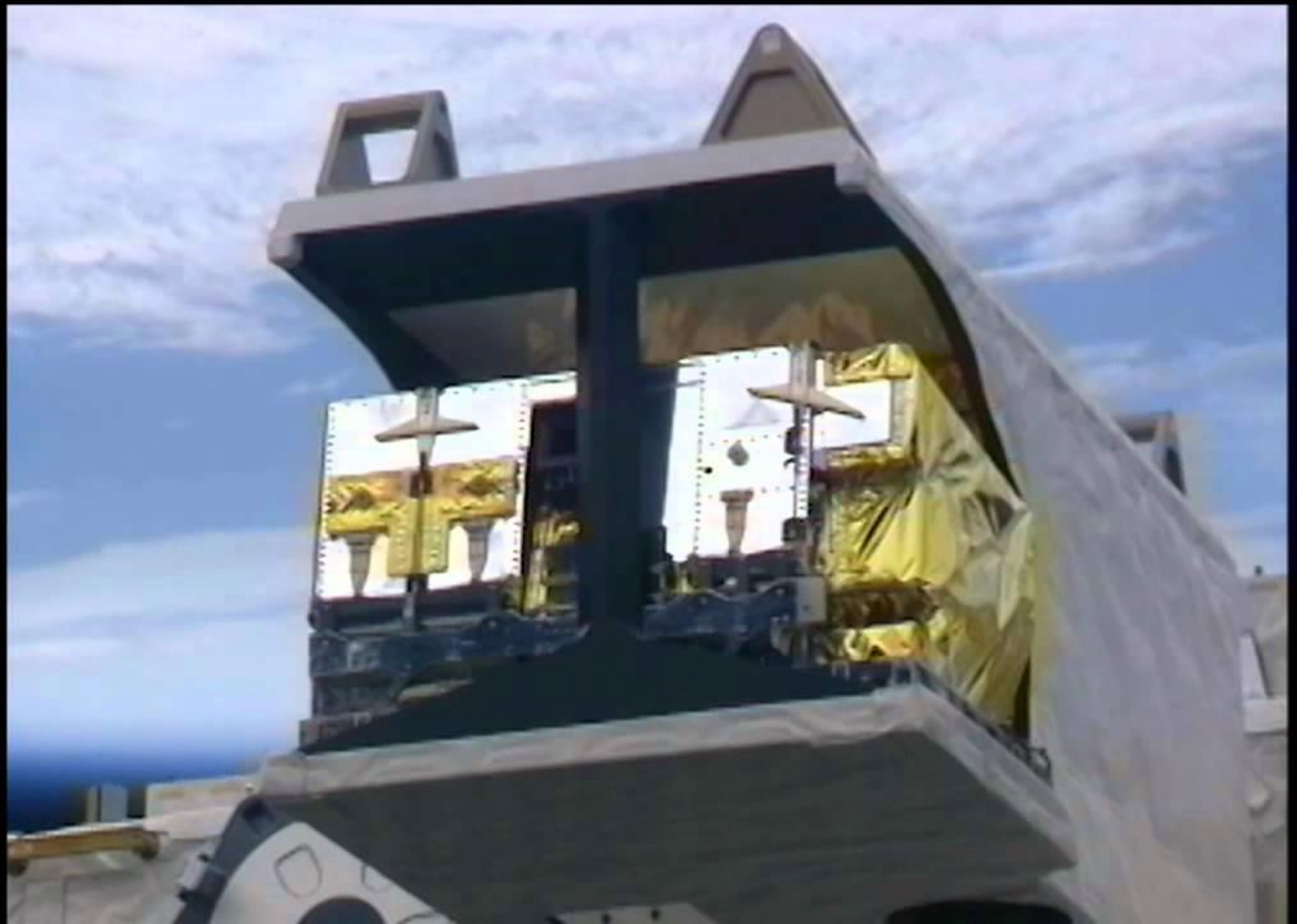

1
00:00:01,634 --> 00:00:10,476
>> Well let's head out to the
Marshall Space Flight Center

2
00:00:15,381 --> 00:00:18,784
in Huntsville Alabama where
Lori Meggs is standing by live.

3
00:00:18,784 --> 00:00:21,020
Lori we are learning
about oceans from space.

4
00:00:21,020 --> 00:00:22,521
What can you tell us about this?

