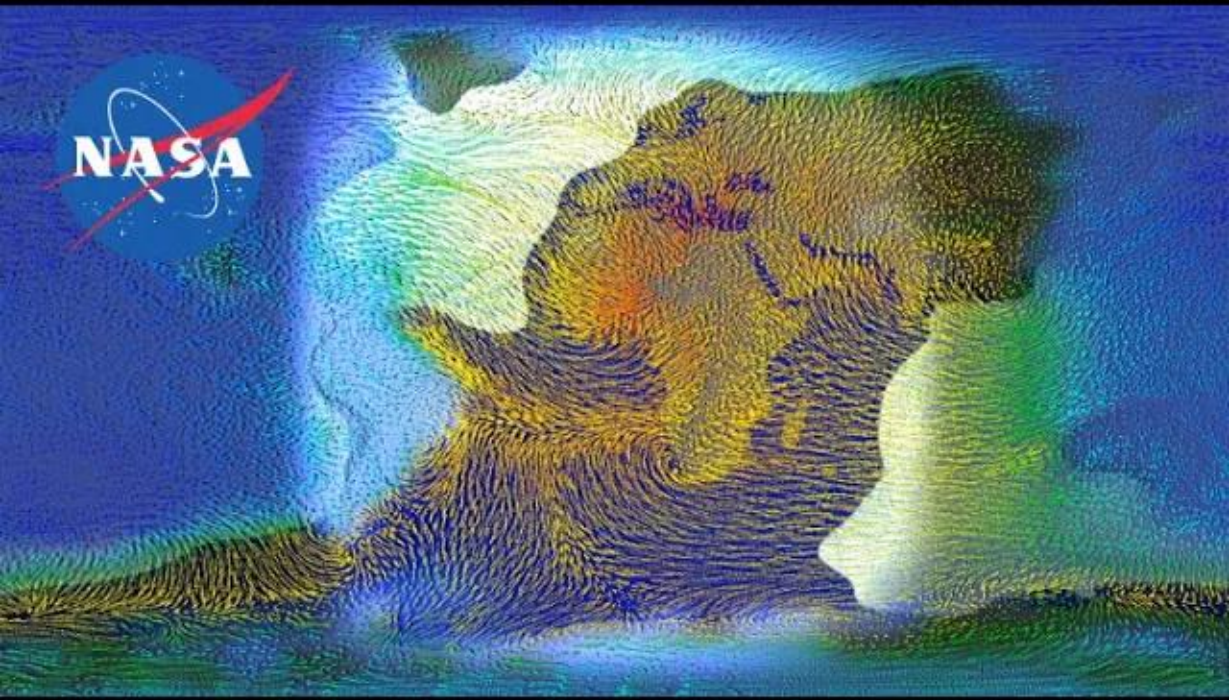
NASA

1
00:00:05,349 --> 00:00:03,030
there's a planet in our galaxy that

2
00:00:07,510 --> 00:00:05,359
scientists are really excited about in

3
00:00:10,070 --> 00:00:07,520
fact it's the closest earth-sized planet

4
00:00:12,310 --> 00:00:10,080
outside our solar system it's probably

5
00:00:14,629 --> 00:00:12,320
rocky and could have liquid water

6
00:00:16,710 --> 00:00:14,639
flowing on its surface an essential

7
00:00:19,189 --> 00:00:16,720
ingredient for life

8
00:00:21,269 --> 00:00:19,199
there's only one problem

9
00:00:27,429 --> 00:00:21,279
we can't actually see it and it's

10
00:00:32,950 --> 00:00:29,910
to get to proxima centauri b it would

11
00:00:35,430 --> 00:00:32,960
take a spacecraft over 75 000 years to

12
00:00:37,590 --> 00:00:35,440
travel there with today's technology

13
00:00:39,910 --> 00:00:37,600

even powerful ground-based telescopes

14
00:00:41,590 --> 00:00:39,920
can't see the planet in any detail

15
00:00:43,350 --> 00:00:41,600
mostly because it's being drowned out by

16
00:00:45,270 --> 00:00:43,360
the light of its star

17
00:00:47,270 --> 00:00:45,280
this raises the question

18
00:00:49,520 --> 00:00:47,280
how do we investigate a planet that you

19
00:00:54,069 --> 00:00:49,530
can't see and you can't get to

20
00:00:57,990 --> 00:00:55,910
this supercomputer is tasked with

21
00:01:00,709 --> 00:00:58,000
running sophisticated climate models to

22
00:01:03,510 --> 00:01:00,719
predict earth's future climate it's loud

23
00:01:06,630 --> 00:01:03,520
you can feel air rushing by you can feel

24
00:01:08,149 --> 00:01:06,640
a hum in the room it feels powerful it's

25
00:01:09,109 --> 00:01:08,159
one of the most powerful supercomputers

26
00:01:11,270 --> 00:01:09,119
in the world

27
00:01:12,789 --> 00:01:11,280
and now it might be scientists only hope

28
