILDING LAST

896

00:22:17,903 --> 00:22:19,171

THE 30-YEAR LIFE

897

00:22:19,171 --> 00:22:20,806

OF THE STANDARD MORTGAGE?

898

00:22:20,806 --> 00:22:22,407

OUR MODELS, AS A REPRESENTATION

899

00:22:22,407 --> 00:22:23,008

OF REALITY,

900

00:22:23,008 --> 00:22:24,309

HAVE TO BE AS ACCURATE

901  
00:22:24,309 --> 00:22:24,876  
AS POSSIBLE.

902  
00:22:24,876 --> 00:22:25,811  
THE ADDITIONAL INFORMATION

903  
00:22:25,811 --> 00:22:26,912  
FROM THE NASA SATELLITES

904  
00:22:26,912 --> 00:22:28,680  
LANDSAT, NISTAR AND [INDISTINCT]

905  
00:22:28,680 --> 00:22:29,414  
REALLY HELPS US

906  
00:22:29,414 --> 00:22:30,849  
CALIBRATE OUR MODEL.

907  
00:22:30,849 --> 00:22:31,950  
>> HAVING THAT REGIONAL

908  
00:22:31,950 --> 00:22:32,984  
WATER-DEPTH MAP

909  
00:22:32,984 --> 00:22:33,819  
REALLY HELPS US

910  
00:22:33,819 --> 00:22:35,353  
HAVE AN UNDERSTANDING

911  
00:22:35,353 --> 00:22:36,488  
WHAT THE FUTURE DAY-TO-DAY

912  
00:22:36,488 --> 00:22:37,589  
LOOKS LIKE IN NORFOLK

913  
00:22:37,589 --> 00:22:38,657

WITH SEA LEVEL RISE.

914

00:22:38,657 --> 00:22:39,357

>> AND SO,

915

00:22:39,357 --> 00:22:39,925

A BETTER UNDERSTANDING

916

00:22:39,925 --> 00:22:40,659

OF SEA LEVEL RISE

917

00:22:40,659 --> 00:22:42,060

WILL HELP YOU DECIDE THE PLACES

918

00:22:42,060 --> 00:22:43,295

WHERE YOU MAY WISH TO WORK

919

00:22:43,295 --> 00:22:44,796

OR LIVE IN THE NEAR FUTURE.

920

00:22:44,796 --> 00:22:45,397

IT ALSO HELPS

921

00:22:45,397 --> 00:22:46,198

TO BETTER UNDERSTAND

922

00:22:46,198 --> 00:22:48,366

SPECIFICALLY WHAT YOUR RISK IS

923

00:22:48,366 --> 00:22:49,901

INHERIT NOT JUST WITH FLOODING,

924

00:22:49,901 --> 00:22:50,902

BUT ALSO WITH THE CHANGES

925

00:22:50,902 --> 00:22:51,737

TO OUR CLIMATE AS

926

00:22:51,737 --> 00:22:53,538

OUR WORLD CONTINUES TO CHANGE,

927

00:22:53,538 --> 00:22:54,306

EITHER FOR THE BETTER

928

00:22:54,306 --> 00:22:56,775

OR WORSE.

929

00:22:56,775 --> 00:22:57,943

>> THAT WAS AN INFORMATIVE

930

00:22:57,943 --> 00:22:59,010

LOOK AT HOW COMMUNITIES

931

00:22:59,010 --> 00:23:00,846

IN THE HAMPTON ROADS REGION

932

00:23:00,846 --> 00:23:01,713

ARE DEALING WITH

933

00:23:01,713 --> 00:23:03,215

THE IMPACT OF SEA LEVELS RISING

934

00:23:03,215 --> 00:23:04,683

ALONG THEIR COAST.

935

00:23:04,683 --> 00:23:05,217

THANK YOU TO

936

00:23:05,217 --> 00:23:06,118

THE CITY OF NORFOLK

937

00:23:06,118 --> 00:23:07,486

AND THE VIRGINIA INSTITUTE

938

00:23:07,486 --> 00:23:08,553

OF MARINE SCIENCE

939

00:23:08,553 --> 00:23:09,121  
FOR SHOWING US

940

00:23:09,121 --> 00:23:10,322  
HOW THEY USE NASA DATA

941

00:23:10,322 --> 00:23:12,290  
IN THESE SITUATIONS.

