

Introduction to Argo Transcription

One of the things that has contributed to our greatly increased knowledge of salinity is the Argo project. This is something that I have been involved in U.S. Argo, but there are 32 countries in the world now involved in this. The idea is we are deploying autonomous instruments called profiling floats around the world that can measure salinity and temperature without ships, without any intervention by humans. These things just cycle up and down in the world, collect profiles of temperature and salinity, and then send the data back via satellite.

As you can see presently there are over 3600 of these things in the world ocean. We have a really nice global coverage as long as you don't get to the Arctic or you don't get too far south in the Antarctic. We're starting to get data under the ice in the Antarctic that's telling us a lot, but we still haven't gotten up onto the Antarctic continental shelves where things are really interesting. Most of the world ocean has great coverage here, and we've learned a lot in the last decade about temperature and salinity in the ocean, and the ocean's effect on climate.

The next slide shows kind of how these things work. So you start one of these things out at the surface there at the upper left. The float will descend to a depth of 1000 meters, and then just drift there not doing very much for about 9 days. At the end of 9 days the float will sink to a depth of 2000 m., and then immediately begin to ascend to the sea surface. It takes about 6 hours for that ascent to happen and during that time the float will collect measurements of temperature and salinity as a function of depth as it's rising.

When it gets to the sea surface then it will immediately upload all of its data to a satellite, and of course it will start over and do that again. Now this figure is a little bit old; it says 6-12 hours at the surface here. The newer ones we're doing now are using the Iridium satellite system, and really only take 5-6 minutes at the sea surface instead of 6-12 hours. There's enough bandwidth that we can transmit a lot more data that way too. Then on the upper right where the thing ends it starts back down again. Presently we're getting these things to go through something like 300 cycles before their batteries are exhausted which is up around 7 or 7½ years, or something like that. This technology is working very well; it's not too complicated. It's revolutionizing our picture of temperature and salinity fields in the world ocean.

The next one here is just a picture of one these floats. The overall link there from the bottom where it is standing up to the white thing on the top is about 5 feet tall. The white thing on the top is where the instrument that measures temperature, salinity, and pressure is—we call it a CTD. The long thin thing is a satellite antenna sticking up from the top. Then again there are over 3000 of these in the world ocean now.

That is just a picture taken in my lab where we put these floats together. We buy the components from a commercial company (Teledyne Webb Research), and then we do all of the assembly and check out and testing in our lab. We do some technical innovation with new sensors as well. Then we also are responsible for getting them in the ocean, deploying them, which is sometimes

the most difficult thing to do to find a ship going someplace that you need to get one of these things in that will actually be able to deploy it for you. Things are working well with this though.

OK. On the next one is just a movie, a cartoon, of how this might work. Here is a ship, a research vessel in this case, and the ship will deploy the float; they are very easy to deploy. It gently puts them over the side. The float then will sink down to its parking depth which is usually about a 1000 m. It takes 6 hours or so to sink. It's sinking slowly here.

Here's how the buoyancy control happens. The float has a bladder in it which you can see is that crescent shaped thing near the bottom there. The bladder is pumped full of oil, or in and out of oil. That causes the bladder to inflate like a balloon, and that changes the buoyancy and causes the float to go up and down. Then at the end of 10 days or so the float will rise as you can here. It will collect temperature and salinity on the way up and eventually we'll punch through the surface here, and the satellite antenna will connect to the satellite and upload the data.

We can have the data here in our lab almost instantaneously of that happening. All the data goes to a central database in France where anyone in the world can access the data in real time for free. The data are all publicly available; people are not sitting on this data at all. If any of you want to get to this data, we can help you get it if you are interested.