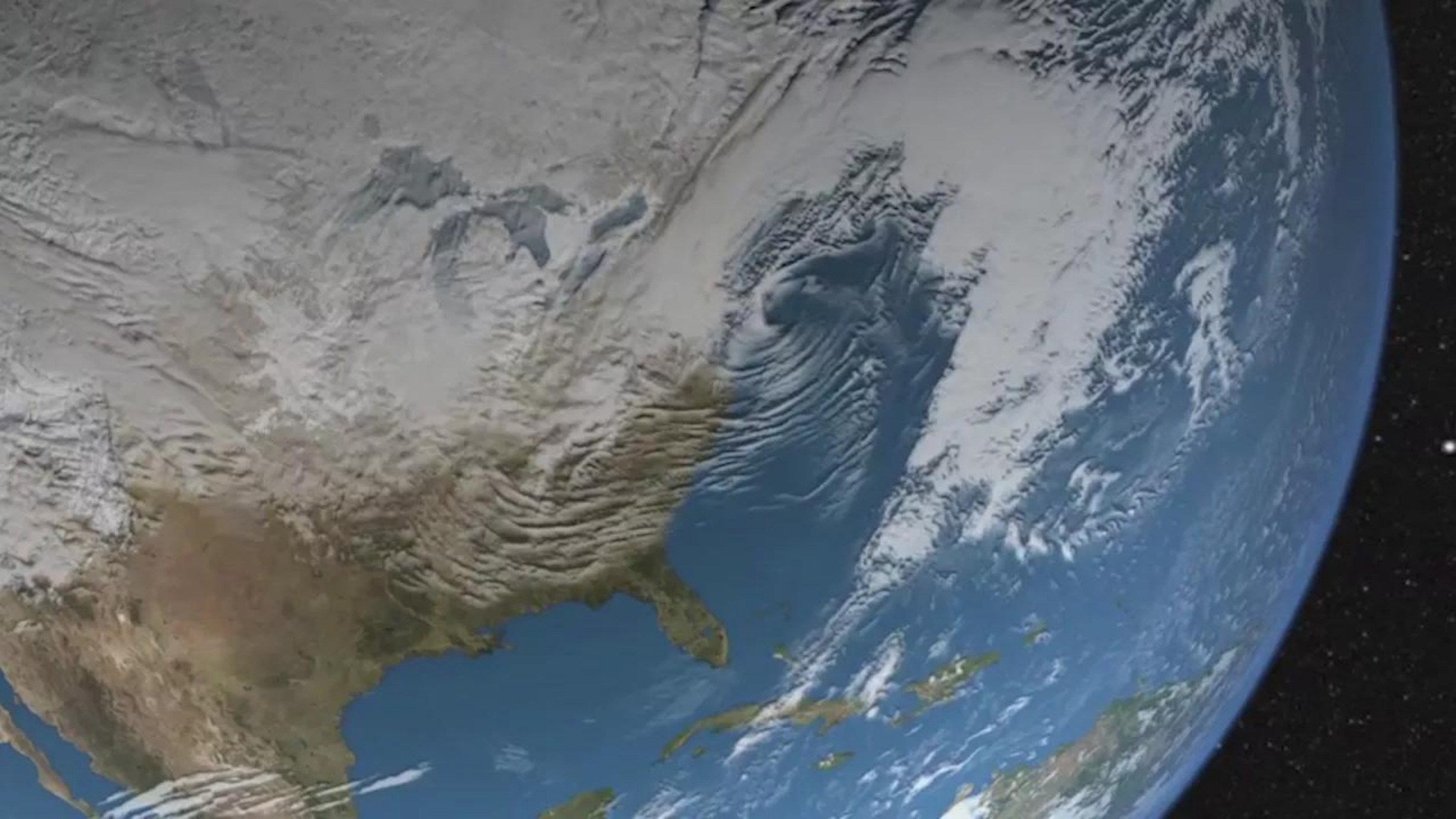

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00:00:00,100 --> 00:00:10,020
[MUSIC]

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00:00:10,020 --> 00:00:25,600
Hey, everyone. Welcome to Earth Expeditions.
Today, we're taking you to the North Atlantic.

