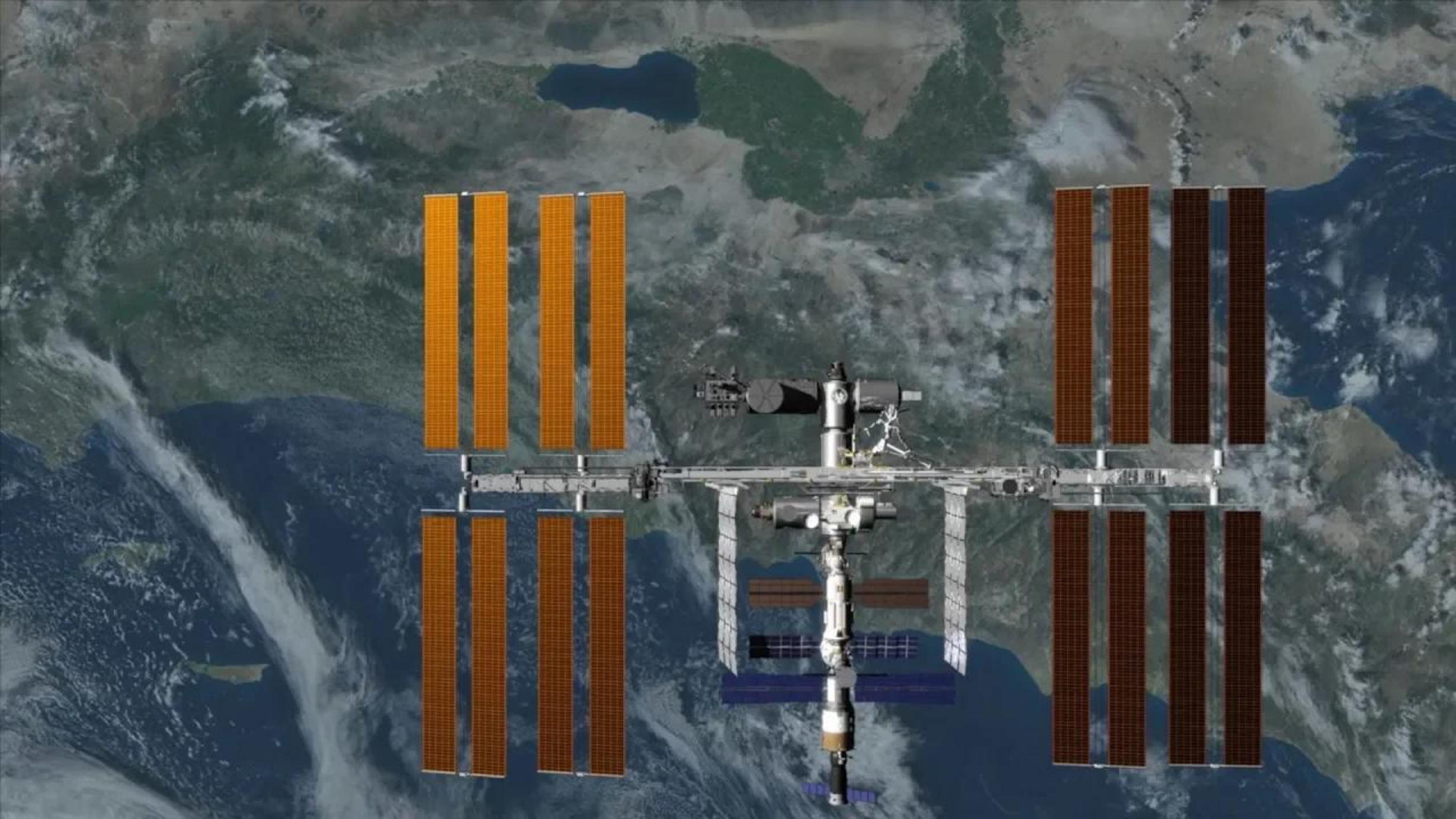

1
00:00:00,400 --> 00:00:03,269
[gentle music]

2
00:00:03,302 --> 00:00:06,205
>> Since about the start of
the Industrial Revolution,

3
00:00:06,238 --> 00:00:07,974
we've seen CO2 levels

4
00:00:08,007 --> 00:00:10,376
in the atmosphere
increase by about 30%.

5
00:00:10,409 --> 00:00:13,413
Human activity is causing
a tipping of the scales,

6
00:00:13,446 --> 00:00:17,016
this very fine delicate
balance that we have

7
00:00:17,049 --> 00:00:18,384
and what we call the
carbon cycle here.

