1
00:00:28,710 --> 00:00:25,429
and it seems a little odd in a way

2
00:00:30,630 --> 00:00:28,720
because salt is really a molecule in the

3
00:00:33,350 --> 00:00:30,640
ocean water

4
00:00:35,830 --> 00:00:33,360
but collectively that salinity plays a

5
00:00:38,069 --> 00:00:35,840
role in the ocean circulation

6
00:00:40,310 --> 00:00:38,079
it's these differences in salinity that

7
00:00:43,190 --> 00:00:40,320
play a role in the processes that affect

8
00:00:46,069 --> 00:00:43,200
weather climate sea life and the whole

9
00:00:48,869 --> 00:00:46,079
ocean system itself and not all oceans

10
00:00:51,430 --> 00:00:48,879
have the same salinity in fact the north

11
00:00:54,069 --> 00:00:51,440
atlantic ocean tends to be the saltiest

12
00:00:56,790 --> 00:00:54,079
much more than the pacific

13
00:00:58,389 --> 00:00:56,800

the salt in the ocean affects its

14
00:01:00,630 --> 00:00:58,399
density just like the temperature

15
00:01:03,510 --> 00:01:00,640
affects its density and the density

16
00:01:05,670 --> 00:01:03,520
meaning the amount of mass per volume

17
00:01:07,510 --> 00:01:05,680
is going to then impact where the water

18
00:01:09,429 --> 00:01:07,520
goes as it circulates throughout the

19
00:01:11,109 --> 00:01:09,439
globe

20
00:01:13,830 --> 00:01:11,119
differences in temperature and salt

21
00:01:15,830 --> 00:01:13,840
content of the water cause some areas of

22
00:01:17,990 --> 00:01:15,840
water to sink and some areas of water to

23
00:01:19,830 --> 00:01:18,000
rise and so we tend to see the sinking

24
00:01:21,350 --> 00:01:19,840
water at the poles the water rising back

25
00:01:22,710 --> 00:01:21,360
up the equator and if you connect the

26
00:01:25,109 --> 00:01:22,720
two together what you have is an

27
00:01:26,630 --> 00:01:25,119
overturning that's deep in the ocean

28
00:01:28,230 --> 00:01:26,640
it's like a big conveyor belt that

29
00:01:30,149 --> 00:01:28,240
operates in the ocean

30
00:01:32,550 --> 00:01:30,159
this overturning moves warm water from

31
00:01:35,350 --> 00:01:32,560
the tropics toward the poles and cold

32
00:01:37,830 --> 00:01:35,360
water from the poles toward the tropics

33
00:01:38,830 --> 00:01:37,840
in this way the overturning regulates

34
00:01:41,030 --> 00:01:38,840
earth's

35
00:01:42,789 --> 00:01:41,040
climate and the atmosphere in the ocean

36
00:01:44,469 --> 00:01:42,799
both being fluids of the earth really

37
00:01:46,469 --> 00:01:44,479
work together we consider them sort of

38
00:01:48,789 --> 00:01:46,479

equal partners in the redistribution of

39
00:01:50,950 --> 00:01:48,799
this heat on the planet

40
00:01:52,310 --> 00:01:50,960
so when those warm waters are returning

41
00:01:54,069 --> 00:01:52,320
as they're moving up to the higher and

42
00:01:56,149 --> 00:01:54,079
higher latitudes then they're releasing

43
00:01:58,550 --> 00:01:56,159
that heat to the atmosphere then the

44
00:02:01,030 --> 00:01:58,560
winds blow over the ocean they pick up

45
00:02:02,870 --> 00:02:01,040
that heat and those winds

46
00:02:04,870 --> 00:02:02,880
over the atlantic ocean are moving from

47
00:02:06,550 --> 00:02:04,880
the north american continent to the

48
00:02:08,710 --> 00:02:06,560
european continent

49
00:02:10,790 --> 00:02:08,720
it takes perhaps a thousand years for

50
00:02:12,550 --> 00:02:10,800
the water to cycle through the deep

51
00:02:13,510 --> 00:02:12,560
oceans so he said the oceans have a

52
00:02:15,190 --> 00:02:13,520
memory

53
00:02:17,510 --> 00:02:15,200
they're like a tape recorder things that

54
00:02:19,030 --> 00:02:17,520
happen now will still be manifest

55
00:02:20,710 --> 00:02:19,040
hundreds of year in the future as that

56
00:02:22,390 --> 00:02:20,720
cold water moves through this giant

57
00:02:23,670 --> 00:02:22,400
circulation

58
00:02:26,790 --> 00:02:23,680
so if there's any change to that