942

00:23:12,290 --> 00:23:13,725  
SPEAKING OF NASA DATA,

943

00:23:13,725 --> 00:23:14,826  
WE'VE TALKED A LOT ABOUT

944

00:23:14,826 --> 00:23:15,894  
HOW THE NEW INFORMATION

945

00:23:15,894 --> 00:23:17,195  
GATHERED FROM ICESAT-2

946

00:23:17,195 --> 00:23:18,296  
WILL HELP US.

947

00:23:18,296 --> 00:23:19,197  
I BET YOU DIDN'T KNOW THAT

948

00:23:19,197 --> 00:23:19,965  
IN ADDITION TO

949

00:23:19,965 --> 00:23:21,633  
THE DATA GATHERED FROM SPACE,

950

00:23:21,633 --> 00:23:22,667  
WE HAVE RESEARCHERS

951  
00:23:22,667 --> 00:23:24,035  
TRAVELING INTO THE FIELD

952  
00:23:24,035 --> 00:23:25,670  
TO CONDUCT GROUND OBSERVATIONS

953  
00:23:25,670 --> 00:23:26,972  
THAT VALIDATE WHAT WE'RE SEEING

954  
00:23:26,972 --> 00:23:28,740  
FROM THE VANTAGE OF SPACE.

955  
00:23:28,740 --> 00:23:29,374  
LET'S TAKE A LOOK AT

956  
00:23:29,374 --> 00:23:30,208  
THE FOOTAGE TAKEN

957  
00:23:30,208 --> 00:23:30,876  
FROM SOME OF

958  
00:23:30,876 --> 00:23:32,144  
THOSE FIELD CAMPAIGNS TO

959  
00:23:32,144 --> 00:23:35,480  
GET A SENSE OF WHAT IT'S LIKE.

960  
00:23:43,188 --> 00:23:44,055  
>> HI, THERE.

961  
00:23:44,055 --> 00:23:46,057  
I'M [INDISTINCT] FROM NASA

962  
00:23:46,057 --> 00:23:49,828  
AND WE ARE ON PENNY BAY

963  
00:23:49,828 --> 00:23:51,663

DOING ICESAT-2 VALIDATION WORK

964

00:23:51,663 --> 00:23:52,564

ON SEA ICE

965

00:23:52,564 --> 00:23:54,633

I'M MEASURING SEA ICE THICKNESS

966

00:23:54,633 --> 00:23:56,067

WITH AN EM31.

967

00:23:56,067 --> 00:23:59,037

>> AND I'M MEASURING SNOW DEPTH

968

00:23:59,037 --> 00:24:01,273

WITH A MAGNAPROBE.

969

00:24:01,273 --> 00:24:02,707

>> WHAT YA DOIN', KELLY?

970

00:24:10,382 --> 00:24:11,216

>> TRYING TO BREATHE?

971

00:24:11,216 --> 00:24:11,950

WHAT'S THE PROBLEM

972

00:24:11,950 --> 00:24:13,652

WITH YOUR BREATHING?

973

00:24:17,289 --> 00:24:18,089

>> SO, IT'S REALLY COOL

974

00:24:18,089 --> 00:24:19,958

TO BE RIGHT NEXT TO ONE.

975

00:24:19,958 --> 00:24:21,159

YOU CAN SEE ALL THE STRUCTURE

976  
00:24:21,159 --> 00:24:22,160  
IN THE GLACIER.

977  
00:24:22,160 --> 00:24:23,628  
YOU KNOW, THESE GLACIERS FORM

978  
00:24:23,628 --> 00:24:25,764  
AS SNOW FROM YEAR AFTER YEAR

979  
00:24:25,764 --> 00:24:27,098  
PACKS ON TOP AND

980  
00:24:27,098 --> 00:24:29,201  
COMPRESSES DOWN INTO ICE.

981  
00:24:29,201 --> 00:24:30,402  
AND SO, THEY PROVIDE

982  
00:24:30,402 --> 00:24:31,503  
A HISTORY OF THE CLIMATE

983  
00:24:31,503 --> 00:24:33,138  
AS WELL AS BEING

984  
00:24:33,138 --> 00:24:36,107  
REALLY BEAUTIFUL.

