



Year 4



Year 1

1
00:00:03,710 --> 00:00:01,730
so what we're talking about is the

2
00:00:05,809 --> 00:00:03,720
Earth's northern polar icecap and what

3
00:00:07,070 --> 00:00:05,819
that's made of is ice that's floating on

4
00:00:08,540 --> 00:00:07,080
top of the Arctic Ocean

5
00:00:10,759 --> 00:00:08,550
and this is ice that's anywhere from

6
00:00:13,160 --> 00:00:10,769
like three feet at the thinnest to about

7
00:00:14,299 --> 00:00:13,170
20 feet at the maximum and we're

8
00:00:15,829 --> 00:00:14,309
interested in this ice for a couple of

9
00:00:17,570 --> 00:00:15,839
reasons the first thing is right now it

10
00:00:19,939 --> 00:00:17,580
functions like a giant mirror on the top

11
00:00:21,470 --> 00:00:19,949
of the planet and when sunlight comes in

12
00:00:24,470 --> 00:00:21,480
it reflects those rays of light back

13
00:00:26,839 --> 00:00:24,480

into space well ice has very different

14

00:00:28,880 --> 00:00:26,849

reflectivity than water water is a lot

15

00:00:30,980 --> 00:00:28,890

darker so as that ice retreats we get

16

00:00:32,780 --> 00:00:30,990

more dark water exposed now that

17

00:00:35,959 --> 00:00:32,790

incoming solar radiation gets absorbed

18

00:00:37,639 --> 00:00:35,969

and it heats up the water and that also

19

00:00:39,680 --> 00:00:37,649

increases the amount of ice that melts

20

00:00:42,500 --> 00:00:39,690

now somebody need to understand too is

21

00:00:44,840 --> 00:00:42,510

that that ice is dynamic every winter it

22

00:00:47,540 --> 00:00:44,850

grows and continues out and then every

23

00:00:49,369 --> 00:00:47,550

summer it melts back the reason people

24

00:00:51,950 --> 00:00:49,379

are concerned right now is that in the

25

00:00:54,740 --> 00:00:51,960

past few years we've seen a dramatic

26
00:00:57,590 --> 00:00:54,750
summer melting that takes the ice back

27
00:01:00,229 --> 00:00:57,600
to a point that's far far far smaller

28
00:01:03,590 --> 00:01:00,239
than we've ever seen it before and in

29
00:01:05,960 --> 00:01:03,600
2009 we set the stage for another year

30
00:01:08,960 --> 00:01:05,970
of this continued melting and reaching

31
00:01:11,210 --> 00:01:08,970
what are near record lows this is

32
00:01:13,310 --> 00:01:11,220
important though not just because of how

33
00:01:15,289 --> 00:01:13,320
much ice we have in terms of extent the

34
00:01:17,870 --> 00:01:15,299
thickness of that ice is also important

35
00:01:19,520 --> 00:01:17,880
and in 2009 what we also released were

36
00:01:22,130 --> 00:01:19,530
some new satellite results where with

37
00:01:23,870 --> 00:01:22,140
first time were able to figure out what

38
00:01:25,760 --> 00:01:23,880

the thickness of the Arctic ice is all

39

00:01:28,670 --> 00:01:25,770

over the place and we're finding is that

40

00:01:31,219 --> 00:01:28,680

it's thinner now and that also thinner

41

00:01:33,280 --> 00:01:31,229

ice is easier to melt and thick ice and

42

00:01:36,920 --> 00:01:33,290

so all of this is setting the stage for

43

00:01:39,109 --> 00:01:36,930

predictions of an Arctic that is

44

00:01:42,319 --> 00:01:39,119

ice-free in summer months somewhere in

45

00:01:44,300 --> 00:01:42,329

the coming decades now we don't know

46

00:01:45,469 --> 00:01:44,310

when it's gonna happen but it's the

47

00:01:48,289 --> 00:01:45,479

kinda thing that a lot of people are

48

00:01:50,359 --> 00:01:48,299

working on trying to model but it's so

49

00:01:52,730 --> 00:01:50,369

obvious that this is happening that

50

00:01:54,590 --> 00:01:52,740

people that live in the Arctic regions

51
00:01:57,590 --> 00:01:54,600
and the countries that border the Arctic

52
00:01:59,780 --> 00:01:57,600
are planning facilities based on there

53
00:02:01,700 --> 00:01:59,790
being less ice there are people building

54
00:02:04,130 --> 00:02:01,710
warm water ports there are oil companies

55
00:02:05,209 --> 00:02:04,140
preparing to do exploration people

56
00:02:07,580 --> 00:02:05,219
talking about using it as a

57
00:02:08,960 --> 00:02:07,590
transportation route but also the Arctic

58
00:02:10,219 --> 00:02:08,970
people's that live there they're

59
00:02:11,839 --> 00:02:10,229
observing these change and they're

60
00:02:13,270 --> 00:02:11,849
saying things like hey we used to be