8
00:00:18,417 --> 00:00:21,220
>> The key motivation
for the OCO-3 experiment

9
00:00:21,253 --> 00:00:24,190
is to continue this
record of carbon dioxide.

10
00:00:24,223 --> 00:00:27,026
OCO-2 was built
to last two years.

11
00:00:27,059 --> 00:00:28,394

We've had it up
there for four years,

12
00:00:28,427 --> 00:00:30,997
but there's always a risk
it's not gonna survive,

13
00:00:31,030 --> 00:00:34,133
so OCO-3 goes on the space
station in the spring.

14
00:00:34,166 --> 00:00:35,468
[gentle music]

15
00:00:35,501 --> 00:00:38,438
We'd like to have measurements
that cover a long duration,

16
00:00:38,471 --> 00:00:41,307
and OCO-3 is gonna help
add to that record.

17
00:00:41,340 --> 00:00:45,078
>> OCO-3 is gonna
specifically produce a dataset

18
00:00:45,111 --> 00:00:46,479
of carbon dioxide measurements.

19
00:00:46,512 --> 00:00:50,450
We'd like to be able to keep
an eye on this atmospheric CO2,

20
00:00:50,483 --> 00:00:52,452
where did it come
from, where's it going,

21
00:00:52,485 --> 00:00:57,056
and how is it related to
other global processes.

22
00:00:57,089 --> 00:00:59,025
>> Annmarie: When plants
are doing photosynthesis,

23
00:00:59,058 --> 00:01:00,293
they emit a little bit of light,

24
00:01:00,326 --> 00:01:02,462
and we can sense that
light in our measurements,

25
00:01:02,495 --> 00:01:06,399
so we have a measure of
plant photosynthesis activity

26
00:01:06,432 --> 00:01:09,435
in combination with
the carbon dioxide.

27
00:01:09,468 --> 00:01:11,437
>> Plants use CO2 for growing.

28
00:01:11,470 --> 00:01:13,339
They absorb it into the leaves,

29
00:01:13,372 --> 00:01:17,477
they convert CO2
and water into sugar

30
00:01:17,510 --> 00:01:20,246
that they use to store
the energy to grow later.

31
00:01:20,279 --> 00:01:21,414
The combination of
these measurements

32
00:01:21,447 --> 00:01:23,182

can tell us about
the relationship

33
00:01:23,215 --> 00:01:25,418
between this net
uptake of CO2 over time

34
00:01:25,451 --> 00:01:29,122
and how that is being
governed by photosynthesis.

35
00:01:29,155 --> 00:01:32,158
>> OCO-2 measures every
day, the same time of day.

36
00:01:32,191 --> 00:01:34,060
With OCO-3 on the space station,

37
00:01:34,093 --> 00:01:36,295
we're gonna sample from
sunlight to sundown,

38
00:01:36,328 --> 00:01:38,364
and so now we can learn
about carbon cycle

39
00:01:38,397 --> 00:01:40,266
through different
parts of the day,

40
00:01:40,299 --> 00:01:43,102
and that's really important,
because plants respond to sun,

41
00:01:43,135 --> 00:01:46,239
so we need to see them
behaving across the day.

42
00:01:46,272 --> 00:01:48,174
[gentle music]

43
00:01:48,207 --> 00:01:50,243
>> Ralph: Our team
designed and built

44
00:01:50,276 --> 00:01:54,347
an agile, mechanical
actuator that allows OCO-3

45
00:01:54,380 --> 00:01:58,317
to look at dozens of areas
on the globe each day,

46
00:01:58,350 --> 00:02:00,086
and each of these areas is about

47
00:02:00,119 --> 00:02:03,122
50 miles by 50 miles in
size, and so that allows us

48
00:02:03,155 --> 00:02:05,191
to actually focus in
on specific areas,

49
00:02:05,224 --> 00:02:09,262
maybe urban areas, as well
as agricultural regions.

50
00:02:09,295 --> 00:02:11,430
>> This capability
of OCO-3 to map out

51
00:02:11,463 --> 00:02:13,299
some of those areas and start to

52
00:02:13,332 --> 00:02:16,435
see some change over time,
and that really is how

53

00:02:16,468 --> 00:02:18,371
we are gonna advance
our understanding

54
00:02:18,404 --> 00:02:20,273
and our modeling for the future