1
00:00:00,000 --> 00:00:03,650
[rocket engines roaring]
3...2...1...0.

2
00:00:03,670 --> 00:00:08,322
We have commit.
We have liftoff.

3
00:00:08,342 --> 00:00:13,327
(Christa Peters-Lidard) Over 50 years ago,
the Apollo 8 mission launched to the moon

4
00:00:13,347 --> 00:00:17,331
in December of 1968.
As part of this mission,

5
00:00:17,351 --> 00:00:20,601
three astronauts were able
to capture an iconic image

6
00:00:20,621 --> 00:00:24,504
of the Earth rising over the
moon, known as Earthrise.

7
00:00:24,524 --> 00:00:29,042
[on recording] We're moving around
to a good view of the Earth.

8
00:00:29,062 --> 00:00:32,846
(Christa Peters-Lidard) This image
inspired a generation of environmental activism,

9
00:00:32,866 --> 00:00:39,019
starting with Earth Day, and decades
of environmental activism since.

10
00:00:39,039 --> 00:00:44,057
The NASA Goddard Space Flight
Center's Earth Sciences Division

11
00:00:44,077 --> 00:00:48,362
is the largest collection of
Earth scientists on the planet,

12
00:00:48,382 --> 00:00:53,533
and our job is to
be the nation's trusted source

13
00:00:53,553 --> 00:00:59,740
of comprehensive environmental
information about the current

14
00:00:59,760 --> 00:01:04,311
state and the future of the
Earth. We build, design, launch

15
00:01:04,331 --> 00:01:08,382
and operate scientific missions
including satellites,

16
00:01:08,402 --> 00:01:13,020
airborne campaigns on aircraft,
as well as ground campaigns,

17
00:01:13,040 --> 00:01:17,024
to understand how the Earth
works and how to predict how the

18
00:01:17,044 --> 00:01:21,662
Earth will change in the future.

19
00:01:21,682 --> 00:01:24,531
(Nathan Kurtz) Goddard developed
two space-based LIDARs

20
00:01:24,551 --> 00:01:27,668
that have launched in the past
year, those being GEDI,

21

00:01:27,688 --> 00:01:30,704
which is used to measure the
vegetation structure of Earth,

22
00:01:30,724 --> 00:01:34,041
and ICESat-2, which measures,
among other things,

23
00:01:34,061 --> 00:01:38,278
vegetation, atmosphere, ocean,
and changes in the ice cover.

24
00:01:38,298 --> 00:01:43,050
With ICESat-2, we're just starting
to see the first year of data.

25
00:01:43,070 --> 00:01:46,753
So what we've seen is the
thickness of the ice

26
00:01:46,773 --> 00:01:50,057
in the Arctic change
over the course of the year.

27
00:01:50,077 --> 00:01:53,327
So we've seen it at its minimum
and we saw the ice grow

28
00:01:53,347 --> 00:01:57,464
to its maximum extent in March,
and maximum thickness.

29
00:01:57,484 --> 00:02:02,002
What we've seen too is that thickness...
it's a lot less than it was

30
00:02:02,022 --> 00:02:05,172
in prior decades, so it's about
half as thick as it was, say,

31

00:02:05,192 --> 00:02:08,342
in the 80s. So we've seen a
substantial change in the ice.

32
00:02:08,362 --> 00:02:12,012
We've also started measuring ice
in the summer with ICESat-2,

33
00:02:12,032 --> 00:02:15,182
and looking to get... can we
see how thick that ice is?

34
00:02:15,202 --> 00:02:18,018
It's a procedure to be able to
do that and this is brand new

35
00:02:18,038 --> 00:02:25,993
data that we're just first
seeing with ICESat-2.

36
00:02:26,013 --> 00:02:29,863
(Doug Morton) From our vantage point in space,
we have a global perspective on the role

37
00:02:29,883 --> 00:02:34,434
the role of fires in the Earth system.
We see landscapes where fires are increasing,

38
00:02:34,454 --> 00:02:37,371
especially in places where
there's plenty of fuel to burn.

39
00:02:37,391 --> 00:02:41,041
Warmer and drier climate
means those fires can grow

40
00:02:41,061 --> 00:02:44,044
faster, get larger, and blow
their smoke further downwind,

41

00:02:44,064 --> 00:02:47,514
impacting communities not just
in the locations where fires

42
00:02:47,534 --> 00:02:53,854
burn, but people thousands of
miles away. NASA has more than

43
00:02:53,874 --> 00:02:57,424
20 satellites on orbit right
now. Each of them help us tell a

44
00:02:57,444 --> 00:03:00,961
part of the story about how fire
changes the Earth system.

45
00:03:00,981 --> 00:03:04,231
We are the first to detect fires
burning in remote locations

46
00:03:04,251 --> 00:03:08,135
with satellites that observe the
location and the intensity of

47
00:03:08,155 --> 00:03:11,505
fires. We're also then tracking
the smoke and the way the smoke

48
00:03:11,525 --> 00:03:14,041
from fires blows to impact
not just local communities, but

49
00:03:14,061 --> 00:03:18,378
people that could live thousands
of miles away. Fires in

50
00:03:18,398 --> 00:03:21,548
California, for example in 2017,
sent their smoke as far East as

51

00:03:21,568 --> 00:03:25,252
New England. Those trace gasses
and the aerosols that fires

52
00:03:25,272 --> 00:03:29,089
release then change our
entire planet. And so at NASA,

53
00:03:29,109 --> 00:03:32,025
scientists like myself are
responsible for not just finding

54
00:03:32,045 --> 00:03:35,062
those fires, but tracking the
impacts they have on ecosystems

55
00:03:35,082 --> 00:03:39,499
and the consequences of those
fires in our atmosphere.

