Wave Chasers: Deep Flows Through the Samoan Passage

Instruments & Measurements

Narrator: The challenge: Measure the massive flow of water coursing northward through the Samoan Passage – three miles deep in the South Pacific. Wavechasers Matthew Alford and John Mickett from the Applied Physics Laboratory at the University of Washington got their first on-site look at the Samoan Passage in the fall of 2011.

Matthew Alford: Last night, we deployed our instrument package beginning to do our time series inside the Samoan Passage – very exciting. We're very excited. You think about the ocean circulation as a kind of big waterworks with lots of big pipes and little pipes. The Samoa Passage is a very very narrow pipe. All of the water that has sunk from the surface in Antarctica all the way to the bottom and has traveled all this way through the South Pacific has now got to squeeze its way through the Samoan Passage on its way to the North Pacific."

John Mickett: We're hoping to get better estimates of the flow. There have been some long-term current measurements here a couple decades ago. We are hoping to put a more extensive array of instruments out so we can get a better idea of the volume of this deep, cold bottom water that's moving north through the gap.

Alford: It's really a pretty exciting area because it's a lot of water. We're talking about 6,000 tons of water every second flowing through this narrow gap, which is about 35 Amazon Rivers. So you can really think about how much this water is really representing down there. And it's 3 miles beneath the sea surface flowing beneath us as part of the global conveyor belt.

Narrator: That 'conveyor belt' – the global thermohaline circulation system – affects global climate. Alford and Mickett believe the Samoan Passage will yield new insights into climate change.

Mickett: We're zooming in on a little specific piece of this overturning circulation – one we think we can resolve and that also has a history here so that we can understand how it's changing in time.

Narrator: The fall 2011 cruise allowed testing of an improved ADCP/CTD Instrument system.

Alford: Usually those ADCP/CTDs have to record their data internally. So what we've done is develop a system by which the ADCPs transmit their data up the wire. They also get power from a battery system down in the package. So that's a substantial improvement because it really lets us look at the data in real time, which lets us make sure the instruments are working and it also lets us monitor the data and make quicker decisions based on what we're finding.

Narrator: Another goal – achieve more accurate multi-beam mapping of the Samoan passage – key to determining precise pathways of the flow. This time out – a surprise: Water 3 miles deep moving unexpectedly fast.

Alford: There's incredibly accelerated flows. And so you would move from zero meters per second flow to perhaps 30 centimeters per second or even 50 centimeters – maybe even more. We don't know yet. By abyssal ocean standards, it's really a whompin' flow.

Narrator: The ultimate goal is to weave all this new and better data into improved computer models of the complex natural forces at work. These new models, in turn, will provide a clearer view into the future of the Earth's oceans and the global climate.