Ocean Thinking: Changes in Latitude _ Q & A Transcription

Website for this webinar: http://cosee.umaine.edu/programs/webinars/spurswebinars/oceanthinking1/

Video: http://vimeo.com/74956815

Note: Bold text in the transcript indicates questions from the audience. Non-bold text is a response from Julius or the moderators.

58:32

Question: How does the water in the SPURS region affect nearby regions in the ocean? Where is that water going in general?

Julius: As I mentioned, you have this big blob—I made a point that it is not a blob. On average it is very high salinity water. This will be the SPURS region. The SPURS region is very isolated, right in the middle of the subtropical gyre. I would argue that the biggest impact it has is that the water during the winter gets subducted and exported towards the equator. That doesn't take that long. I'm not really sure.

When we're talking about the deep overturning circulation earlier in the presentation, we were talking about time scales of hundreds of thousands of years. This one here would be much quicker since water doesn't have to move all the way to the ocean bottom and then through all of the ocean basins, and then basically get upwelled at the other side of the ocean. This is a smaller and faster process which makes it actually very interesting for the climate.

Question: Does the dust coming off the African continent affect the salinity of the ocean water in the SPURS area?

Julius: That's an interesting question. We definitely saw the dust. We had a very strong gusty wind when I was on the Knorr in September, 2012. We saw the clear blue sky turn very hazy. It was kind of a weird mood. The dust definitely can reach this region. I think that the amount of evaporation that we see has more of an affect on the salinity process . To be quite honest I would have to look that up, but I don't think the salinity would be that much influenced by the dust. There are other processes that suggest the dust is a fertilizer for marine life. I'm not a real expert in that. So I don't want to make any further statements about that. I've definitely seen the dust there, so it gets over to the region.

Question: What was the most surprising thing that you learned while you were on any of those cruises?

Julius: The most surprising thing for me was this freshwater intrusion. It fascinates me, and that is why I am working with it. I didn't really expect anything this pronounced to happen in the upper ocean here. That would probably be the most surprising thing in the physical sense. In the biological sense, if you are on a ship you always find time to stare out overboard and look in the water. This is truly an area where the analogy of a desert is fitting, because there's not a lot life there. Once in a while we see a little of what's called Sargassum, which is a plant that floats. Basically it creates a little island. We fished out some of these Sargassum. There's a bunch of little crabs and animals on there. So these little patches

are kind of like oases of the ocean. I find that very fitting. I've often heard that analogy of the desert. Obviously it's full of water, but then you kind of see these parallels. That was at least for me surprising.

Question: Does the water from the Amazon River reach that study area at all?

Julius: It doesn't reach very far. If think I skipped one of the videos that I could show now. I'm sorry I skipped this, but here we go. This is a nice way to show it. This is sea surface salinity. You can see the Amazon plume popping out right here, and right here depending on the ocean currents and the season. It doesn't really reach the SPURS area, at least not from what we can tell with the satellite. I wouldn't have thought the Amazon plume reaches out that far. It doesn't really reach the SPURS region. It's a good question. I love that video.

Question: Does your research data go into computer models that are trying to forecast climate and climate change?

Julius: As of right now, no, not my data. I'm working closely with Stephen Lee in California at JPL. He runs a regional model in a support effort for SPURS, which means you have a model that basically increases resolution in different domains towards the SPURS region. Actually that is the model I showed; let me just go back to that. As far as we can tell right now it does a really good job, at least with the structures and the general ocean state.

I think that a lot of these findings will go into improving climate models in terms of how air-sea fluxes, and how these changes between the ocean and the atmosphere are described, because generally the problem with climate models is the resolution is not nearly as good as this one over here. This is an incredible one km. resolution. You probably get 100 to 200 in the modern GCMs (Global Climate Model). That means that all these processes that happen on smaller scales than the grid boxes need to be parameterized. I think a lot of the SPURS research will go into improving these parameterization schemes. By that it will probably contribute to improve ocean models, and general climate forecast. Right now, and especially with my data, it's not fed into any climate models.