985  
00:24:36,741 --> 00:24:37,375  
>> WOW!

986  
00:24:37,375 --> 00:24:38,577  
WHAT AN INCREDIBLE PERSPECTIVE

987  
00:24:38,577 --> 00:24:40,111  
TO SEE HOW RESEARCHERS WORK

988  
00:24:40,111 --> 00:24:41,980

IN THESE EXTREME ENVIRONMENTS.

989

00:24:41,980 --> 00:24:44,015

IT'S REALLY AMAZING.

990

00:24:44,015 --> 00:24:44,916

TO TELL US MORE ABOUT

991

00:24:44,916 --> 00:24:45,984

SOME OF OUR OWN EXPERIENCES

992

00:24:45,984 --> 00:24:47,819

WORKING IN ANTARCTICA,

993

00:24:47,819 --> 00:24:49,955

I'M JOINED BY BROOKE MEDLEY.

994

00:24:49,955 --> 00:24:51,923

THANK YOU FOR BEING HERE TODAY.

995

00:24:51,923 --> 00:24:53,892

>> THANK YOU FOR HAVING ME ON.

996

00:24:53,892 --> 00:24:54,492

>> SO, BROOKE,

997

00:24:54,492 --> 00:24:55,393

YOU'RE THE DEPUTY

998

00:24:55,393 --> 00:24:56,294

PROJECT SCIENTIST

999

00:24:56,294 --> 00:24:58,396

FOR OPERATION ICEBRIDGE.

1000

00:24:58,396 --> 00:24:59,965

COULD YOU EXPLAIN WHERE AND WHY

1001  
00:24:59,965 --> 00:25:00,665  
YOU GO INTO THE FIELD

1002  
00:25:00,665 --> 00:25:01,933  
TO STUDY ICE?

1003  
00:25:01,933 --> 00:25:03,134  
WHY DID YOU GO INTO THE FIELD

1004  
00:25:03,134 --> 00:25:05,503  
WHEN WE CAN JUST FLY OVER IT?

1005  
00:25:05,503 --> 00:25:06,238  
>> THAT'S A REALLY GREAT

1006  
00:25:06,238 --> 00:25:06,805  
QUESTION.

1007  
00:25:06,805 --> 00:25:08,006  
SO, I'VE HAD

1008  
00:25:08,006 --> 00:25:10,375  
THE FORTUNATE OPPORTUNITY

1009  
00:25:10,375 --> 00:25:12,143  
TO BE ABLE TO GO TO

1010  
00:25:12,143 --> 00:25:13,778  
BOTH GREENLAND TWICE LAST YEAR

1011  
00:25:13,778 --> 00:25:16,114  
AND ANTARCTICA, AS WELL,

1012  
00:25:16,114 --> 00:25:17,482  
MOST RECENTLY ANTARCTICA.

1013  
00:25:17,482 --> 00:25:19,851

I JUST GOT BACK A FEW MONTHS AGO

1014

00:25:19,851 --> 00:25:21,987

FROM ANTARCTICA

1015

00:25:21,987 --> 00:25:23,722

WHERE WE ACTUALLY WERE

1016

00:25:23,722 --> 00:25:26,291

ON THE GROUND, ON THE ICE

1017

00:25:26,291 --> 00:25:27,859

TAKING MEASUREMENTS

1018

00:25:27,859 --> 00:25:29,694

BOTH OF SURFACE ELEVATION,

1019

00:25:29,694 --> 00:25:31,463

WHICH IS WHAT WE SEE

1020

00:25:31,463 --> 00:25:32,664

WITH ICESAT-2,

1021

00:25:32,664 --> 00:25:34,366

BUT ALSO OTHER SORT

1022

00:25:34,366 --> 00:25:35,200

OF MEASUREMENTS

1023

00:25:35,200 --> 00:25:36,534

OF HOW MUCH SNOW THERE WAS

1024

00:25:36,534 --> 00:25:37,669

ON THE GROUND,

1025

00:25:37,669 --> 00:25:39,838

HOW THICK IS THE ICE,

1026  
00:25:39,838 --> 00:25:41,740  
DIFFERENT SORT OF MEASUREMENTS

1027  
00:25:41,740 --> 00:25:43,642  
THAT HELP US BETTER INTERPRET

1028  
00:25:43,642 --> 00:25:44,910  
WHAT WE CAN SEE

1029  
00:25:44,910 --> 00:25:46,411  
FROM SATELLITE --

1030  
00:25:46,411 --> 00:25:46,978  
FROM ONLY

1031  
00:25:46,978 --> 00:25:48,346  
JUST THE SATELLITE DATA.