61
00:02:16,060 --> 00:02:13,280
able to walk out on the sea I

62
00:02:17,560 --> 00:02:16,070
and now we can't do that anymore so

63
00:02:20,080 --> 00:02:17,570

these changes are real and they're

64

00:02:21,580 --> 00:02:20,090

happening and what we're trying to do at

65

00:02:24,580 --> 00:02:21,590

NASA is like I say to go out and

66

00:02:26,410 --> 00:02:24,590

characterize this ice understand how it

67

00:02:28,450 --> 00:02:26,420

works how is it affected by ocean

68

00:02:30,760 --> 00:02:28,460

currents how is it affected by winds how

69

00:02:32,890 --> 00:02:30,770

is it affected by sunlight so that we

70

00:02:35,050 --> 00:02:32,900

can correlate that with the changes we

71

00:02:38,260 --> 00:02:35,060

see in the atmosphere and develop better

72

00:02:40,570 --> 00:02:38,270

predictive models we study the Arctic

73

00:02:43,000 --> 00:02:40,580

sea ice with a range of tools the most

74

00:02:44,740 --> 00:02:43,010

important tools are satellite tools you

75

00:02:46,240 --> 00:02:44,750

need to think of this ice as being

76

00:02:48,070 --> 00:02:46,250

continent scale okay this isn't

77

00:02:49,630 --> 00:02:48,080

something you can get with a single

78

00:02:51,580 --> 00:02:49,640

aircraft light and that's why NASA is

79

00:02:53,650 --> 00:02:51,590

really important because we operate the

80

00:02:55,510 --> 00:02:53,660

satellites you can study it with because

81

00:02:57,820 --> 00:02:55,520

from that we can tell what the

82

00:02:59,530 --> 00:02:57,830

concentration of ice is you know is it

83

00:03:01,090 --> 00:02:59,540

ice that's a foot thick that's covering

84

00:03:04,180 --> 00:03:01,100

everything or is it little patches of

85

00:03:05,890 --> 00:03:04,190

ice but that's not the whole story we

86

00:03:07,510 --> 00:03:05,900

also need detailed studies we're

87

00:03:10,270 --> 00:03:07,520

interested in how rough is the surface

88

00:03:12,310 --> 00:03:10,280

this ice is in some places it's smooth

89

00:03:14,590 --> 00:03:12,320

like that pond in the Midwest that

90

00:03:16,540 --> 00:03:14,600

freezes every winter but in other cases

91

00:03:18,550 --> 00:03:16,550

that ice has been blown and crunched

92

00:03:20,590 --> 00:03:18,560

together and we get ridges and mounds

93

00:03:22,030 --> 00:03:20,600

and things like that we also put people

94

00:03:24,040 --> 00:03:22,040

out there on the ground just walking

95

00:03:26,020 --> 00:03:24,050

around studying things we'll also study

96

00:03:28,000 --> 00:03:26,030

with aircraft and aircraft are great

97

00:03:30,040 --> 00:03:28,010

because the tools we can use an aircraft

98

00:03:33,040 --> 00:03:30,050

do different things and satellites or

99

00:03:35,140 --> 00:03:33,050

ground studies we map how much snow has

100

00:03:36,610 --> 00:03:35,150

fallen on the ice we try to measure the

101

00:03:37,870 --> 00:03:36,620

size of cracks as they were called

102

00:03:41,290 --> 00:03:37,880

leaves and put all that information

103

00:03:42,940 --> 00:03:41,300

together now why should you care if you

104

00:03:44,680 --> 00:03:42,950

don't live in the Arctic areas that's a

105

00:03:47,230 --> 00:03:44,690

really good question and the fact is

106

00:03:48,850 --> 00:03:47,240

this all this stuff we talk about when

107

00:03:50,890 --> 00:03:48,860

you retreat the ice cover and you heat

108

00:03:52,390 --> 00:03:50,900

the ocean up with more sunlight you also

109

00:03:54,280 --> 00:03:52,400

have to think about there's gonna be

110

00:03:55,690 --> 00:03:54,290

more water evaporating to the atmosphere

111

00:03:58,180 --> 00:03:55,700

there's a lot of other exchanges going

112

00:04:00,130 --> 00:03:58,190

on that's gonna change the way that the

113

00:04:02,590 --> 00:04:00,140

Earth's climate works and we expect

114

00:04:05,260 --> 00:04:02,600

weather patterns over in North America

115

00:04:08,020 --> 00:04:05,270

to change now this stuff is very very

116

00:04:10,360 --> 00:04:08,030

difficult to model but the most recent

117

00:04:12,520 --> 00:04:10,370

models suggest is that if we lose the

118

00:04:14,949 --> 00:04:12,530

Arctic ice cap we may have more droughts

119

00:04:16,840 --> 00:04:14,959

in North America so these are important