56
00:03:39,519 --> 00:03:43,336
(Susan Strahan) NASA has been studying ozone
from space for about 40 years now.

57
00:03:43,356 --> 00:03:47,541
We have nearly daily, global
measurements of ozone since

58
00:03:47,561 --> 00:03:51,445
1979. Science is showing us
that the Montreal Protocol is an

59
00:03:51,465 --> 00:03:55,015
effective treaty and it's
working as intended, and I think

60
00:03:55,035 --> 00:03:57,951
that's fantastic news for all
of us on the whole planet!

61

00:03:57,971 --> 00:04:01,221
We learned that if you look at
the HCl, hydrochloric acid,

62
00:04:01,241 --> 00:04:04,558
measurements during certain
conditions inside the ozone

63
00:04:04,578 --> 00:04:08,295
hole, and then you track those
conditions each year, you can

64
00:04:08,315 --> 00:04:11,865
make a measurement of whether or
not the chlorine is going down.

65
00:04:11,885 --> 00:04:15,569
And it turns out that as the
chlorine goes down, we're seeing

66
00:04:15,589 --> 00:04:18,672
the amount of ozone depletion
going down right along with it.

67
00:04:18,692 --> 00:04:21,374
So the two are tracking
together. And that gives us

68
00:04:21,394 --> 00:04:24,744
confidence that this treaty is successful
and it's working as intended.

69
00:04:24,764 --> 00:04:30,150
(Jeremy Werdell) The ocean is absolutely
immense and it's very difficult to be

70
00:04:30,170 --> 00:04:33,987
all places at all times. This is
where satellites come in.

71

00:04:34,007 --> 00:04:36,423
There's a fleet of
earth-observing satellites

72
00:04:36,443 --> 00:04:40,660
hosted by NASA that view the
global ocean every two days.

73
00:04:40,680 --> 00:04:45,365
The PACE mission is NASA's
Plankton, Aerosol, Cloud, ocean

74
00:04:45,385 --> 00:04:48,568
Ecosystem mission, scheduled for
launch in December of 2022.

75
00:04:48,588 --> 00:04:52,472
It is NASA's next big investment
in the combined study of the oceans

76
00:04:52,492 --> 00:04:56,076
and the atmospheres. From the
oceans, it's designed to improve

77
00:04:56,096 --> 00:05:00,080
our ability to discriminate and
identify phytoplankton community

78
00:05:00,100 --> 00:05:03,450
structure. In particular, their
evolution in time and space.

79
00:05:03,470 --> 00:05:08,622
(Lesley Ott) Satellites give us about
6 million observations of weather

80
00:05:08,642 --> 00:05:11,224
every 6 hours, so that's a
whole lot of data! One of the

81

00:05:11,244 --> 00:05:14,794
things at NASA that we do is try
to do a good job of merging all

82
00:05:14,814 --> 00:05:18,498
of that data with a model field.
That's the starting point of a

83
00:05:18,518 --> 00:05:21,535
weather forecast, and that helps
us improve the way that we can

84
00:05:21,555 --> 00:05:24,070
predict weather. That improves
the way that we get weather

85
00:05:24,090 --> 00:05:26,573
forecasts on our phone and
improves our lives a little bit

86
00:05:26,593 --> 00:05:29,843
every day. NASA plays a really
critical role in that because we

87
00:05:29,863 --> 00:05:33,013
understand satellites probably
as well as anyone in the world.

88
00:05:33,033 --> 00:05:36,516
And so we can really pioneer and
get new types of data into those

89
00:05:36,536 --> 00:05:39,052
weather forecasts and make
sure that that helps us improve

90
00:05:39,072 --> 00:05:42,656
forecasts for everyone going
forward.

91

00:05:42,676 --> 00:05:47,427
(Jeremy Werdell) Being at
Goddard is absolutely incredible.

92
00:05:47,447 --> 00:05:50,730
It's one of the greatest collections
of Earth scientists in the world.

93
00:05:50,750 --> 00:05:53,767
So the access that we have to each other
is just, in my mind, unparalleled.

94
00:05:53,787 --> 00:05:58,538
(Susan Strahan) There are so many really smart
people that know... that have expertise in

95
00:05:58,558 --> 00:06:03,143
so many different areas of atmospheres:
chemistry, dynamics, in measurements, in modeling.

96
00:06:03,163 --> 00:06:06,213
(Lesley Ott) It's a fast-moving
group of people,

97
00:06:06,233 --> 00:06:10,083
but it's always changing. And it's a whole lot
of fun to be a part of all of that energy.

98
00:06:10,103 --> 00:06:12,786
(Christa Peters-Lidard)
NASA's Artemis mission is an

99
00:06:12,806 --> 00:06:16,489
opportunity to look back at
Earth and regain that sense of

100
00:06:16,509 --> 00:06:20,827
awe and wonder that we had
with the Earthrise photo that