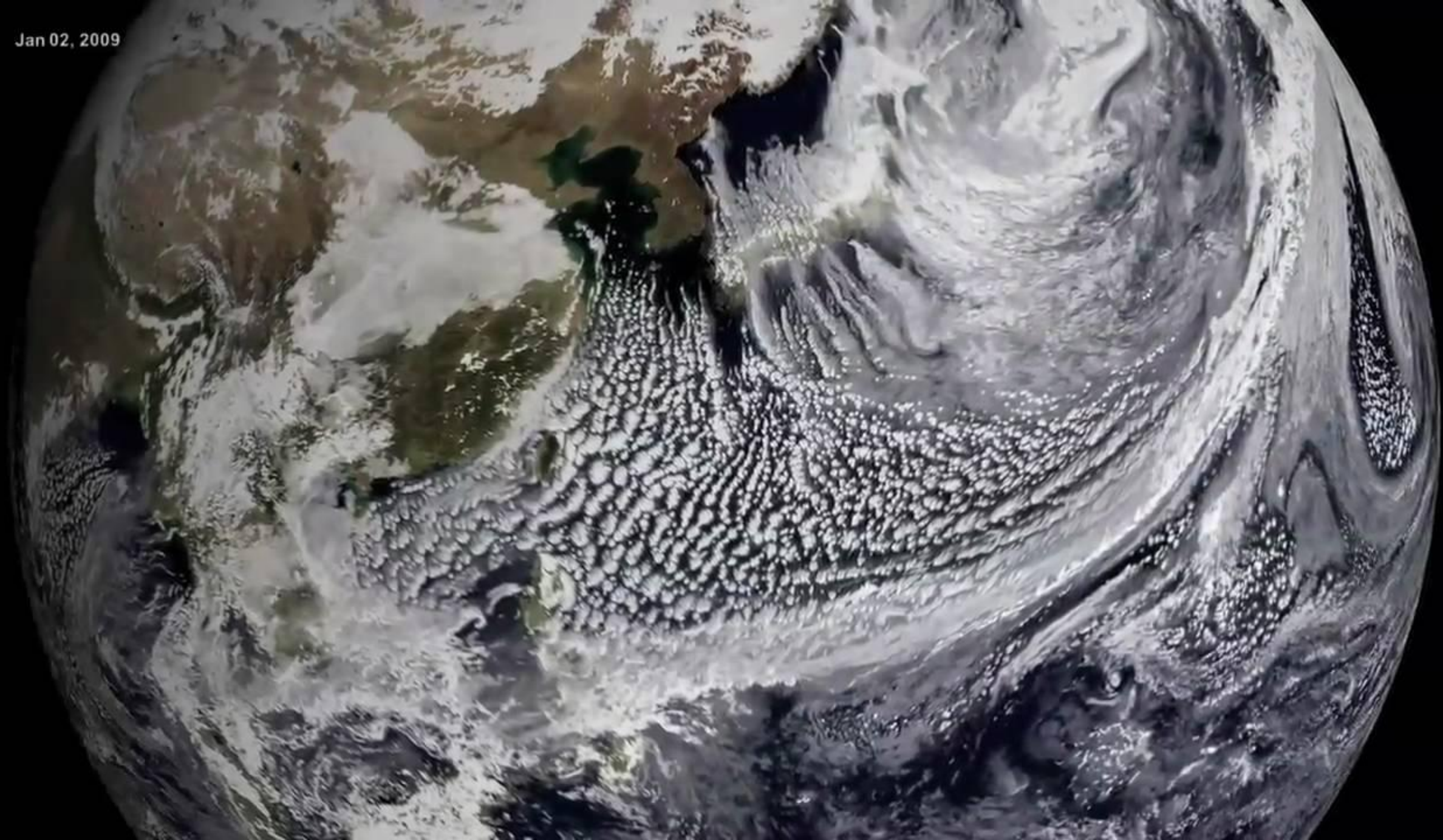


Jan 02, 2009



1
00:00:12,090 --> 00:00:04,010

[music]

2
00:00:12,110 --> 00:00:16,100

All of the events of the past decade - all of our memories -

3
00:00:16,120 --> 00:00:20,110

- have something in common. They all took place

4
00:00:20,130 --> 00:00:24,170

during the hottest decade ever recorded since humans began keeping temperature records

5
00:00:24,190 --> 00:00:28,210

about 150 years ago.

