
NASA
528
Langley Research Center
N528NA

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00:00:00,000 --> 00:00:20,000
[MUSIC]

2
00:00:21,700 --> 00:00:27,100
Anyoung-haseyo. That's hello in Korean.
Because today our investigators are in South

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00:00:27,180 --> 00:00:31,090
Korea to study air quality.
Air quality is a lot like your breath, Tom.

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00:00:31,090 --> 00:00:34,870
Most people aren't going to say anything unless
it's bad.

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00:00:34,870 --> 00:00:39,900
At NASA, we're constantly looking at air quality
around the globe from space. Today we're showing

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00:00:39,900 --> 00:00:44,090
you how we do this with aircraft and ground
instruments with NASA's Earth science mission

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00:00:44,090 --> 00:00:48,810
called the Korea U.S. Air Quality Campaign,
or KORUS-AQ for short.

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00:00:48,810 --> 00:00:52,090
This campaign will deepen our understanding
of the processes controlling air quality,

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00:00:52,090 --> 00:00:56,440
and will also improve the ability of our forecasts
to assess air quality conditions.

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00:00:56,440 --> 00:01:01,079
I had a chance to chat with Barry Lefer a
few days before he left for the start of KORUS-AQ,

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00:01:01,079 --> 00:01:05,950
and I picked his brain about why we should
be studying air quality over Asia in particular.

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00:01:05,950 --> 00:01:11,469
Hey, so Barry, tell us why we need NASA to
study air pollution.

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00:01:11,469 --> 00:01:14,909
Well, it turns out air pollution's a global
problem, and the best way to see the global

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00:01:14,909 --> 00:01:21,189
view is from space, from satellites. And it's
amazing when the first global satellite of

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00:01:21,189 --> 00:01:25,289
air--measuring air pollution from the Space
Shuttle, all the surprises we saw that we

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00:01:25,289 --> 00:01:26,459
didn't expect.
Hmm.

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00:01:26,459 --> 00:01:30,850
So, that's really exciting.
But, measuring air pollution from space must

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00:01:30,850 --> 00:01:34,929
be tough. I mean, you're talking about small
particles and gases and things. How does that

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00:01:34,929 --> 00:01:36,939
work?
Yeah. So, it turns out very small amounts

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00:01:36,939 --> 00:01:41,319
of air pollution can cause human health effects.
And so, it is indeed a challenge, and part

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00:01:41,319 --> 00:01:46,479
of it is is that clouds get in the way.
And also, we're measuring the whole column

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00:01:46,479 --> 00:01:50,939
of pollutants, and what we care about is what's
really down at the surface. It's amazing over

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00:01:50,939 --> 00:01:54,920
the last 10 years, the improvements we've
made in understanding how to take that column

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00:01:54,920 --> 00:01:58,399
and what is at the surface.
And now KORUS-AQ is going to help us with

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00:01:58,399 --> 00:02:01,999
that. But, you're going to use, I think, something
like three different airplanes and some stuff

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00:02:01,999 --> 00:02:04,359
on the ground. Tell us about how all that
comes together.

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00:02:04,359 --> 00:02:09,890
Yeah, it is indeed a lot of coordination involved,
and we're working with our Korean colleagues

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00:02:09,890 --> 00:02:15,010
closely. It turns out that we need multiple
views of the problem.

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00:02:15,010 --> 00:02:18,310
Hmm.
And so, we have the NASA DC-8 making these

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00:02:18,310 --> 00:02:22,620
walls, and then we have the NASA King Air
flying high, looking down with an airborne

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00:02:22,620 --> 00:02:26,480
simulator. So, it's an exact duplicate of
the satellite. But, since the satellite's

32
00:02:26,480 --> 00:02:29,209
not launched yet, we can actually see what
the satellite's going to see--.

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00:02:29,209 --> 00:02:30,560
--Hmm--.
--From this higher airplane.

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00:02:30,560 --> 00:02:34,450
Now, why Korea, right? The KO in KORUS is
Korea. Why did you guys pick Korea to go with?