1032  
00:25:48,346 --> 00:25:49,814  
BUT WHILE WE WERE IN THE FIELD

1033  
00:25:49,814 --> 00:25:50,715  
IN ANTARCTICA,

1034  
00:25:50,715 --> 00:25:52,250  
WE HAD THE UNIQUE OPPORTUNITY

1035  
00:25:52,250 --> 00:25:54,085  
OF ALSO BEING

1036  
00:25:54,085 --> 00:25:55,186  
IN THE SAME LOCATION

1037  
00:25:55,186 --> 00:25:56,788  
AS OPERATION ICEBRIDGE,

1038  
00:25:56,788 --> 00:25:58,590

WHICH IS AN AIRBORNE

1039

00:25:58,590 --> 00:25:59,557

NASA MISSION.

1040

00:25:59,557 --> 00:26:01,192

AND SO, OPERATION ICEBRIDGE

1041

00:26:01,192 --> 00:26:02,460

ACTUALLY IS A MORE THAN

1042

00:26:02,460 --> 00:26:04,362

TEN-YEAR-LONG MISSION

1043

00:26:04,362 --> 00:26:05,764

THAT WAS TASKED TO ACTUALLY

1044

00:26:05,764 --> 00:26:08,233

BRIDGE THE GAP BETWEEN ICESAT,

1045

00:26:08,233 --> 00:26:09,701

OUR ORIGINAL LASER

1046

00:26:09,701 --> 00:26:12,003

ALTIMETER MISSION, AND ICESAT-2.

1047

00:26:12,003 --> 00:26:14,005

IT'S THIS REALLY AMAZING CHANCE

1048

00:26:14,005 --> 00:26:16,908

TO HAVE THE HIGH SATELLITE

1049

00:26:16,908 --> 00:26:19,577

IN THE SKY MEASURING THE EARTH,

1050

00:26:19,577 --> 00:26:20,178

THEN WE HAVE

1051  
00:26:20,178 --> 00:26:21,179  
OUR AIRBORNE CAMPAIGN

1052  
00:26:21,179 --> 00:26:21,980  
THAT HAS LOTS OF

1053  
00:26:21,980 --> 00:26:22,681  
DIFFERENT INSTRUMENTS

1054  
00:26:22,681 --> 00:26:25,183  
INCLUDING ONE THAT IS THE SAME,

1055  
00:26:25,183 --> 00:26:25,850  
EFFECTIVELY,

1056  
00:26:25,850 --> 00:26:27,752  
AS WHAT ICESAT-2 HAS ONBOARD.

1057  
00:26:27,752 --> 00:26:28,920  
AND THEN WE'RE ON THE GROUND.

1058  
00:26:28,920 --> 00:26:29,955  
SO, WHAT THAT DOES IS

1059  
00:26:29,955 --> 00:26:30,855  
IT REALLY GIVES US

1060  
00:26:30,855 --> 00:26:32,257  
THE BEST PICTURE

1061  
00:26:32,257 --> 00:26:34,759  
OF HOW THE ICE IS CHANGING

1062  
00:26:34,759 --> 00:26:36,494  
AND WE CAN THEN HAVE THE --

1063  
00:26:36,494 --> 00:26:37,696

HAVE THE MOST CONFIDENCE

1064

00:26:37,696 --> 00:26:39,030

IN OUR MEASUREMENTS

1065

00:26:39,030 --> 00:26:39,931

BECAUSE WE SEE IT

1066

00:26:39,931 --> 00:26:43,134

AT EVERY SINGLE LEVEL.