59
00:02:28,229 --> 00:02:26,800
overturning circulation that means that

60
00:02:30,550 --> 00:02:28,239
northern europe and the british isles

61
00:02:32,150 --> 00:02:30,560
would be robbed of that heat

62
00:02:34,470 --> 00:02:32,160
due to those waters that are returning

63
00:02:37,509 --> 00:02:34,480

to the high latitudes the oceans are

64
00:02:39,750 --> 00:02:37,519
vast covering 70 percent of our planet

65
00:02:42,470 --> 00:02:39,760
and so it is no surprise that we still

66
00:02:44,390 --> 00:02:42,480
know only a little about this system and

67
00:02:46,790 --> 00:02:44,400
how it will respond to change and

68
00:02:48,869 --> 00:02:46,800
furthermore create change

69
00:02:50,949 --> 00:02:48,879
climate change on earth is complicated

70
00:02:52,630 --> 00:02:50,959
by the fact that the ocean

71
00:02:54,390 --> 00:02:52,640
moves much more slowly than the

72
00:02:55,589 --> 00:02:54,400
atmosphere so you have warming in the

73
00:02:57,509 --> 00:02:55,599
atmosphere warming in the ocean but

74
00:02:59,350 --> 00:02:57,519
they're occurring at different speeds so

75
00:03:01,110 --> 00:02:59,360
they're out of sync and that's that

76
00:03:03,270 --> 00:03:01,120
makes predicting what's going to happen

77
00:03:05,190 --> 00:03:03,280
the next 102 years very very difficult

78
00:03:06,949 --> 00:03:05,200
now what we might expect happens in a

79
00:03:08,630 --> 00:03:06,959
very simplistic sense is that as the

80
00:03:10,949 --> 00:03:08,640
ocean warms there's going to be more

81
00:03:12,149 --> 00:03:10,959
evaporation and that more evaporation

82
00:03:15,030 --> 00:03:12,159
would mean that the oceans become

83
00:03:17,509 --> 00:03:15,040
saltier but really it's not just that

84
00:03:18,470 --> 00:03:17,519
simple because there's also evaporation

85
00:03:20,070 --> 00:03:18,480
precipitation

86
00:03:21,110 --> 00:03:20,080
and the ice as well and that's all

87
00:03:23,830 --> 00:03:21,120
wrapped up in the study of the

88
00:03:25,750 --> 00:03:23,840

hydrologic cycle

89
00:03:28,070 --> 00:03:25,760
people have been measuring salinity for

90
00:03:31,750 --> 00:03:28,080
centuries but ships and buoys alone

91
00:03:34,070 --> 00:03:31,760
cannot match the perspective from space

92
00:03:36,789 --> 00:03:34,080
fact a whole quarter of the oceans

93
00:03:39,030 --> 00:03:36,799
larger than the size of africa have no

94
00:03:40,630 --> 00:03:39,040
salinity data at all

95
00:03:43,190 --> 00:03:40,640
up until now when we've been trying to

96
00:03:45,030 --> 00:03:43,200
understand how density changes impact

97
00:03:46,710 --> 00:03:45,040
ocean circulation we've really just had

98
00:03:48,949 --> 00:03:46,720
half the picture

99
00:03:51,350 --> 00:03:48,959
when the aquarius satellite is launched

100
00:03:53,589 --> 00:03:51,360
scientists for the first time can look

101
00:03:56,309 --> 00:03:53,599
at salinity of the surface of the ocean

102
00:03:57,830 --> 00:03:56,319
from 400 miles above the earth but now

103
00:03:59,429 --> 00:03:57,840
with the aquarius mission we'll be able

104
00:04:01,830 --> 00:03:59,439
to complete that other half we'll be

105
00:04:03,350 --> 00:04:01,840
able to look at the salinity information

106
00:04:05,190 --> 00:04:03,360
and so salinity combined with

107
00:04:07,270 --> 00:04:05,200
temperature will give us the information

108
00:04:09,030 --> 00:04:07,280
about the density field in the first two

109
00:04:11,350 --> 00:04:09,040
months of aquarius's launch the

110
00:04:14,550 --> 00:04:11,360
satellite will gather more salinity data

111
00:04:16,629 --> 00:04:14,560
than in the last 125 years

112
00:04:18,870 --> 00:04:16,639
this mission will help scientists better

113
00:04:21,830 --> 00:04:18,880

understand how salinity and ocean

114
00:04:23,830 --> 00:04:21,840
circulation are tied to global climate