1
00:00:00,100 --> 00:00:00,834
[Music]

2
00:00:00,834 --> 00:00:03,136
So when we look
at Jupiter, we see a lot of

3
00:00:03,136 --> 00:00:05,806
structure that looks
very similar to the Earth.

4
00:00:05,806 --> 00:00:10,577
We can see storms, we see
cyclones, we see anticyclones,

5
00:00:10,577 --> 00:00:13,247
and these sort of storms and
weather systems that we see on

6
00:00:13,247 --> 00:00:16,250
Earth are very similar and
are happening on Jupiter.

7
00:00:16,250 --> 00:00:19,720
Fluid mechanics is hopefully the
same everywhere in the universe,

8
00:00:19,720 --> 00:00:22,356
but Jupiter and Earth
are very different.

9
00:00:22,356 --> 00:00:25,058
Jupiter is much bigger, it
rotates a lot faster, they're

10
00:00:25,058 --> 00:00:28,528
made of different material,
and Jupiter is much further away

11

00:00:28,528 --> 00:00:31,031
from the Sun than the Earth is.

12
00:00:31,031 --> 00:00:34,668
The quasi-biennial oscillation,
or the QBO, on Earth is an

13
00:00:34,668 --> 00:00:37,771
equatorial phenomenon in the
stratosphere where the winds are

14
00:00:37,771 --> 00:00:40,507
changing direction
approximately every two years.

15
00:00:40,507 --> 00:00:44,611
Depending on which phase the QBO
is in, eastward or westward, the

16
00:00:44,611 --> 00:00:47,748
temperature signal corresponds
to that, so it's warmer in the

17
00:00:47,748 --> 00:00:50,484
eastward phase and
cooler in the westward phase.

18
00:00:50,484 --> 00:00:53,487
It's been shown that it
can actually be a barrier to

19
00:00:53,487 --> 00:00:57,357
transport of aerosols across the
equator, and has been linked to

20
00:00:57,357 --> 00:01:00,661
the frequency and the formation
of hurricanes in the Atlantic

21
00:01:00,661 --> 00:01:02,296

and the Pacific Ocean.

22
00:01:02,296 --> 00:01:06,066
The long-term scales on Earth's
climate is something that we're

23
00:01:06,066 --> 00:01:08,635
very interested in, and how
that applies to other planets'

24
00:01:08,635 --> 00:01:13,140
atmospheres is really why we're
studying Earth and Jupiter.

25
00:01:13,140 --> 00:01:15,208
The quasi-quadrennial
oscillation in Jupiter's

26
00:01:15,208 --> 00:01:18,211
stratosphere is a temperature
signal that we see in the

27
00:01:18,211 --> 00:01:21,448
equator, where we see the
temperature get warmer and

28
00:01:21,448 --> 00:01:24,418
cooler approximately
every four Earth years.

29
00:01:24,418 --> 00:01:27,321
We used a general circulation
model, where we focused on

30
00:01:27,321 --> 00:01:30,123
simulating the effects of
small-scale waves produced from

31
00:01:30,123 --> 00:01:33,827
convection in Jupiter's

equatorial region to simulate

32
00:01:33,827 --> 00:01:34,928
the QQO.

33
00:01:34,928 --> 00:01:38,832
The waves propagate upwards from
the clouds and force the winds

34
00:01:38,832 --> 00:01:42,035
in the stratosphere to change
direction, going from eastward

35
00:01:42,035 --> 00:01:45,238
to westward
approximately every four years.

36
00:01:45,238 --> 00:01:48,742
Our model was able to reproduce
the behavior of the QQO, but was

37
00:01:48,742 --> 00:01:51,211
also able to reproduce
temperatures from the

38
00:01:51,211 --> 00:01:54,348
observations, and both of
those together give us a lot of

39
00:01:54,348 --> 00:01:57,351
confidence that our model is
very accurate in what's driving

40
00:01:57,351 --> 00:01:58,652
the QQO.

41
00:01:59,419 --> 00:02:02,189
The outer planets serve as a
laboratory for understanding

42
00:02:02,189 --> 00:02:05,792
atmospheric physics under very
different conditions than are

43
00:02:05,792 --> 00:02:07,094
present on the Earth.

44
00:02:07,094 --> 00:02:09,896
Understanding how their
atmospheres change and evolve

45
00:02:09,896 --> 00:02:11,999
and their climates can give
us insight