1
00:00:01,000 --> 00:00:23,109
[Music]

2
00:00:29,120 --> 00:00:27,589
water is all around us and it's

3
00:00:31,279 --> 00:00:29,130
important to nearly every natural

4
00:00:35,450 --> 00:00:31,289
process on earth cannot be

5
00:00:37,399 --> 00:00:35,460
underestimated it is the only compound

6
00:00:44,090 --> 00:00:37,409
that can be found naturally as a liquid

7
00:00:46,579 --> 00:00:44,100
gas and solid the process by which water

8
00:00:48,860 --> 00:00:46,589
moves around the earth from the oceans

9
00:00:51,560 --> 00:00:48,870
to the atmosphere to the land and back

10
00:00:54,469 --> 00:00:51,570
to the ocean is called the water cycle

11
00:00:56,329 --> 00:00:54,479
water regulates climate storing heat

12
00:00:59,270 --> 00:00:56,339
during the day and releasing it at night

13
00:01:03,469 --> 00:00:59,280

and carries heat from the tropics to the

14
00:01:05,479 --> 00:01:03,479
poles by sea and by air let's follow a

15
00:01:07,100 --> 00:01:05,489
single molecule of water beginning in

16
00:01:09,590 --> 00:01:07,110
the ocean through the paths that might

17
00:01:12,890 --> 00:01:09,600
take before eventually winding up right

18
00:01:17,359 --> 00:01:12,900
where it started back in the big blue

19
00:01:19,490 --> 00:01:17,369
sea the fuel for this journey will be

20
00:01:22,929 --> 00:01:19,500
provided by our planet's prime energy

21
00:01:27,669 --> 00:01:25,359
during the day the Sun heats up the air

22
00:01:31,749 --> 00:01:27,679
and ocean surface causing water

23
00:01:33,429 --> 00:01:31,759
molecules to evaporate evaporation

24
00:01:37,539 --> 00:01:33,439
occurs when a liquid molecule of water

25
00:01:39,819 --> 00:01:37,549
escapes into the air as a gas this

26
00:01:42,459 --> 00:01:39,829
scientific visualization shows how water

27
00:01:46,480 --> 00:01:42,469
evaporation indicated in turquoise is

28
00:01:48,819 --> 00:01:46,490
driven by the energy of the Sun notice

29
00:01:52,660 --> 00:01:48,829
how the rate of evaporation pulses over

30
00:01:55,240 --> 00:01:52,670
land it speeds up in the day and almost

31
00:01:58,270 --> 00:01:55,250
disappears at night over the ocean

32
00:02:02,160 --> 00:01:58,280
evaporation appears to remain constant

33
00:02:08,979 --> 00:02:05,529
water in the air in gas form is known as

34
00:02:11,199 --> 00:02:08,989
water vapor the molecule is now fresh

35
00:02:14,880 --> 00:02:11,209
water having left the ocean salt and

36
00:02:17,080 --> 00:02:14,890
other particles behind the water

37
00:02:19,839 --> 00:02:17,090
evaporates and goes into the atmosphere

38
00:02:22,700 --> 00:02:19,849

and then it doesn't necessarily just

39
00:02:28,120 --> 00:02:22,710
turn around and fall as rain or snow

40
00:02:30,110 --> 00:02:28,130
[Music]