Question: **How accurate are the buoy and satellite measurements of salinity?**

Julius: Aquarius should be 0.1 [0.2] 0.2. OK. Sorry about that. So the satellite measurements are not nearly as precise as the measurements we take on a ship. Obviously they have a different advantage of just having a global coverage. Unfortunately we don't have a map here—that would have been nice. What surprises me is how sparse salinity measurements over the years are in the ocean. If you ever watch a map of all historical data, there are huge gaps where no ship has measured salinity. That's where the satellite comes in. We provide an enormous resolution in time and in space. The precision of the instrument is not as high as a shipboard measurement.

Question: How long was that data stream that we saw from SEASOAR? How much of a period of time was that data collected over?

Julius: That should be about 4 to 5 days for what we saw here. Yeah. 5 days. March 22 to March 27. So it's less than a week. I don't know if you can see this, but it's already averaged into columns. There still

tightly spaced so that you don't even see the single profiles here. You can kind of see the pattern here when the instrument didn't get all the way up in the shallow water. This is an incredible resolution for anybody who has seen other sections of the ocean they would have probably taken measurements here, and if you're lucky here right at the other end. This really gives us a lot of detail and a lot of data to work with. It's quite amazing. I think we get on average a profile every 2 to 3 km .

Question: How did you and the crew decide where to take those types of measurements and where to get that SEASOAR data? How did they choose the location for that?

Julius: Good question. It was a very exciting part of the cruise for me. The idea behind it was to run regularly spaced survey. As always with operational oceanography you have to make exceptions and [?release an instrument as you can see here]. It will never be a perfect grid. This was region we wanted to survey so we chose this radiator pattern. It gives you a lot of nice repetitions in sections in north-south directions. Then once I found these fresh and warm patches--they fascinated me—I had to find one again.

We used a bunch of different data sources. We had autonomous floats that were giving us information. From the sea surface heights you can infer—at least for the larger scales—like the eddy circulation in that area. We actually found another one of these features. That was mainly based on the sea surface height satellite data that we were supplied with. We hypothesized that this water comes from the south of the region. We found a region that should have invected water to the north again, and indeed we found another one of these similar intrusions here. A lot of the time it is hunting for it. Also a portion of it is luck.

Question: Why can't you do more things at this scale? Is this the best scale to look at data like this, or is it at satellite scale, or is it a combination of both?

Julius: There's always something you can do better. Research missions are usually not about a single person getting all they want. You have to make compromises, especially since we had so many different specialized instruments with us. Clearly you could have observed this at a smaller scale. This is right at the edge of the satellite resolution in space. It's smaller than the satellite could resolve. Obviously there are some times you wish you would have driven over here again. The time is very limited. I'm very happy that we got 2 repetitions of these features. It's never optimal. Whatever observations you get, you got to make the best out of it, then put them into context with the other measurements. That's kind of the idea. This satellite showed us that at least in the south here on a larger scale there was a bigger volume of freshwater at the time where we saw this intrusion. This was just kind of the peak of the iceberg. Other measurements provide context that give you some confidence about what you are actually seeing there.

Question: How many different researchers are involved in the SPURS projects and the cruises?

Julius: Good question. I don't know that off the top of my head. Of course there's a division between the dry side which means the modeling and reanalysis, and the wet side for people who actually go to sea. I don't know from the top of my head. I don't know, maybe you have a number?

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Annette: I don't have the number. I think it could be around 30.

Julius: That sounds about the right order of magnitude. There all [??] people on the Spanish cruise that are primarily associated with SPURS. Generally you just try to get on board the research ship and try to do 24/7 science, and whenever you have time and opportunity you do your measurements. You just try to use the ship as efficiently as possible towards—I don't know—the greater goal, if you can call it that. I guess you get the best quality science and a good compromise for everybody who is on the ship.

Question: When did you first get interested in oceanography?

Julius: I like to tell at little story. I was in high school. I just finished high school and didn't know what to do. In Germany, you either have to go into the army for a year, or you do social service. I worked with handicapped children in a municipal school. During that time I was asking myself what I should study, because I knew I wanted to do something with science, but I didn't want to do super math or pure physics. I wanted to do something applied. I was rock climbing a lot at that time. My climbing partner was much older than me. I asked him what he would study if he could study again. He said, "Oceanography." My reaction was, 'huh.' What is oceanography? I went to the library; I got some books; I did a little research on the Internet. Basically I said, "I am going to give this a try," and I have loved it ever since.