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00:00:25,600 --> 00:00:29,320
We've got a team in the field right now.
Actually, we've got a team on the ocean and

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00:00:29,320 --> 00:00:32,119
in the sky right now. Let's check in on the
researchers.

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00:00:32,119 --> 00:00:39,930
Chemistry, biology, physics, the NASA mission
has gathered experts in all three disciplines

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00:00:39,930 --> 00:00:45,489
and more for an ambitious project to study
Earth's climate. It's called the North Atlantic

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00:00:45,489 --> 00:00:51,510
Aerosols and Marine Ecosystems Study. NASA
called it NAAMES. It's a complex mission with

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00:00:51,510 --> 00:00:56,920
a million moving parts, but there are three
big ones to note. First, there's the research

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00:00:56,920 --> 00:01:04,220
vessel Atlantis, a laboratory at sea.
Then, there's NASA's own C-130 Hercules, a

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00:01:04,220 --> 00:01:11,130
laboratory in the sky. And one more, but we'll
get to that. It's big hardware for sure, but

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00:01:11,130 --> 00:01:18,259
the stars of the show, besides a crackerjack
team of scientists, are these guys, phytoplankton.

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00:01:18,259 --> 00:01:23,500
In the North Atlantic, there are trillions,
and springtime is when they bloom.

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00:01:23,500 --> 00:01:29,340
Phytoplankton produce a gas called dimethyl
sulfide, or DMS, and as that gas passes into

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00:01:29,340 --> 00:01:35,270
the atmosphere, it rapidly breaks down. The
resulting sulfur compounds become aerosols,

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00:01:35,270 --> 00:01:40,329
microscopic particles, in essence, and water
condenses around them. And you know what you

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00:01:40,329 --> 00:01:47,229
get when countless water droplets condense
in the atmosphere? Clouds. There's a startling

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00:01:47,229 --> 00:01:53,920
connection. Phytoplankton affect cloud formation.
But phytoplankton growth depends on available

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00:01:53,920 --> 00:01:58,960
carbon, and the warmer the temperatures of
the ocean, the less carbon that water can

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00:01:58,960 --> 00:02:05,229
hold. Less carbon could restrict phytoplankton
growth, which in turn could affect global

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00:02:05,229 --> 00:02:12,560
cloud cover, among other things. When one
part of the system changes, everything shifts,

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00:02:12,560 --> 00:02:18,069
and that's why NASA has teams out in the field
studying how the system works from all sorts

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00:02:18,069 --> 00:02:22,090
of angles.
So, what's the mission's third big moving

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00:02:22,090 --> 00:02:28,269
part? That would be the agency's fleet of
spacecraft currently in orbit gathering global

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00:02:28,269 --> 00:02:36,040
information 24/7/365. Lessons learned from
NAAMES and related research will help experts

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00:02:36,040 --> 00:02:41,060
develop the next generation of spacecraft,
some of which are already on the drawing board.

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00:02:41,060 --> 00:02:46,290
Let's talk with NAAMES' principle investigator
Mike Behrenfeld from Oregon State University.

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00:02:46,290 --> 00:02:51,330
Mike, why do you go out in the field?
Sometimes you can't simulate natural conditions

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00:02:51,330 --> 00:02:55,750
in a lab. And so, what you do is you take
your lab to sea so that you can actually measure

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00:02:55,750 --> 00:02:59,610
natural communities, natural conditions that
you can't get in the lab.

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00:02:59,610 --> 00:03:03,689
So, is just a shift in aircraft working on
this project?

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00:03:03,689 --> 00:03:09,079
This project that we're doing on the Atlantis
is not an isolated event, right? It's part

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00:03:09,079 --> 00:03:13,700
of a much bigger picture. So, we have satellites.
We have the work that's done on the ship.

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00:03:13,700 --> 00:03:17,700
We have modelers, and it's all these different
components that bring the whole story together.

