Anyoung-haseyo. That's hello in Korean. Because today our investigators are in South Korea to study air quality. Air quality is a lot like your breath, Tom.

Most people aren't going to say anything unless it's bad.

At NASA, we're constantly looking at air quality around the globe from space. Today we're showing you how we do this with aircraft and ground instruments with NASA's Earth science mission called the Korea U.S. Air Quality Campaign, or KORUS-AQ for short.

This campaign will deepen our understanding of the processes controlling air quality, and will also improve the ability of our forecasts to assess air quality conditions.

I had a chance to chat with Barry Lefer a few days before he left for the start of KORUS-AQ, and I picked his brain about why we should be studying air quality over Asia in particular.
Hey, so Barry, tell us why we need NASA to study air pollution.

Well, it turns out air pollution's a global problem, and the best way to see the global view is from space, from satellites. And it's amazing when the first global satellite of

air--measuring air pollution from the Space Shuttle, all the surprises we saw that we didn't expect.

Hmm.

So, that's really exciting. But, measuring air pollution from space must be tough. I mean, you're talking about small particles and gases and things. How does that work?

Yeah. So, it turns out very small amounts of air pollution can cause human health effects. And so, it is indeed a challenge, and part of it is that clouds get in the way. And also, we're measuring the whole column of pollutants, and what we care about is what's really down at the surface. It's amazing over the last 10 years, the improvements we've made in understanding how to take that column.
and what is at the surface. And now KORUS-AQ is going to help us with that. But, you're going to use, I think, something like three different airplanes and some stuff on the ground. Tell us about how all that comes together.

Yeah, it is indeed a lot of coordination involved, and we're working with our Korean colleagues closely. It turns out that we need multiple views of the problem. And so, we have the NASA DC-8 making these walls, and then we have the NASA King Air flying high, looking down with an airborne simulator. So, it's an exact duplicate of the satellite. But, since the satellite's not launched yet, we can actually see what the satellite's going to see--. Now, why Korea, right? The KO in KORUS is Korea. Why did you guys pick Korea to go with?
Well, we could have gone anywhere in the world for this study, any megacity. But, the Koreans,

we have a special relationship with the Koreans. They're building a sister satellite to the NASA TEMPO satellite--. Hmm--.

--Which is going to launch in a few years. And so, we want to work on how to calibrate and validate that satellite before it's even in space.

Okay. Now, tell us, how does all this data come together in the end? Explain a little more about how our world works.

We're going to spend the next two to four years after we get the data analyzing it, modeling it, and writing scientific papers and presenting them at conferences. And I'm really excited and looking forward to the results.

There are a lot of factors that can affect local air quality. Some are visual and some are not so visual.

There are these types of natural pollutants
like fires and windblown dust. And some pollutants

can even come from far away distances, even
over oceans. And some pollutants are also

caused by human activities.
Right, and that's why KORUS-AQ has a whole

range of instruments on aircraft and on the
ground. It's things like LiDAR that are in

the airplanes using lasers to measure the
particulates in the atmosphere, through to

gas stations on the ground that are measuring
things like how much nitrogen oxide is in

the atmosphere. How does that relate to the
formation of other pollutants we could breathe

in?
Right, right. And a lot of the forms of air

pollution, they are visible. But, it's important
to know that there equally harmful types of

pollutants that are invisible.
Right. And I think that's the thing, is people

say, oh, I see smog. That's the problem. Smog
is actually a byproduct of all of those other

things.
At NASA, we have satellites that give us global
snapshots of how air quality has changed over the years. KORUS-AQ is really important because it's giving us a lot of this ground data to help us validate our measurements from space, and it also improves our knowledge of the challenges facing satellite observations of air quality. It's also helping us and the Koreans design the next generation of pollution tracking satellites. In this campaign, continuous data will be collected from more than 300 ground-based air quality sites. Hmm. South Korea is a great place to do this. It's a natural air quality laboratory with big cities and small towns, forests, and nearby oceans. And how these different pollution sources interact is being monitored by our KORUS-AQ team. Let's check in with our team in our South Korea laboratory on how they're making these measurements.
We're at Osan Airbase in South Korea. Hanger 1187 is the KORUS-AQ base of operations. Here
we have our flight planning meetings and also the space where the scientists get to prepare
their instruments.
Our flight plans are very complex, sometimes flying just a couple of thousand feet above the surface over populated areas, building vertical profiles of the atmosphere. And it's a very busy airspace, so our team has worked closely, coordinating flight plans, with the local authorities.
The data we're collecting during KORUS-AQ will be particularly useful in better understanding how to measure air pollution from space. To do that, we need to combine the data we're collecting from the air with data gathered from the ground at hundreds of sites across South Korea. One of the major ground sites is a 90-minute drive east from the airbase into the forests of South Korea. We're at Taehwa Research Forest southeast of Seoul at a monitoring station that South Korean scientists use to measure weather and
81
00:05:51,379 --> 00:05:56,480
the atmosphere. NASA has brought a variety
of new sensors here to this site.

82
00:05:56,480 --> 00:06:02,939
Taehwa is far enough away from industry that
it is a relatively clean air site and a good

83
00:06:02,939 --> 00:06:08,009
place to measure emissions given off by trees.
Scientists want to better understand how these

84
00:06:08,009 --> 00:06:16,129
emissions mix with manmade pollutants to form
ozone in the atmosphere.

85
00:06:16,129 --> 00:06:19,230
That team in Korea is busy and doing a great
job, as you can see.

86
00:06:19,230 --> 00:06:22,900
During this time, we're actually collecting
data to share with our scientists, students,

87
00:06:22,899 --> 00:06:27,159
whoever wants it.
And so, we just give that data away?

88
00:06:27,160 --> 00:06:32,830
Yep, we are NASA, giving away data and reaching
new heights since day one.

89
00:06:32,829 --> 00:06:36,139
Oh, well. Good night, everybody.
What about NAAMES?

90
00:06:36,139 --> 00:06:39,959
Oh, right. I'm Kasha and this is Tom. Good
night, everybody.

91
00:06:39,959 --> 00:06:44,719
First of all, I'm Kasha and he's Tom. And
I'm not talking about names. I'm talking about
the North Atlantic Aerosols and Marine Ecosystems Study.

So, actually it's really cool because right now we are in Korea, and then we will be going all the way across the world to the North Atlantic Ocean to study--.

--Ah--.
--Phytoplankton.

That's right, NAAMES. That's a five-year experiment from NASA using floating and flying laboratories to look at plankton in the ocean. With our Earth changing, such as our oceans warming, this study will tell us how plankton production is also changing, and how different species of plankton are starting to evolve and how this affects our climate.

So, I'm very excited to talk to all of you next time. Until then, be sure to check out NASA.gov and the Earth Expedition's page for more information on air quality and ecosystem studies. From KORUS-AQ in the air to the sequel, KORUS-OC in the water, and the upcoming NAAMES mission.
in the North Atlantic, a lot is happening

00:07:34,079 --> 00:07:36,870
in Earth science as we continue to keep an
eye on the air.

00:07:36,870 --> 00:07:49,090
At NASA, we know our planet is changing, and
we're on it.