6
00:00:28,230 --> 00:00:32,250

In the last decade, the Earth's temperature rose roughly

7
00:00:32,270 --> 00:00:36,280

a third of a degree fahrenheit. Since 1880, it's risen about

8
00:00:36,300 --> 00:00:40,290

one and a half degrees. You might say the Earth's running a fever.

9
00:00:40,310 --> 00:00:44,350

And scientists predict it's going to get much worse.

10
00:00:44,370 --> 00:00:48,410

Already, we can tally the signs.

11
00:00:48,430 --> 00:00:52,450

Global sea level rose by over an inch during the decade,

12
00:00:52,470 --> 00:00:56,480

almost twice as fast as the average during the twentieth century.

13
00:00:56,500 --> 00:01:00,490

Arctic summer sea ice declined by over 300,000 square miles -

14

00:01:00,510 --> 00:01:04,570

- enough ice to cover the states of Texas and Kentucky.

15

00:01:04,590 --> 00:01:08,670

The vast majority of climate scientists say evidence

16

00:01:08,690 --> 00:01:12,720

for human-caused warming is clear. But less understood

17

00:01:12,740 --> 00:01:16,740

is exactly how this warming will change the complex interactions between our planet's land,

18

00:01:16,760 --> 00:01:20,760

water, sky, and the living the organisms that inhabit our world.

19

00:01:20,780 --> 00:01:24,850

[music]

20

00:01:24,870 --> 00:01:28,890

As NASA scientists improve their understanding and predictions

21

00:01:28,910 --> 00:01:32,950

about climate change, NASA satellites provide critical data about

22

00:01:32,970 --> 00:01:36,980

what's happening on our planet today... real-life observations scientists

23

00:01:37,000 --> 00:01:41,580

use to hone their predictions.

24

00:01:41,600 --> 00:01:45,590

And NASA gets a global view of three major pieces of the climate puzzle: how much of the sun's energy

25

00:01:45,610 --> 00:01:49,630

is hitting the Earth, how much of that energy is reflected

26

00:01:49,650 --> 00:01:53,660

back out into space, and how much is being trapped, heating the planet.

27

00:01:53,680 --> 00:01:57,690

NASA satellites

28

00:01:57,710 --> 00:02:01,700

measure the sun's energy, which fluctuates due to a ten to twelve year

29

00:02:01,720 --> 00:02:05,710

cycle. Could increased solar activity be causing global warming?

30

00:02:05,730 --> 00:02:09,790

Satellite evidence shows that the solar cycle has only a

31

00:02:09,810 --> 00:02:13,840

slight impact on our planet's temperatures. In fact, even though

32

00:02:13,860 --> 00:02:17,880

the last few years have been some of the warmest on record, the sun has been

33

00:02:17,900 --> 00:02:21,900

in a deep lull in activity. That means slightly less solar energy

34

00:02:21,920 --> 00:02:25,920

is reaching Earth. And when the solar cycle ramps up again,

35

00:02:25,940 --> 00:02:29,980

scientists expect temperatures will rise even a little more.

36

00:02:30,000 --> 00:02:34,030

A second piece of the temperature puzzle

37

00:02:34,050 --> 00:02:38,050

is our planet's brightness. All other things being equal,

38

00:02:38,070 --> 00:02:42,080

a brighter, more reflective planet bounces more energy back to space.

39

00:02:42,100 --> 00:02:46,090

Some of the brightest, most reflective areas of our planet are those covered with ice.

40

00:02:46,110 --> 00:02:50,130

NASA imagery shows those areas shrinking,

41

00:02:50,150 --> 00:02:54,170

especially in the Arctic.