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00:02:34,450 --> 00:02:39,040
Well, we could have gone anywhere in the world
for this study, any megacity. But, the Koreans,

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00:02:39,040 --> 00:02:42,360
we have a special relationship with the Koreans.
They're building a sister satellite to the

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00:02:42,360 --> 00:02:44,040
NASA TEMPO satellite--.
--Hmm--.

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00:02:44,040 --> 00:02:48,519
--Which is going to launch in a few years.
And so, we want to work on how to calibrate

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00:02:48,519 --> 00:02:51,170
and validate that satellite before it's even
in space.

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00:02:51,170 --> 00:02:54,799
Okay. Now, tell us, how does all this data
come together in the end? Explain a little

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00:02:54,799 --> 00:02:58,920
more about how our world works.
We're going to spend the next two to four

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00:02:58,920 --> 00:03:04,599
years after we get the data analyzing it,
modeling it, and writing scientific papers

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00:03:04,599 --> 00:03:07,689
and presenting them at conferences. And I'm
really excited and looking forward to the

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00:03:07,689 --> 00:03:11,219
results.
There are a lot of factors that can affect

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00:03:11,219 --> 00:03:14,670
local air quality. Some are visual and some
are not so visual.

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00:03:14,670 --> 00:03:20,140
There are these types of natural pollutants
like fires and windblown dust. And some pollutants

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00:03:20,140 --> 00:03:24,560
can even come from far away distances, even
over oceans. And some pollutants are also

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00:03:24,560 --> 00:03:28,480
caused by human activities.
Right, and that's why KORUS-AQ has a whole

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00:03:28,480 --> 00:03:33,079
range of instruments on aircraft and on the
ground. It's things like LIDAR that are in

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00:03:33,079 --> 00:03:37,349
the airplanes using lasers to measure the
particulates in the atmosphere, through to

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00:03:37,349 --> 00:03:41,379
gas stations on the ground that are measuring
things like how much nitrogen oxide is in

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00:03:41,379 --> 00:03:45,230
the atmosphere. How does that relate to the
formation of other pollutants we could breathe

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00:03:45,230 --> 00:03:48,890
in?
Right, right. And a lot of the forms of air

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00:03:48,890 --> 00:03:53,670
pollution, they are visible. But, it's important
to know that there equally harmful types of

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00:03:53,670 --> 00:03:57,040
pollutants that are invisible.
Right. And I think that's the thing, is people

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00:03:57,040 --> 00:04:02,030
say, oh, I see smog. That's the problem. Smog
is actually a byproduct of all of those other

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00:04:02,030 --> 00:04:04,730
things.
At NASA, we have satellites that give us global

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00:04:04,730 --> 00:04:09,859
snapshots of how air quality has changed over
the years. KORUS-AQ is really important because

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00:04:09,859 --> 00:04:14,499
it's giving us a lot of this ground data to
help us validate our measurements from space,

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00:04:14,499 --> 00:04:18,299
and it also improves our knowledge of the
challenges facing satellite observations of

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00:04:18,299 --> 00:04:21,500
air quality.
It's also helping us and the Koreans design

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00:04:21,500 --> 00:04:26,690
the next generation of pollution tracking
satellites. In this campaign, continuous data

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00:04:26,690 --> 00:04:31,180
will be collected from more than 300 ground-based
air quality sites.

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00:04:31,180 --> 00:04:33,260
Hmm.
South Korea is a great place to do this. It's

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00:04:33,260 --> 00:04:38,410
a natural air quality laboratory with big
cities and small towns, forests, and nearby

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00:04:38,410 --> 00:04:42,870
oceans. And how these different pollution
sources interact is being monitored by our

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00:04:42,870 --> 00:04:45,780
KORUS-AQ team.
Let's check in with our team in our South

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00:04:45,780 --> 00:04:50,880
Korea laboratory on how they're making these
measurements.

