Salinity Processes in the Upper Ocean Regional Study
NASA Jet Propulsion Laboratory
Video Transcripts

Video: Why SPURS?
URL: https://vimeo.com/58198165 [05:40]

Description
Dr. Raymond Schmitt gives a brief summary of why the SPURS cruise is happening.

Transcript
Our real motivation is trying to understand how the ocean salinity is related to the global water cycle. Now the water cycle is certainly one of the most important global change issues that society faces. In the past few years we've seen an increase in the intensity of droughts and floods. 2010 and 2011 were very wet years; 2012 was very dry and hot in the U.S. Why is that? What we think is going on is with the increasing air temperatures, the atmosphere can hold more humidity. That causes more evaporation in dry regions, and more precipitation in wet regions.

Of course society lives on the land. That's our primary concern. People often forget where that water comes from. It turns out that 90% of global evaporation comes from the ocean. So the ocean is really the source of the global water cycle. It's an uncontaminated source in the sense that we can look at what's happening in the ocean, see the changes in salinity, and relate that to the change in the intensification of the water cycle. On land society has put up dams to impede the flow of rivers. We pump up groundwater for irrigation. We've chopped down forests and allowed other areas to reforest. There's not a pristine measure of the change in the global water cycle. But we think there is in the ocean. We think that we can do that by looking at the global salinity patterns.

On image 4 I'm looking at a map of the estimated evaporation minus precipitation over the global ocean in the top panel, and then a map of the surface salinity in the lower panel. Each ocean is a little different. The Pacific is a bit fresher than the Atlantic. The red areas in the upper panel represent where water is mostly evaporating, and the blue areas represent areas where there is more rainfall than evaporation. What that does is imprint a pattern of salinity variations on the surface of the ocean. The red areas are regions of high salinity, and the blue areas are regions of low salinity. We think the salinity patterns are telling us about a change in the water cycle.

On the left of image 5 we're looking at the average ocean surface salinity similar to the previous slide with a different projection. Again you can see the Atlantic is much saltier than the Pacific. On the right we're looking at the 50-year trend in

surface salinity. These are from recent papers published by some Australians in Science magazine and the Journal of Climate. What this relationship shows is that the salty areas (the red areas) are getting even saltier. The fresh areas are getting even fresher. This is a real first-order indication of an intensification of the global water cycle. We're doing a much better job on measuring the salinity of the ocean in the past few decades, especially now with the new salinity sensing satellite. What we've discovered looking at this new data is that this intensification is much larger than any of the models predicted. There's a real puzzle here. Why is the ocean showing such a strong response to a changing water cycle? As oceanographers we have to understand what is going on in the ocean.

I'm just showing a close-up on image 6. The evaporation and precipitation is on the left, the salinity is on the right. You can see the red areas where the water is leaving the ocean is the saltiest. We are heading out into the middle of the Atlantic to look at the saltiest region in the whole global ocean. In fact this year recent data shows it has been one of the saltiest summers on record. We anticipate going out there and developing good datasets to help us understand how the ocean is mixing and transporting this salt, and why the salinity maximum is where it is, and why is it as strong as it is.

I just have a summary slide to give you the basic ideas here. We know that salinity is a very sensitive indicator of the intensity of the water cycle. The indications are that the intensification is much stronger than the models predicted which has huge consequences for society. We have to understand these trends. As oceanographers we have to determine how much mixing is going on in the ocean, how much eddy transport, and how much mean ocean currents are carrying the salt around. Our real challenge is to understand why the salinity maximum is where it is, and is as strong as it is.