00:01:14,870 --> 00:01:12,799
for discovering whether any of these

29
00:01:17,830 --> 00:01:14,880
newly discovered planets could possibly

30
00:01:22,070 --> 00:01:20,230
last year a team at nasa goddard

31
00:01:25,510 --> 00:01:22,080
institute for space studies in new york

32
00:01:27,350 --> 00:01:25,520
city decided to investigate further

33
00:01:29,510 --> 00:01:27,360
what happens when you take a possibly

34
00:01:31,990 --> 00:01:29,520
rocky planet situated in its solar

35
00:01:34,310 --> 00:01:32,000
system's habitable zone and simulate

36
00:01:36,310 --> 00:01:34,320
hypothetical climates based on the only

37
00:01:37,270 --> 00:01:36,320
planet we know of with life

38
00:01:39,510 --> 00:01:37,280

earth

39
00:01:41,670 --> 00:01:39,520
we only know basic details about proxima

40
00:01:44,069 --> 00:01:41,680
centauri b its size

41
00:01:46,710 --> 00:01:44,079
mass distance from its star and the type

42
00:01:49,030 --> 00:01:46,720
of star it orbits and that's it

43
00:01:50,310 --> 00:01:49,040
right out of the gate proxima b has some

44
00:01:52,789 --> 00:01:50,320
problems

45
00:01:57,510 --> 00:01:52,799
it's 20 times closer to its star proxima

46
00:02:01,109 --> 00:01:58,789
this means that it's likely

47
00:02:03,109 --> 00:02:01,119
gravitationally locked to it just like

48
00:02:05,190 --> 00:02:03,119
the moon is gravitationally locked to

49
00:02:08,070 --> 00:02:05,200
the earth

50
00:02:11,110 --> 00:02:08,080
as a result one side of proxima b always

51
00:02:12,949 --> 00:02:11,120
faces its sun's intense radiation while

52
00:02:14,790 --> 00:02:12,959
the other freezes in the darkness of

53
00:02:16,949 --> 00:02:14,800
space

54
00:02:19,589 --> 00:02:16,959
but slap on a hypothetical atmosphere on

55
00:02:25,370 --> 00:02:19,599
the planet and fill it with an ocean and

56
00:02:25,380 --> 00:02:32,550
[Music]