1067

00:26:43,134 --> 00:26:43,768

>> SO, WHEN YOU'RE

1068

00:26:43,768 --> 00:26:44,970

OUT IN THE FIELD,

1069

00:26:44,970 --> 00:26:45,804

WHAT DOES A NORMAL DAY

1070

00:26:45,804 --> 00:26:48,640

LOOK LIKE FOR YOU?

1071

00:26:48,640 --> 00:26:49,975

>> SO, WHEN YOU'RE --

1072

00:26:49,975 --> 00:26:50,809

SAY IF YOU'RE ON

1073

00:26:50,809 --> 00:26:51,776

OPERATION ICEBRIDGE,

1074

00:26:51,776 --> 00:26:54,179

WHICH IS THE AIRBORNE CAMPAIGN,

1075

00:26:54,179 --> 00:26:55,847

IT'S-IT'S, UM--

1076  
00:26:55,847 --> 00:26:56,781  
WE BASE TYPICALLY

1077  
00:26:56,781 --> 00:26:58,083  
NOT ON THE ICE SHEET

1078  
00:26:58,083 --> 00:26:58,817  
FOR ANTARCTICA.

1079  
00:26:58,817 --> 00:26:59,718  
SO, WE'LL BE BASED OUT OF

1080  
00:26:59,718 --> 00:27:02,287  
SOUTH AMERICA OR AUSTRALIA,

1081  
00:27:02,287 --> 00:27:05,123  
AND WE DO VERY LONG FLIGHTS.

1082  
00:27:05,123 --> 00:27:08,526  
SO, IMAGINE YOU'RE ON A PLANE

1083  
00:27:08,526 --> 00:27:10,695  
FOR 12 HOURS A DAY,

1084  
00:27:10,695 --> 00:27:11,763  
FIVE DAYS A WEEK.

1085  
00:27:11,763 --> 00:27:12,897  
SO, IT CAN BE VERY GRUELING

1086  
00:27:12,897 --> 00:27:14,199  
AND VERY DIFFICULT,

1087  
00:27:14,199 --> 00:27:15,033  
BUT YOU GET TO SEE

1088  
00:27:15,033 --> 00:27:16,001

SOME OF THE MOST FANTASTIC

1089

00:27:16,001 --> 00:27:17,268

SCENERY I'VE EVER

1090

00:27:17,268 --> 00:27:18,703

BEEN ABLE TO SEE.

1091

00:27:18,703 --> 00:27:19,671

WHEN YOU'RE ON THE GROUND,

1092

00:27:19,671 --> 00:27:20,705

IT'S MUCH DIFFERENT.

1093

00:27:20,705 --> 00:27:23,475

SO, YOU'RE ACTUALLY IN THE COLD

1094

00:27:23,475 --> 00:27:25,643

TRYING TO COLLECT MEASUREMENTS

1095

00:27:25,643 --> 00:27:27,012

AND DOING THE BEST THAT YOU CAN,

1096

00:27:27,012 --> 00:27:30,148

EVEN THOUGH YOU'RE IN HUGE GEAR,

1097

00:27:30,148 --> 00:27:32,117

IT'S WINDY

1098

00:27:32,117 --> 00:27:33,551

AND YOU JUST WANT TO

1099

00:27:33,551 --> 00:27:34,552

KIND OF CRAWL BACK INSIDE

1100

00:27:34,552 --> 00:27:36,221

AND GET WARM AGAIN.

1101  
00:27:36,221 --> 00:27:37,689  
SO, A LITTLE BIT

1102  
00:27:37,689 --> 00:27:39,524  
DIFFERENT, UM, PERSPECTIVES,

1103  
00:27:39,524 --> 00:27:40,458  
BUT AT THE END OF THE DAY,

1104  
00:27:40,458 --> 00:27:41,359  
WE'RE TRYING TO ANSWER

1105  
00:27:41,359 --> 00:27:42,927  
THE SAME SCIENCE QUESTIONS,

1106  
00:27:42,927 --> 00:27:44,129  
WHICH IS, UM --

1107  
00:27:44,129 --> 00:27:45,063  
AND COMPLEMENT ONE ANOTHER,

1108  
00:27:45,063 --> 00:27:46,998  
AS WELL.

1109  
00:27:46,998 --> 00:27:48,266  
>> THAT SOUNDS INCREDIBLE.