5
00:00:22,521 --> 00:00:24,223
>> Lori Meggs: That's right
Amiko [assumed spelling] It's

6
00:00:24,223 --> 00:00:30,863
called HICO or Hyperspectral
Imager for the Coastal Oceans

7
00:00:30,863 --> 00:00:34,200
and this is a special camera
that allows scientists

8
00:00:34,200 --> 00:00:36,168
to study the coastal regions

9
00:00:36,168 --> 00:00:39,405
and environmentally characterize
those coastal regions,

10
00:00:39,405 --> 00:00:41,307
the land and the water.

11
00:00:41,307 --> 00:00:45,478
This camera separates light into

hundreds of wavelength channels

12
00:00:45,478 --> 00:00:49,782
that provides information on
the composition of the land

13
00:00:49,782 --> 00:00:50,916
and water along the coast.

14
00:00:50,916 --> 00:00:53,686
I recently spoke with
one of the investigators

15
00:00:53,686 --> 00:00:56,088
from the Naval Research
Laboratory

16
00:00:56,088 --> 00:01:00,659
at Stennis Space
Center to find out more.

17
00:01:00,659 --> 00:01:01,760
>> Rick Gould:

18
00:01:01,760 --> 00:01:04,230
It's a hyperspectral
high resolution sensor

19
00:01:04,230 --> 00:01:06,866
that measures the reflectives
of light out of the water

20
00:01:06,866 --> 00:01:11,504
so it extends a long time
series of measurements that NASA

21
00:01:11,504 --> 00:01:16,475
and European countries have
made for several decades

22
00:01:16,475 --> 00:01:22,248
but it has also several unique
capabilities and applications,

23
00:01:22,248 --> 00:01:26,952
specific for the scientific
and Naval communities.

24
00:01:26,952 --> 00:01:30,022
>> Lori Meggs: What are some
of those unique capabilities?

25
00:01:30,022 --> 00:01:31,524
>> Rick Gould: Well it's
the only sensor in space

26
00:01:31,524 --> 00:01:36,529
that measures the light
spectrum hyperspectrally.

27
00:01:36,529 --> 00:01:41,267
So as opposed to some of the
standard ocean color sensors

28
00:01:41,267 --> 00:01:42,468
that had maybe eight bands,

29
00:01:42,468 --> 00:01:47,873
HICO has 128 very narrow
resolution bands that help

30
00:01:47,873 --> 00:01:53,979
up distinguish and unravel
the optical components

31
00:01:53,979 --> 00:01:55,781
in the water column.

32
00:01:55,781 --> 00:01:59,785

And those optical properties
influence light penetration

33
00:01:59,785 --> 00:02:02,488
so they're important for
primary production measurements,

34
00:02:02,488 --> 00:02:06,158
phytoplankton distributions
as well as topics of interest

35
00:02:06,158 --> 00:02:07,793
to the Navy, anything
that's impacted

36
00:02:07,793 --> 00:02:09,028
by the penetration of light.

37
00:02:09,028 --> 00:02:10,129
>> Lori Meggs: For those

38
00:02:10,129 --> 00:02:15,267
who don't know what
does hyperspectral mean?

39
00:02:15,267 --> 00:02:17,503
>> Rick Gould: Okay we're
looking at visible wavelengths

40
00:02:17,503 --> 00:02:22,308
from about 400 to 900
nanometers at discrete channels

41
00:02:22,308 --> 00:02:24,510
of about 5.7 nanometers.

42
00:02:24,510 --> 00:02:27,546
So every 5.7 nanometers

43

00:02:27,546 --> 00:02:30,449
over that spectral range
we've got a separate signal

44
00:02:30,449 --> 00:02:34,920
and different phytoplankton
pigments and properties

45
00:02:34,920 --> 00:02:36,855
in the water absorb
light differently

46
00:02:36,855 --> 00:02:39,358
so as the light transmitted
from the sun some

47
00:02:39,358 --> 00:02:41,160
of it reflects off the
surface of the water,

48
00:02:41,160 --> 00:02:45,264
some of it penetrates and when
it's in the water the dissolved

49
00:02:45,264 --> 00:02:50,536
and particular material alters
that spectral composition

50
00:02:50,536 --> 00:02:54,106
and when it's reflected back
to the center we can look

51
00:02:54,106 --> 00:02:59,979
at that difference and try
and understand what was

52
00:02:59,979 --> 00:03:01,213
in the water that caused that.

53
00:03:01,213 --> 00:03:03,115

>> Lori Meggs: So why is
this data important to have?

54
00:03:03,115 --> 00:03:04,950
>> Rick Gould: Well the
phytoplankton are the base

55
00:03:04,950 --> 00:03:06,285
of the food chain.

