



1
00:00:01,100 --> 00:00:03,480
[Music]

2
00:00:03,640 --> 00:00:05,220
[Volcano Rumbling]

3
00:00:08,220 --> 00:00:09,780
[Music]

4
00:00:16,700 --> 00:00:22,320
>>To my right you can see the pristine Hawaiian
atmosphere- beautiful blue sky, scattered

5
00:00:22,339 --> 00:00:23,339
meteorological clouds.

6
00:00:23,339 --> 00:00:28,949
But as we pan over, then we see the rising
volcanic gas from Halemaumau.

7
00:00:28,949 --> 00:00:34,880
And this is primarily sulfur dioxide and then
steam, in this case, coming out of the vent,

8
00:00:34,880 --> 00:00:39,960
roughly, 2000 degrees Fahrenheit, the gas
rises of thermal buoyancy until it equilibrates

9
00:00:39,960 --> 00:00:44,690
with the surrounding air, the same temperature,
and then we bend over and become entrained

10
00:00:44,690 --> 00:00:45,690
with the wind patterns.

11
00:00:45,690 --> 00:00:51,559
The SO₂ and sulfur dioxide gas reacts with
the atmosphere to form sulfate aerosols.

12
00:00:51,559 --> 00:00:57,350
And these are very dangerous to human health,
both from breathing, and also form corrosive

13
00:00:57,350 --> 00:00:58,359
acids.

14
00:00:58,359 --> 00:01:02,140
This noxious mixture is called volcanic smog
or vog.

15
00:01:02,140 --> 00:01:05,840
Right now the vog models are initialized by
point sources.

16
00:01:05,840 --> 00:01:12,140
But we can measure the two-dimensional distribution
of sulfur dioxide at the plume source from

17
00:01:12,140 --> 00:01:15,670
the satellites and the aircraft through our
remote sensing which then helps make more

18
00:01:15,670 --> 00:01:18,500
accurate estimates of how it will be dispersed.

19
00:01:18,500 --> 00:01:22,430
So we're hoping to improve these volcanic
forecast models.

20
00:01:22,430 --> 00:01:27,909
On the ground we're making measurements to
help validate or collaborate the data we get

21
00:01:27,909 --> 00:01:31,740
from the aircraft.

22
00:01:31,860 --> 00:01:33,720
[Car driving]

23
00:01:36,720 --> 00:01:44,170
>>What I like about the landscapes on volcanoes
is the strange shapes, forms, colors of lava

24
00:01:44,170 --> 00:01:51,979
flows, of ash flows, of all these different
volcanic surfaces that very slowly get re-inhabited

25
00:01:51,979 --> 00:01:53,509
by vegetation.

26
00:01:53,509 --> 00:01:58,040
It's an interesting thing to see.

27
00:01:58,400 --> 00:02:02,000
[Music]

28
00:02:02,540 --> 00:02:04,500
I grew up on an island volcano in Greece.

29
00:02:04,509 --> 00:02:09,060
An extinct volcano, not a very active volcano,
but I had the chance many years later, in

30
00:02:09,060 --> 00:02:14,370
graduate school then, to come along on a trip
to the Philippines a few years after Mount

31
00:02:14,370 --> 00:02:15,989
Pinatubo had erupted.

32
00:02:15,989 --> 00:02:22,019
And what I saw was the human impact, the human
factor, of how volcanic eruptions effect livelihoods

33
00:02:22,019 --> 00:02:23,019
of people.

34
00:02:23,019 --> 00:02:26,870
That is something that had a profound impact
on me, that made it basically my life's mission

35
00:02:26,870 --> 00:02:32,579
to keep working on improving the methods that
help us understand how volcanoes work and

36
00:02:32,580 --> 00:02:38,780
to be able to better forecast how and when
eruptions occur.

37
00:02:45,480 --> 00:02:51,139
We are downwind of the plume source by a few
miles, by this point, some of the gas has

38
00:02:51,140 --> 00:02:56,370
converted into aerosols, and we are measuring
the product of that conversion here.

39
00:02:57,520 --> 00:03:04,660
The measurements we do here are, in most cases,
timed with the overpasses of the ER-2 aircraft.

40
00:03:04,669 --> 00:03:10,450
So once we are back at our computers and look
at this imaging data, we can then use our

41
00:03:10,450 --> 00:03:15,750
measurements from the ground here to improve
the gas retrievals and aerosol retrievals

42
00:03:15,750 --> 00:03:20,700
we do on the imagery data.

43
00:03:22,110 --> 00:03:23,440
>>We're measuring with two techniques.

44
00:03:23,440 --> 00:03:27,430

One is a sun photometer, and we're measuring how the sunlight shining through the plume

45

00:03:27,430 --> 00:03:29,540

is scattered by the particles.

46

00:03:29,540 --> 00:03:33,880

And the other is a instrument called the FlySpec, which measures ultraviolet radiation, and

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00:03:33,880 --> 00:03:38,100

we're seeing the absorption of the UV radiation by the actual gas in the plume.

48

00:03:38,100 --> 00:03:39,660

[Lava splashing]

49

00:03:39,800 --> 00:03:43,440

We are one of several teams that are looking at the volcano in this HysplRI preparatory

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00:03:43,450 --> 00:03:44,450

mission.

51

00:03:44,450 --> 00:03:46,970

We have another team looking at the actual molten material.

52

00:03:46,970 --> 00:03:51,209

We have another team coming in to make in-situ measurements of the concentrations of the

53

00:03:51,209 --> 00:03:52,209

gas.

54

00:03:52,209 --> 00:03:56,850

And there's another team that's measuring the impact of the volcanic gas on the vegetation

55

00:03:56,850 --> 00:03:57,850
in the area.

56
00:03:57,850 --> 00:04:02,090
>>Using the ground-based instrument, we have
the highest spatial resolution, and then as

57
00:04:02,090 --> 00:04:06,160
we go higher up through the airborne and the
satellite sensors, the spatial resolution

58
00:04:06,160 --> 00:04:10,590
is a lot poorer, and so we want to see if
we can still pick out these characteristics

59
00:04:10,590 --> 00:04:14,359
on both the lava lake and the lava flows.

60
00:04:14,359 --> 00:04:18,650
>>We're here to correct the data to make sure
that what we see in space is what we actually

61
00:04:18,650 --> 00:04:19,860
see on the ground.

62
00:04:21,140 --> 00:04:23,820
The atmosphere, it's like looking at a lens.

63
00:04:23,820 --> 00:04:27,040
And we're right now characterizing that lens.

64
00:04:27,040 --> 00:04:33,420
>>The great hope is that if and when the HypsIRI
mission will be flying on a satellite platform,

65
00:04:33,420 --> 00:04:38,530
that we will be able to get very frequent
measurements and re-measurements of these

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00:04:38,530 --> 00:04:42,689

volcanic emissions, not only here in Hawaii,
but all around the world on all of the about

67

00:04:42,689 --> 00:04:44,849

550 active volcanoes.

68

00:04:44,849 --> 00:04:50,010

>>We can have a real impact on helping people
to manage this risk if we can make the measurements