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00:04:50,880 --> 00:04:57,130
We're at Osan Airbase in South Korea. Hanger
1187 is the KORUS-AQ base of operations. Here

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00:04:57,130 --> 00:05:01,660
we have our flight planning meetings and also
the space where the scientists get to prepare

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00:05:01,660 --> 00:05:05,760
their instruments.
Our flight plans are very complex, sometimes

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00:05:05,760 --> 00:05:11,320
flying just a couple of thousand feet above
the surface over populated areas, building

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00:05:11,320 --> 00:05:16,810
vertical profiles of the atmosphere. And it's
a very busy airspace, so our team has worked

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00:05:16,810 --> 00:05:20,410
closely, coordinating flight plans, with the
local authorities.

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00:05:20,410 --> 00:05:25,110
The data we're collecting during KORUS-AQ
will be particularly useful in better understanding

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00:05:25,110 --> 00:05:29,950
how to measure air pollution from space. To
do that, we need to combine the data we're

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00:05:29,950 --> 00:05:34,150
collecting from the air with data gathered
from the ground at hundreds of sites across

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00:05:34,150 --> 00:05:39,220
South Korea. One of the major ground sites
is a 90-minute drive east from the airbase

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00:05:39,220 --> 00:05:46,440
into the forests of South Korea.
We're at Taehwa Research Forest southeast

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00:05:46,440 --> 00:05:51,380
of Seoul at a monitoring station that South
Korean scientists use to measure weather and

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00:05:51,380 --> 00:05:56,480
the atmosphere. NASA has brought a variety
of new sensors here to this site.

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00:05:56,480 --> 00:06:02,940
Taehwa is far enough away from industry that
it is a relatively clean air site and a good

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00:06:02,940 --> 00:06:08,010
place to measure emissions given off by trees.
Scientists want to better understand how these

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00:06:08,010 --> 00:06:16,130
emissions mix with manmade pollutants to form
ozone in the atmosphere.

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00:06:16,130 --> 00:06:19,230
That team in Korea is busy and doing a great
job, as you can see.

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

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00:06:22,900 --> 00:06:27,160
whoever wants it.
And so, we just give that data away?

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

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00:06:32,830 --> 00:06:36,140
Oh, well. Good night, everybody.
What about NAAMES?

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00:06:36,140 --> 00:06:39,960
Oh, right. I'm Kasha and this is Tom. Good
night, everybody.

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00:06:39,960 --> 00:06:44,720
First of all, I'm Kasha and he's Tom. And
I'm not talking about names. I'm talking about

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00:06:44,720 --> 00:06:48,180
the North Atlantic Aerosols and Marine Ecosystems
Study.

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00:06:48,180 --> 00:06:54,400
So, actually it's really cool because right
now we are in Korea, and then we will be going

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00:06:54,400 --> 00:06:58,250
all the way across the world to the North
Atlantic Ocean to study--.

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00:06:58,250 --> 00:06:59,320
--Ah--.
--Phytoplankton.

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00:06:59,320 --> 00:07:04,300
That's right, NAAMES. That's a five-year experiment
from NASA using floating and flying laboratories

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00:07:04,300 --> 00:07:08,530
to look at plankton in the ocean.
With our Earth changing, such as our oceans

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00:07:08,530 --> 00:07:13,090
warming, this study will tell us how plankton
production is also changing, and how different

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00:07:13,090 --> 00:07:17,320
species of plankton are starting to evolve
and how this affects our climate.

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00:07:17,320 --> 00:07:22,090
So, I'm very excited to talk to all of you
next time. Until then, be sure to check out

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00:07:22,090 --> 00:07:26,640
NASA.gov and the Earth Expedition's page for
more information on air quality and ecosystem

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00:07:26,640 --> 00:07:30,130
studies.
From KORUS-AQ in the air to the sequel, KORUS-OC

103
00:07:30,130 --> 00:07:34,080
in the water, and the upcoming NAAMES mission
in the North Atlantic, a lot is happening

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00:07:34,080 --> 00:07:36,870
in Earth science as we continue to keep an
eye on the air.