57
00:02:32,560 --> 00:02:38,550
here's where this gets interesting

58
00:02:42,309 --> 00:02:39,990
we're looking at the side of proxima

59
00:02:44,630 --> 00:02:42,319
centauri b that's facing its star so

60
00:02:46,869 --> 00:02:44,640
it's the warmer side

61
00:02:48,949 --> 00:02:46,879
in the simulation the modelers gave the

62
00:02:50,790 --> 00:02:48,959
planet a global ocean

63
00:02:52,790 --> 00:02:50,800

the ocean circulates heat around the

64
00:02:55,270 --> 00:02:52,800
planet through ocean currents that are

65
00:02:57,670 --> 00:02:55,280
produced by the planet's rotation just

66
00:02:59,670 --> 00:02:57,680
as we see on earth

67
00:03:01,509 --> 00:02:59,680
the ocean current actually carries warm

68
00:03:05,030 --> 00:03:01,519
water to the side of the planet without

69
00:03:06,869 --> 00:03:05,040
starlight and up towards the poles

70
00:03:09,190 --> 00:03:06,879
this creates a characteristic pattern of

71
00:03:12,149 --> 00:03:09,200
ice-covered ocean similar to our own

72
00:03:14,149 --> 00:03:12,159
north pole versus ice-free ocean

73
00:03:17,270 --> 00:03:14,159
a pattern we would see on any rotating

74
00:03:19,750 --> 00:03:17,280
ocean-covered planet

75
00:03:21,750 --> 00:03:19,760
in this simulation modelers use earth's

76
00:03:23,509 --> 00:03:21,760
continents as a stand-in to predict what

77
00:03:25,350 --> 00:03:23,519
would happen if most of the land was on

78
00:03:27,110 --> 00:03:25,360
the side of the planet facing away from

79
00:03:29,270 --> 00:03:27,120
its star

80
00:03:31,190 --> 00:03:29,280
how much land might be covered in ice

81
00:03:35,280 --> 00:03:31,200
and how might ocean currents interact

82
00:03:37,430 --> 00:03:35,290
with land masses when transferring heat

83
00:03:39,670 --> 00:03:37,440
[Music]

84
00:03:41,589 --> 00:03:39,680
conversely if most of the continents

85
00:03:43,350 --> 00:03:41,599
face the warmth of its star

86
00:03:45,910 --> 00:03:43,360
how much incoming radiation would

87
00:03:47,270 --> 00:03:45,920
actually be absorbed by the ocean and

88
00:03:51,509 --> 00:03:47,280

how could this affect the planet's

89
00:03:54,229 --> 00:03:53,190
so those are some of the tricks we play

90
00:03:56,949 --> 00:03:54,239
we give it different kinds of

91
00:03:58,550 --> 00:03:56,959
atmospheres and see how the planet

92
00:04:00,070 --> 00:03:58,560
responds the climate response to that

93
00:04:01,670 --> 00:04:00,080
because we really want the planet to be

94
00:04:03,110 --> 00:04:01,680
in in what we call the habitable zone

95
00:04:08,470 --> 00:04:03,120
where it would have liquid water on its

96
00:04:11,990 --> 00:04:10,550
scientists are finding these exoplanets

97
00:04:14,789 --> 00:04:12,000
could actually have ingredients to

98
00:04:16,870 --> 00:04:14,799
support life under a range of surprising

99
00:04:18,710 --> 00:04:16,880
conditions compared to earth

100
00:04:20,789 --> 00:04:18,720
is it possible that our notions of what

101
00:04:21,990 --> 00:04:20,799
make a planet suitable for life are too

102
00:04:23,990 --> 00:04:22,000
limiting

103
00:04:25,590 --> 00:04:24,000
had alien civilizations pointed their

104
00:04:27,830 --> 00:04:25,600
telescopes towards earth billions of

105
00:04:29,749 --> 00:04:27,840
years ago expecting to find a blue

106
00:04:31,749 --> 00:04:29,759
planet swimming in oxygen they would

107
00:04:33,749 --> 00:04:31,759
have found a much different world we

108
00:04:35,110 --> 00:04:33,759
definitely look at earth through time we

109
00:04:37,350 --> 00:04:35,120
might try different topographies

110
00:04:39,030 --> 00:04:37,360
different land sea masks for example

111
00:04:40,469 --> 00:04:39,040
you know the topography we have today on

112
00:04:42,550 --> 00:04:40,479
earth is not the topography earth had

113
00:04:44,310 --> 00:04:42,560

250 million years ago

114
00:04:46,710 --> 00:04:44,320
with money and time both limited

115
00:04:48,469 --> 00:04:46,720
resources scientists are looking for the

116
00:04:49,990 --> 00:04:48,479
most promising planets to point their

117
00:04:52,629 --> 00:04:50,000
observatories at

118
00:04:54,629 --> 00:04:52,639
proxima centauri b may offer a blueprint