56
00:03:06,285 --> 00:03:07,586
They're the main source of
primary production in the ocean

57
00:03:07,586 --> 00:03:09,922
so it's important to
map their distributions

58
00:03:09,922 --> 00:03:12,691
and understand what controls
their biomass and growth,

59
00:03:12,691 --> 00:03:14,426
and by measuring
the light coming

60
00:03:14,426 --> 00:03:18,931
out of the water we can
map these distributions

61
00:03:18,931 --> 00:03:23,569
on synoptic scales
at very high temporal

62
00:03:23,569 --> 00:03:25,971
and spatial resolutions
globally.

63
00:03:25,971 --> 00:03:27,606
>> Lori Meggs: How's

it all work?

64
00:03:27,606 --> 00:03:30,009
>> Rick Gould: Well HICO
measures the radiance at the top

65
00:03:30,009 --> 00:03:33,912
of the atmosphere out from the
International Space Station

66
00:03:33,912 --> 00:03:36,982
so in that signal is the
water leaving radiance

67
00:03:36,982 --> 00:03:39,451
which is what we're
interested in as well

68
00:03:39,451 --> 00:03:41,620
as the atmospheric
radiance, which is our noise.

69
00:03:41,620 --> 00:03:42,955
So after we perform an
atmospheric correction we're

70
00:03:42,955 --> 00:03:44,356
left with the water
leaving radiance and from

71
00:03:44,356 --> 00:03:45,791
that spectral signature we can
try and unravel the dissolved

72
00:03:45,791 --> 00:03:46,992
and particular material
in the water column.

73
00:03:46,992 --> 00:03:47,826
>> Lori Meggs: So

when did you launch?

74
00:03:47,826 --> 00:03:49,228
How long have you been there?

75
00:03:49,228 --> 00:03:50,329
>> Rick Gould: It was launched
and started on the Space Station

76
00:03:50,329 --> 00:03:51,363
on the 24th of September
in 2009 so it's been

77
00:03:51,363 --> 00:03:52,431
up there almost four years.

78
00:03:52,431 --> 00:03:53,699
We've collected over
8100 scenes to date

79
00:03:53,699 --> 00:03:54,967
and it's been a great
demonstration of the potential

80
00:03:54,967 --> 00:03:56,368
for hyperspectral imagery,
the optical properties

81
00:03:56,368 --> 00:03:58,037
and the environmental properties
of interest to the Navy as well

82
00:03:58,037 --> 00:03:59,305
as the scientific community.

83
00:03:59,305 --> 00:04:00,005
>> Lori Meggs: Any results
so far that you've shared

84

00:04:00,005 --> 00:04:00,939
and maybe some spinoffs?

85
00:04:00,939 --> 00:04:02,207
>> Rick Gould: Sure,
yeah, we've,

86
00:04:02,207 --> 00:04:03,509
as I said we've collected
a lot of imagery globally

87
00:04:03,509 --> 00:04:04,209
so we can look at the high
resolution coastal processes

88
00:04:04,209 --> 00:04:05,044
anywhere in the globe.

89
00:04:05,044 --> 00:04:06,178
We can select our own targets.

90
00:04:06,178 --> 00:04:07,546
We've applied some new
optimization algorithms

91
00:04:07,546 --> 00:04:08,480
where we can estimate water
depth, water optical properties

92
00:04:08,480 --> 00:04:09,815
and bottom reflect
simultaneously

93
00:04:09,815 --> 00:04:10,949
and we've partnered with the
EPA to monitor coastal areas

94
00:04:10,949 --> 00:04:12,217
of the United States and
we're trying to bring

95
00:04:12,217 --> 00:04:13,619
that to a broader audience
so that we can present it

96
00:04:13,619 --> 00:04:14,820
like we do weather where we have
an application where we can look

97
00:04:14,820 --> 00:04:15,821
at ocean conditions easily
for the general public.

98
00:04:15,821 --> 00:04:17,189
>> Lori Meggs: What's
next for HICO?

99
00:04:17,189 --> 00:04:18,123
>> Rick Gould: Well I think
we have at least another year

100
00:04:18,123 --> 00:04:19,525
of operations on
the Space Station.

101
00:04:19,525 --> 00:04:20,659
We're hoping to be right next
to a lidar sensor that's going

102
00:04:20,659 --> 00:04:21,994
to go up next year so
by combining the active

103
00:04:21,994 --> 00:04:22,628
and the passive signals we'll
get even more information

104
00:04:22,628 --> 00:04:24,029
from the ocean.