1110  
00:27:48,266 --> 00:27:49,267  
WHAT IS IT THAT MADE YOU

1111  
00:27:49,267 --> 00:27:52,270  
DECIDE TO STUDY ICE?

1112  
00:27:52,270 --> 00:27:53,238  
>> THAT'S A GREAT QUESTION.

1113  
00:27:53,238 --> 00:27:55,974

SO, I NEVER EVEN REALLY KNEW

1114

00:27:55,974 --> 00:27:57,042

WHAT A GLACIER WAS

1115

00:27:57,042 --> 00:27:59,878

PROBABLY UNTIL I WAS IN COLLEGE.

1116

00:27:59,878 --> 00:28:01,413

AND I'D NEVER SEEN ONE,

1117

00:28:01,413 --> 00:28:02,647

YOU KNOW, WITH MY OWN EYES.

1118

00:28:02,647 --> 00:28:06,317

AND SO, I HAD THE OPPORTUNITY

1119

00:28:06,317 --> 00:28:07,752

TO MOVE TO OREGON

1120

00:28:07,752 --> 00:28:09,554

AFTER UNDERGRADUATE,

1121

00:28:09,554 --> 00:28:10,221

AND WHEN I DID,

1122

00:28:10,221 --> 00:28:11,489

I SAW MY FIRST GLACIER AND I --

1123

00:28:11,489 --> 00:28:13,258

I HATE TO SOUND CLICHÉ,

1124

00:28:13,258 --> 00:28:14,759

BUT I ABSOLUTELY FELL IN LOVE.

1125

00:28:14,759 --> 00:28:16,861

AND SO, AFTER THAT,

1126  
00:28:16,861 --> 00:28:18,463  
I COMPLETELY CHANGED

1127  
00:28:18,463 --> 00:28:20,498  
MY CAREER PATH

1128  
00:28:20,498 --> 00:28:23,668  
TO FOCUS ON RESEARCH,

1129  
00:28:23,668 --> 00:28:24,769  
AND SPECIFICALLY RESEARCH

1130  
00:28:24,769 --> 00:28:26,438  
REGARDING GLACIERS

1131  
00:28:26,438 --> 00:28:27,372  
AND ICE SHEETS.

1132  
00:28:27,372 --> 00:28:31,576  
AND I COULDN'T BE HAPPIER, SO--

1133  
00:28:31,576 --> 00:28:32,043  
>> WOW!

1134  
00:28:32,043 --> 00:28:33,111  
WHAT AN EXPERIENCE.

1135  
00:28:33,111 --> 00:28:34,112  
THANK YOU SO MUCH

1136  
00:28:34,112 --> 00:28:35,080  
FOR JOINING US TODAY

1137  
00:28:35,080 --> 00:28:35,814  
AND TAKING US INTO

1138  
00:28:35,814 --> 00:28:37,816

THE FIELD WITH YOU.

1139

00:28:37,816 --> 00:28:38,450

>> ABSOLUTELY.

1140

00:28:38,450 --> 00:28:40,251

IT WAS MY PLEASURE.

1141

00:28:40,251 --> 00:28:41,219

>> AND THANK YOU

1142

00:28:41,219 --> 00:28:42,720

FOR EVERYONE WATCHING AT HOME

1143

00:28:42,720 --> 00:28:43,388

AS WE EXPLORED

1144

00:28:43,388 --> 00:28:45,090

EARTH'S ICY REGIONS.

1145

00:28:45,090 --> 00:28:46,224

AND EXAMINE SOME OF

1146

00:28:46,224 --> 00:28:47,325

THE LATEST SCIENCE ABOUT

1147

00:28:47,325 --> 00:28:49,427

HOW OUR PLANET IS CHANGING.

1148

00:28:49,427 --> 00:28:50,261

YOU CAN CONTINUE

1149

00:28:50,261 --> 00:28:51,329

LEARNING ABOUT EARTH

1150

00:28:51,329 --> 00:28:52,530

AND THE WAYS NASA STUDIES IT

1151

00:28:52,530 --> 00:28:55,133

BY VISITING NASA.GOV/EARTH

1152

00:28:55,133 --> 00:28:56,634

OR FOLLOWING @NASA\_ICE