T-TIDE

Tasman Tidal Dissipation Experiment on the R/V *Falkor*

Narrator: A month at sea tracking waves. Not the waves you can see, but a huge, powerful force that surges far below the surface.

Hayley Dosser: Everywhere in the ocean you have mountains and mountain ridges just like on the continents. In the ocean, you have the tide pushing water back and forth across these ridges and when it does this, it kind of disturbs the water in such a way that you get a wave generated.

Narrator: Ph.D. student Hayley Dosser and oceanographer Luc Rainville of the Applied Physics Laboratory at the University of Washington spent weeks tracking sub-surface waves in the Tasman Sea.

Luc Rainville: South of New Zealand, there's a big underwater ridge and also a fairly strong tide. So as the tidal currents go back and forth past the ridge south of New Zealand, they generate disturbances that propagate as internal waves across the Tasman Sea.

Dosser: We know a lot about how these beams are generated. But we don't know a lot about where they end up and what happens to them. And whether or not they break on the continental slope — whether or not they reflect and carry their energy out into the middle of the ocean again.

Narrator: The deep waves — beams of energy — surge hundreds of meters beneath the surface traveling 1400 kilometers in four days.

Rainville: The goal of T-Tide is really to understand the life cycle of an internal wave — what happens to internal waves as they propagate through the ocean and the multitude of motions that exist in the ocean. And most importantly: what happens when these waves hit the continental shelf?

Narrator: In early 2015, Luc and Hayley were among 60 researchers monitoring deep waves in the Tasman Sea — part of the Tasman Tidal Dissipation Experiment: T-TIDE.

Rainville: During T-TIDE, we had two ships: the R/V *Revelle* was near the shelf and the R/V *Falkor,* where I was, was in the middle of the ocean in the Tasman Sea. And we were trying to get snapshots of where the internal tides were right underneath the ship. So we had a CTD measuring density and velocity and we were just going up and down with the CTD getting the data in real time.

Narrator: A CTD is lowered from the *Falkor* into the tidal beam far below. Instruments measure water velocity and turbulence — sampling temperature a hundred times a second .

Dosser: Using salinity and temperature, you can calculate density and when you have an internal wave... what they do is move layers of constant density in the ocean up and down. So you can track that signal.

Rainville: Then by integrating all the data you start getting a complete picture of the life cycle of these internal tides. While there is some dissipation, it seems that most of the signal is reflected back to sea. And we still have to figure out exactly what happens to it and what are the processes responsible for this.

You only get that complete picture by integrating parts. Projects like T-TIDE involve lots of people with lots of tools. And the way you synthesize all those tools — is often by trying to integrate them — to put them in a computer model.

Our goal in projects like that is to capture the physics so that we understand what's happened while we were out there on the ships and with the moorings in the water. But what will happen there this year — what happens next year — when we're not there to measure it? The only way to really get to those questions is to use the knowledge we have — put it in a computer model and then project forward.

Narrator: A piece of the puzzle presented by deep sea waves. The data amassed by the T-TIDE researchers is another critical step toward understanding the impact of deep waves on water masses, marine biology, weather and climate.

This is APL — The Applied Physics Laboratory at the University of Washington in Seattle.