1
00:00:08,170 --> 00:00:04,080
[music]

2
00:00:08,190 --> 00:00:12,330
Narrator: By studying water in all its forms,

3
00:00:12,350 --> 00:00:16,480
the Aqua satellite gives us insights into things the complex nature of our atmosphere,

4
00:00:16,500 --> 00:00:20,610
helping us understand our day-to-day weather,

5
00:00:20,630 --> 00:00:24,710
and our long-term climate.

6
00:00:24,730 --> 00:00:28,800
Just one instrument on Aqua – the Atmospheric Infrared Sounder, or AIRS,

7
00:00:28,820 --> 00:00:32,870
has given us phenomenal new science and practical applications

8
00:00:32,890 --> 00:00:36,920
with its three-dimensional view of the atmosphere.

9
00:00:36,940 --> 00:00:40,980
Chahine: When we started with AIRS on Aqua,

10
00:00:41,000 --> 00:00:45,010
we had two goals defined to us, you know, before the mission started.

11
00:00:45,030 --> 00:00:49,180
One, provide data to the nation’s weather forecasting data center,

12
00:00:49,200 --> 00:00:53,360
which is NOAA,

13
00:00:53,380 --> 00:00:57,530

and improve weather forecasting.

14
00:00:57,550 --> 00:01:01,650
Narrator: We all know that weather forecasting is never perfect – but scientists continually work to make it bette

15
00:01:01,670 --> 00:01:05,840
and the AIRS instrument on Aqua has played a key role.

16
00:01:05,860 --> 00:01:10,000
By peeling back the layers of clouds to see the

17
00:01:10,020 --> 00:01:14,140
dense water vapor hidden within, the AIRS instrument has helped NASA and NOAA models

18
00:01:14,160 --> 00:01:18,280
improve weather forecasts by six hours.

19
00:01:18,300 --> 00:01:22,410
Seeing six hours further into the future doesn't just help improve our weekend forecast;

20
00:01:22,430 --> 00:01:26,520
it can make a big difference to all kinds of businesses, shipping,

21
00:01:26,540 --> 00:01:30,600
aviation, and agriculture.

22
00:01:30,620 --> 00:01:34,670
Chahine: So that was the first goal.

23
00:01:34,690 --> 00:01:38,720
Achieved – and we the science team, felt good.

24
00:01:38,740 --> 00:01:42,760
The second goal was improve our understanding of the climate system –

25
00:01:42,780 --> 00:01:46,800
the water vapor. That is the main

26
00:01:46,820 --> 00:01:50,970
That is the main mechanism by which weather and climate

27
00:01:50,990 --> 00:01:55,150
is formed here on Earth.

28
00:01:55,170 --> 00:01:59,320
Narrator: The AIRS instrument actually does more than look at water -- it studies gasses in our atmosphere like

29
00:01:59,340 --> 00:02:03,480
which is crucial to understanding natural and human induced climate change.

30
00:02:03,500 --> 00:02:07,640
Parkinson: The AIRS carbon dioxide data have generated particular interest

31
00:02:07,660 --> 00:02:11,800
because of carbon dioxide's role in the greenhouse effect, allowing

32
00:02:11,820 --> 00:02:15,910
the sun's radiation to come through the atmosphere easily

33
00:02:15,930 --> 00:02:20,020
and reach the Earth's surface, but blocking some of the Earth's radiation

34
00:02:20,040 --> 00:02:24,110
from getting out to outer space. Carbon dioxide is not

35
00:02:24,130 --> 00:02:28,190
the abundant of the greenhouse gasses -- water vapor's the most abundant --

36
00:02:28,210 --> 00:02:32,250
but carbon dioxide has generated the most interest

37
00:02:32,270 --> 00:02:36,300
and that's because carbon dioxide is the most abundant of the green house gasses

38
00:02:36,320 --> 00:02:40,330

that humans are known to be impacting significantly.

39
00:02:40,350 --> 00:02:44,520
We know that humans are pouring

40
00:02:44,540 --> 00:02:48,700
carbon dioxide into the atmosphere through industrial activities

41
00:02:48,720 --> 00:02:52,880
and also that some of our land use changes are affecting the amount of carbon dioxide

42
00:02:52,900 --> 00:02:56,990
in the atmosphere. The AIRS data, in addition to all the

43
00:02:57,010 --> 00:03:01,110
other uses, are now allowing us to monitor on a global basis,

44
00:03:01,130 --> 00:03:05,290
the changes in atmospheric carbon dioxide.

45
00:03:05,310 --> 00:03:09,450
Narrator: Every year plant life on Earth takes up carbon dioxide in the spring,

46
00:03:09,470 --> 00:03:13,590
causing an annual fluctuation of CO2 in the atmosphere.

47
00:03:13,610 --> 00:03:17,730
Parkinson: The AIRS data showt the seasonal cycle really well

48
00:03:17,750 --> 00:03:21,840
and they also show that every year, as the carbon dioxide

49
00:03:21,860 --> 00:03:25,930
amounts rise and then fall, they rise to a higher level

50
00:03:25,950 --> 00:03:30,000
and don't fall quite as low as they did the year before

51
00:03:30,020 --> 00:03:34,060
which shows that there's a prominent long-term upward trend

52
00:03:34,080 --> 00:03:38,100
and this trend is in large part due because of

53
00:03:38,120 --> 00:03:42,120
the carbon dioxide that's being added to the atmosphere through human activities.

54
00:03:42,140 --> 00:03:46,300
Narrator: The AIRS science team has learned that it takes CO2 emissions

55
00:03:46,320 --> 00:03:50,470
a year or two to become well-mixed in the atmosphere – much longer

56
00:03:50,490 --> 00:03:54,650
than previously thought. They've also learned how the movement of carbon dioxide

57
00:03:54,670 --> 00:03:58,830
around the globe can be related to weather patterns. And they've even

58
00:03:58,850 --> 00:04:02,970
And they've even discovered unexpected sources of emissions.

59
00:04:02,990 --> 00:04:07,100
Chahine: You look at the carbon dioxide in the northern hemisphere, yes you have industrial nations

60
00:04:07,120 --> 00:04:11,230
industrial areas, from the USA to Europe to Asia, you name it,

61
00:04:11,250 --> 00:04:15,340
and we see it. Yet we were able to see

62
00:04:15,360 --> 00:04:19,430
a very strong band of carbon dioxide in the southern hemisphere.

63
00:04:19,450 --> 00:04:23,500

Where is that coming from?

64
00:04:23,520 --> 00:04:27,540
Narrator: The emissions turned out to be coming from specific regions

65
00:04:27,560 --> 00:04:31,570
in South America, South Africa, and Australia.

66
00:04:31,590 --> 00:04:35,600
Chahine: You put all three together, and all of the sudden, we have discovered that there is a

67
00:04:35,620 --> 00:04:39,780
large belt of carbon dioxide in the southern hemisphere

68
00:04:39,800 --> 00:04:43,960
never discovered before.

69
00:04:43,980 --> 00:04:48,130
Narrator: AIRS has proven to be a versatile and robust scientific instrument,