41
00:02:32,630 --> 00:02:30,120
condensation is the process by which

42
00:02:34,640 --> 00:02:32,640
water vapor molecules cool stick

43
00:02:38,510 --> 00:02:34,650
together and become liquid again in

44
00:02:40,309 --> 00:02:38,520
cloud formation this often happens high

45
00:02:42,199 --> 00:02:40,319
in the atmosphere where the temperature

46
00:02:45,979 --> 00:02:42,209
is much lower than it is near the

47
00:02:48,740 --> 00:02:45,989
surface what happens in the atmosphere

48
00:02:51,680 --> 00:02:48,750
is just like we have currents in the

49
00:02:53,930 --> 00:02:51,690
ocean we have winds in the atmosphere

50
00:02:57,260 --> 00:02:53,940
that actually to some extent Drive what

51
00:02:59,090 --> 00:02:57,270
goes on in the ocean currents materials

52
00:03:00,890 --> 00:02:59,100
in the atmosphere can travel actually a

53
00:03:03,080 --> 00:03:00,900
great distance sometimes you know a

54
00:03:04,670 --> 00:03:03,090
quarter of a way around the world just

55
00:03:07,100 --> 00:03:04,680
until they get to the point where they

56
00:03:08,900 --> 00:03:07,110
actually turn into rain or snow and

57
00:03:12,320 --> 00:03:08,910
thereby fall back to the ocean or or

58
00:03:15,620 --> 00:03:12,330
fall back to the land this is called

59
00:03:18,650 --> 00:03:15,630
precipitation if the water molecule

60
00:03:20,960 --> 00:03:18,660
falls on land as snow it may be stored

61
00:03:22,880 --> 00:03:20,970
for a very long period of time in a

62
00:03:25,430 --> 00:03:22,890
polar ice sheet or mountain glacier

63
00:03:28,699 --> 00:03:25,440

depending on climate conditions when

64
00:03:30,470 --> 00:03:28,709
rain falls or the snow melts typically

65
00:03:34,130 --> 00:03:30,480
the next place it goes it infiltrates

66
00:03:35,840 --> 00:03:34,140
into the soil so so soil is not a solid

67
00:03:37,280 --> 00:03:35,850
it's not like a rock there there are

68
00:03:39,140 --> 00:03:37,290
poor spaces in there and those can be

69
00:03:40,310 --> 00:03:39,150
filled with water and typically there is

70
00:03:41,900 --> 00:03:40,320
a certain amount of water in that soil

71
00:03:46,810 --> 00:03:41,910
at all times if the soil is completely

72
00:03:52,280 --> 00:03:50,390
if soil becomes saturated any additional

73
00:03:55,759 --> 00:03:52,290
rainfall will collect in puddles and

74
00:03:58,360 --> 00:03:55,769
streams soil water that percolates deep

75
00:04:03,110 --> 00:03:58,370
enough will help to recharge an aquifer

76
00:04:06,440 --> 00:04:03,120
an aquifer is any underground geologic

77
00:04:08,599 --> 00:04:06,450
formation that stores water so it's

78
00:04:12,380 --> 00:04:08,609
typically either rock with a lot of

79
00:04:14,360 --> 00:04:12,390
cracks in it or it's sandy layer sand

80
00:04:16,620 --> 00:04:14,370
has a lot of pore space in it it can

81
00:04:18,810 --> 00:04:16,630
store a lot of water

82
00:04:21,050 --> 00:04:18,820
the water molecule might remain in an

83
00:04:23,850 --> 00:04:21,060
aquifer for more than a million years

84
00:04:26,190 --> 00:04:23,860
more likely it would help to replenish a

85
00:04:29,490 --> 00:04:26,200
stream which would feed into lakes and

86
00:04:32,610 --> 00:04:29,500
rivers eventually the water molecule

87
00:04:40,860 --> 00:04:32,620
will return to where it started the

88
00:04:43,320 --> 00:04:40,870

ocean people also have a role in the

89
00:04:45,240 --> 00:04:43,330
water cycle by pumping water out of the

90
00:04:47,220 --> 00:04:45,250
ground for irrigation cutting down

91
00:04:49,560 --> 00:04:47,230
forests for development and building

92
00:04:52,170 --> 00:04:49,570
roads and other concrete surfaces that

93
00:04:54,120 --> 00:04:52,180
lead to runoff people can have a serious

94
00:04:56,790 --> 00:04:54,130
impact on the path a water molecule

95
00:04:59,130 --> 00:04:56,800
takes the most obvious way that people

96
00:05:02,040 --> 00:04:59,140
affect the water cycle are the ways that

97
00:05:04,710 --> 00:05:02,050
that we control the water after it's

98
00:05:07,920 --> 00:05:04,720
fallen on the land surface as rain or

99
00:05:11,130 --> 00:05:07,930
melts as snow but we have put in dams

100
00:05:14,070 --> 00:05:11,140
and rivers to to hold this water we also

101
00:05:16,380 --> 00:05:14,080
put the groundwater out and use that so

102
00:05:19,230 --> 00:05:16,390
it's these water resources we call them

103
00:05:20,880 --> 00:05:19,240
are really us taking a natural part of

104
00:05:22,140 --> 00:05:20,890
the water cycle and using it for

105
00:05:25,450 --> 00:05:22,150
anything

106
00:05:29,230 --> 00:05:25,460
the water cycle also affects and is

107
00:05:31,749 --> 00:05:29,240
affected by climate variations if the

108
00:05:34,510 --> 00:05:31,759
water cycle is one of the ways that we

109
00:05:36,100 --> 00:05:34,520
will really feel any changes in climate

110
00:05:37,600 --> 00:05:36,110
so climate changes will feed back to

111
00:05:40,600 --> 00:05:37,610
what our cycle changes things like how

112
00:05:42,760 --> 00:05:40,610
much precipitation and area receives the

113
00:05:44,510 --> 00:05:42,770

frequency of droughts and floods and

114
00:05:47,300 --> 00:05:44,520
this sort of thing

115
00:05:48,980 --> 00:05:47,310
the water cycle is the adventurous

116
00:05:52,070 --> 00:05:48,990
journey that water takes through the

117
00:05:53,900 --> 00:05:52,080
oceans atmosphere and land driven by the

118
00:05:56,250 --> 00:05:53,910
Sun

119
00:05:58,500 --> 00:05:56,260
improving our understanding of the water

120
00:06:00,780 --> 00:05:58,510
cycle and how it is changing will be

121
00:06:04,410 --> 00:06:00,790
critical for future decisions related to