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00:03:17,700 --> 00:03:24,280
So, you can't necessarily do a global science
project from a single standpoint. But, every

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00:03:24,280 --> 00:03:27,439
element is critical to coming up with the
answers that you're looking for.

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00:03:27,439 --> 00:03:32,180
How many field campaigns are involved in NAAMES?
It involves four field campaigns, not just

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00:03:32,180 --> 00:03:37,370
this one. And each one is targeting a specific
time of the year, specific set of events,

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00:03:37,370 --> 00:03:41,090
in the ocean as well as in the atmosphere.
We're leading a little bit of us behind in

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00:03:41,090 --> 00:03:46,269
each one of these cruises. So, we have what
are called drifters, and we deploy those at

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00:03:46,269 --> 00:03:50,950
different locations in the North Atlantic
here. And those drifters will follow a piece

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00:03:50,950 --> 00:03:56,159
of water for up to years.
And we're also deploying what are called floats,

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00:03:56,159 --> 00:04:00,680
which ironically sink, and they go up and
down through the water column. And they can

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00:04:00,680 --> 00:04:05,069
often stay in a single spot for a couple of
years. And they take measurements continuously,

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00:04:05,069 --> 00:04:08,370
up and down through the water column, looking
at the biology, looking at the chemistry and

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00:04:08,370 --> 00:04:13,040
the optics. And that continues to give us
data of what's happening with those ecosystems

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00:04:13,040 --> 00:04:14,939
that we studied on the ship and then left
behind.

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00:04:14,939 --> 00:04:18,470
How did this project start?
You know, the NAAMES project started from

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00:04:18,470 --> 00:04:22,380
space and worked its way down to the ocean,
which is not often the case. One of the reasons,

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00:04:22,380 --> 00:04:26,690
as I mentioned, that the field research is
really important is because it provides a

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00:04:26,690 --> 00:04:32,090
level of detail that we can't get from robots
and satellites, right? There's a lot of detail

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00:04:32,090 --> 00:04:35,950
in there. And so, the satellite data would
kind of kick this off. It's looking at the

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00:04:35,950 --> 00:04:40,100
full annual cycle of the plankton and bringing
up some ideas that were kind of contrary to

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00:04:40,100 --> 00:04:44,940
what we had thought was driving blooms.
This is really big science and helps us answer

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00:04:44,940 --> 00:04:48,360
so many questions about climate change. Exclamation
point.

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00:04:48,360 --> 00:04:52,980
Yeah, I know. One of the things I love about
the NAAMES expedition is that it's going after

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00:04:52,980 --> 00:04:57,070
one of the biggest unknowns in the Earth's
system. Like, literally how do the different

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00:04:57,070 --> 00:05:01,110
components link up?
Right, right. And it's really cool because

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00:05:01,110 --> 00:05:05,030
this is all related to climate change. And
I think a lot of times when we read about

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00:05:05,030 --> 00:05:08,870
climate change, when we hear about climate
change, it's a lot of really depressing topics.

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00:05:08,870 --> 00:05:12,010
And it just seems like we're doomed and things
like that.

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00:05:12,010 --> 00:05:16,410
But, what I really like being here at NASA
and having all this great NASA research and

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00:05:16,410 --> 00:05:20,860
instruments and team is this kind of the hope
for the future. I mean we're looking at all

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00:05:20,860 --> 00:05:25,580
these mysteries, and we're going to learn
so much that it's really inspiring to see

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00:05:25,580 --> 00:05:30,100
all these people come together and try and
learn more about our Earth and our lives here

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00:05:30,100 --> 00:05:32,870
on Earth.
Yeah, and hopefully, we can take the information

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00:05:32,870 --> 00:05:35,640
and better predict and better forecast where
we're headed.

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00:05:35,640 --> 00:05:37,680
Right.
Anyhow, next up, we are going to take you

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00:05:37,680 --> 00:05:42,830
to the tropical Pacific to see coral reefs
and how they're responding to changing ocean

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00:05:42,830 --> 00:05:47,990
conditions with NASA's coral expedition.
Right. So, tune in next time, and until then,