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00:00 **Host:** Dr. Gary Lagerloef who is in charge of the Aquarius satellite that we have been talking about, and we'll talk about that more. So Aquarius measures salinity, but that's just one measurement of the ocean that is very important to understand, currents, and all of these other effects. What are some of the other measurements that are so important?

00:27 **Dr. Lagerloef:** You're right. The salinity by itself is really an important new observation to make. We've never done this type of observation from space before. But we can't understand all of the mechanisms by just looking at this one thing in isolation. We have other satellites that provide rainfall data, sea surface temperature data, surface winds, and indirectly ocean currents. We get ocean currents from measuring sea level. Sea level is obtained by mapping it out with a radar altimeter. You've already seen in this program earlier tonight some examples of what those radar altimeters can map out. They could also be used to map sea floor bathymetry, but they also give us surface sea level variability related to ocean currents. It's done by radar. It's extremely precise.

01:12 **Host:** Give me an idea on how precise it is.

01:14 **Dr. Lagerloef:** Imagine if there is a satellite flying in orbit and its 1300 kilometers high; that's 700 miles, something like that. It sends a radar pulse and times how long it takes for the echo to come back. That's how it measures it's altitude above the sea surface. You can see some examples of these satellites here in the picture. The precision that we have is about two centimeters from that high an altitude. That's less than a diameter of a quarter. This is an extremely precise measurement. When we average this data over the whole globe, and from year to year, we can start to see long-term trends to an accuracy of less than a millimeter per year precision. You're seeing an example of that in this chart here. This is a long-term average graph of sea level rise based on the series of three different altimeters, the TOPEX/Poseidon which was launched in 1993, and then Jason-1 followed by Jason-2. These satellites basically formed a time series where we're able to continue these precise measurements. This red curve that you see in the graph here shows the evolution of global average sea level over the last 20 years. You can see from the scale on the left hand side that the sea level has risen by 60 millimeters. That's 6 centimeters. At this rate, if it is sustained for the whole century, that would be about 33 centimeters over the century—that's about a foot of sea level change at the current rate. Now climate models are predicting that that's going to accelerate, and we're seeing accelerating ice melt from Greenland. We're seeing disappearing sea ice in the Arctic. We have very good reason to believe that this sea level rise is going to change more rapidly in the future than we see it today.

02:55 **Host:** When I think about everything that we're learning from the program and what you talked about, NASA must be pretty busy putting all of these satellites up.

03:08 **Dr. Lagerloef:** Yeah, you're right. As a matter of fact, those satellites that I just showed you in the last presentation—maybe it will come up again in a minute, yeah here it is—(the TOPEX Jason series) was actually an international cooperation between the United States and France. These two countries partnered together to develop all three of these missions.

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03:23 **Host:** So it's a collaboration the way all of this gets done?

03:26 **Dr. Lagerloef:** A lot of it does. A large number of NASA missions are done in some form of international collaboration.

03:33 **Host:** So what about Aquarius, your satellite.

03:35 **Dr. Lagerloef:** Aquarius is done in partnership with Argentina. Here's the picture again. It's no accident that we made this example—an artist's rendition of it—over Patagonia, because our partner is Argentina. Argentina has a space program. It's a young space program. It's been going on since the early nineties. It was a bilateral agreement between the United States and Argentina that was signed then for peaceful cooperation in space. The elements of this agreement are that Argentina wanted to develop satellites, and develop instrument technology for making earth observations particularly over South America for a lot of practical applications like monitoring hazards, and crop rotations, and fires, and things like that. But they wanted access to space. They needed rockets to launch them, and rockets are expensive. The partnership with NASA is that we provide launches for their satellites; they provide room on their satellites for some of our instruments. We both get something out of the deal. That's the basic nature of the agreement that we have with Argentina.

04:43 **Host:** Did you work with the Argentines to develop the instrumentation that was needed on this satellite to accomplish its mission?

04:51 **Dr. Lagerloef:** The instrument itself, the Aquarius instrument, was all developed within NASA. The satellite itself—what we call the service platform—was done by Argentina. The big foil-covered antenna you see in that picture, and the stuff in the front where you see those three circles—that's the radiometer instruments—was built by NASA. Everything to the right of that was all built by Argentina, including the solar panels which are those big square things you see on the back. Again, it was launched by the U.S. on a Boeing Delta rocket.

05:28 **Host:** Well, I think like the partnerships Dr. Lagerloef was just talking about, this is a partnership.