



1  
00:00:03,010 --> 00:00:06,850

You know when we talk about the water cycle,  
particularly when you teach the water cycle,

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00:00:06,850 --> 00:00:11,830

say, in school, you think of that diagram  
and it has the clouds dropping snow onto the

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00:00:11,830 --> 00:00:17,010

mountains and the water flowing off into the  
rivers and going into a lake maybe and then

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00:00:17,010 --> 00:00:24,170

into the ocean. And in many depictions, humans  
are absent. We don't see that actually there's

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00:00:24,170 --> 00:00:29,800

a giant dam next to that lake, and that dam  
actually controls how much water is flowing

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00:00:29,800 --> 00:00:35,850

into the ocean. So in this study we used data  
from NASA's new ICESat-2 satellite, which launched

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00:00:35,850 --> 00:00:41,149

in October of 2018, to try to better understand  
how surface water varies around the world.

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00:00:41,149 --> 00:00:45,300

And so we intersect data from the satellite,  
which tells us the water levels. So how much

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00:00:45,300 --> 00:00:50,350

water is in the lake essentially, with a global  
dataset of where surface water bodies are,

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00:00:50,350 --> 00:00:54,949

and which ones are reservoirs and which ones  
are not. Try to better understand how natural water

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00:00:54,949 --> 00:00:59,929  
bodies and how reservoirs vary seasonally  
and to be able to understand the impact of

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00:00:59,929 --> 00:01:06,180  
human management on total seasonal variability  
of water storage. In my view this study represents

13  
00:01:06,180 --> 00:01:13,430  
kind of a first quantification of the impact  
that humans have on the surface water storage component

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00:01:13,430 --> 00:01:17,851  
of the water cycle. No one has ever been able  
to quantify this value before. And what we

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00:01:17,851 --> 00:01:22,230  
find is that reservoirs are significantly  
more variable. So the amount of water stored

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00:01:22,230 --> 00:01:26,910  
in them varies a lot more than natural water  
bodies. And in particular they're responsible

17  
00:01:26,910 --> 00:01:32,580  
for 57 percent of the total seasonal water  
storage variability on Earth. So in other

18  
00:01:32,580 --> 00:01:36,700  
words, human management. So you know, humans  
modulating the water levels in reservoirs

19  
00:01:36,700 --> 00:01:42,780  
is responsible for the majority of surface  
water variability on Earth. Even though reservoirs

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00:01:42,780 --> 00:01:48,110  
actually account for a very small percentage,  
only about 3.9% of the total water bodies

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00:01:48,110 --> 00:01:54,410  
that we observed. And the reason for this  
is that ICESat-2 is a laser altimeter, which

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00:01:54,410 --> 00:02:00,050  
means that it provides very high resolution,  
really highly accurate observations of surface

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00:02:00,050 --> 00:02:05,700  
water level. This means that we can now observe  
the height of very small water bodies, as

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00:02:05,700 --> 00:02:11,180  
small as several hundred or a thousand square  
meters. And so in doing this now we can look

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00:02:11,180 --> 00:02:15,249  
at hundreds of thousands of water bodies instead  
of a couple hundred water bodies, and also

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00:02:15,249 --> 00:02:20,670  
we know that those observations of water level  
are quite accurate. In the future, as we have,

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00:02:20,670 --> 00:02:25,519  
you know, increasing population, we have growing  
development around the world and growing industrialization,

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00:02:25,519 --> 00:02:28,940  
we have growing demands on water through agriculture  
and we also have climate change, which is

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00:02:28,940 --> 00:02:32,950  
changing the way water is moving around the  
world. So when you have all those factors,

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00:02:32,950 --> 00:02:35,940  
it's clear that there's going to be greater  
demands on water usage in the future. And

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00:02:35,940 --> 00:02:40,111  
so a study like this can tell us, okay, here  
is how water is currently being managed. Here