42

00:02:54,190 --> 00:02:58,200

As sea ice vanishes into darker ocean, our planet becomes less reflective and warms even further.

43

00:02:58,220 --> 00:03:03,280

Clouds also reflect a lot of sunlight.

44

00:03:03,300 --> 00:03:08,350

As our planet warms, more water evaporates, potentially

45

00:03:08,370 --> 00:03:12,400

creating more clouds. More cloud cover increases the Earth's brightness,

46

00:03:12,420 --> 00:03:16,420

possibly helping to cool the planet. But clouds,

47

00:03:16,440 --> 00:03:20,430

and the small particles called aerosols that help them form, are climate wild cards.

48

00:03:20,450 --> 00:03:24,470

Many current climate models predict some cooling

49

00:03:24,490 --> 00:03:28,510

due to increased cloud cover. Will it be enough to significantly slow

50

00:03:28,530 --> 00:03:32,540

global warming? Scientists are using NASA data to look for the answer.

51
00:03:32,560 --> 00:03:36,570
Further complicating the issue is that water vapor

52
00:03:36,590 --> 00:03:40,570
is actually the world's most abundant greenhouse gas. That's right,

53
00:03:40,590 --> 00:03:44,670
the same molecules that might cool the planet in cloud form

54
00:03:44,690 --> 00:03:48,740
actually warm it when they're in the form of a gas.

55
00:03:48,760 --> 00:03:52,780
They help create a blanket around the Earth, catching heat radiating from the planet's surface

56
00:03:52,800 --> 00:03:56,800
and trapping it within the atmosphere. As the planet warms,

57
00:03:56,820 --> 00:04:00,830
more water evaporates from the ocean, creating more of this

58
00:04:00,850 --> 00:04:04,910
heat-trapping greenhouse gas. Humans can't directly control

59
00:04:04,930 --> 00:04:08,980
the amount of water vapor in the air, but we can have a much greater impact

60
00:04:09,000 --> 00:04:13,020
on other major greenhouse gases. Carbon dioxide

61
00:04:13,040 --> 00:04:17,050
is the second most prevalent greenhouse gas, and it's our biggest contribution

62
00:04:17,070 --> 00:04:21,060
to global warming. Fossil fuel burning releases

63
00:04:21,080 --> 00:04:25,110

large amounts of carbon dioxide into the air.

64

00:04:25,130 --> 00:04:29,160

NASA satellite instruments capture the infrared signature of carbon dioxide

65

00:04:29,180 --> 00:04:33,190

in the global atmosphere. They show a rise throughout the decade.

66

00:04:33,210 --> 00:04:37,210

NASA also monitors other greenhouse gases,

67

00:04:37,230 --> 00:04:41,230

such as methane, nitrous oxides and CFCs. In recent

68

00:04:41,250 --> 00:04:45,300

years, CFC have decreased. Methane and nitrous oxide

69

00:04:45,320 --> 00:04:49,460

are on the rise. Greenhouse gas is most likely

70

00:04:49,480 --> 00:04:53,510

the main contributor to current global warming. It's the key piece in the

71

00:04:53,530 --> 00:04:57,540

temperature puzzle, and it's unlocked the door to higher and higher temperatures.

72

00:04:57,560 --> 00:05:01,560

[music]

73

00:05:01,580 --> 00:05:05,570

2010.

74

00:05:05,590 --> 00:05:09,610

It marks the end of the hottest decade we've recorded... so far.

75

00:05:09,630 --> 00:05:13,650

What will the next ten years hold for the Earth's climate?

76
00:05:13,670 --> 00:05:17,710
Computer models predict an even warmer planet,

77
00:05:17,730 --> 00:05:21,740
with more extreme weather, less ice, and higher seas.

78
00:05:21,760 --> 00:05:25,750
The severity of those changes

79
00:05:25,770 --> 00:05:29,810
will depend partly on how our planet's complex system responds,