

Transition Funding for the Shallow Water Integrated Mapping System (SWIMS) and Modular Microstructure Profiler (MMP)

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LONG-TERM GOALS

I am interested in the general problems of internal waves and ocean mixing. Knowledge of these is important for advancing the performance of operational and climate models, as well as for understanding local problems such as pollutant dispersal and biological productivity. SWIMS and MMP are valuable, highly capable instruments that will enable me to participate in many future ONR initiatives, complementing my other suite of moored profiling instruments.

OBJECTIVES

- Transition the Shallow Water Integrated Mapping System (SWIMS) and Modular Microstructure Profiler (MMP) instrumentation from Mike Gregg's group to mine.

APPROACH

Shallow Water Integrated Mapping System (SWIMS) Towed behind a ship, SWIMS is winched up and down from the surface to about 500-600 m depending on tow speed, which can range from 0-6 knots. It carries up and downlooking ADCP's, two pumped CTD's, optical backscatter, and a newly developed temperature microstructure package (χ -ometer). The velocity measurements obtained from SWIMS are substantially better than those obtained from a shipboard ADCP because they can get much closer to the bottom. Additionally, SWIMS allows tighter sawtooths than similar undulating bodies such as Triaxus and Seasoar, and can be operated much closer to steep topography.

Modular Microstructure Profiler (MMP) is a loosely tethered microstructure profiler that carries a pumped CTD, and shear probes and FP07 thermistors for velocity and temperature microstructure. With a noise floor near 10^{-10} W kg⁻¹, it is one of the most sensitive microstructure instruments available. It is deployed from the stern of the ship with a twisted-pair cable, requiring a team of three people per shift to operate. MMP can be operated in time series or along transects, providing repeated profiles of dissipation, diffusivity and buoyancy flux. Profiles to 300 m can be done every 15-20 minutes. Dissipation rates are calculated from shear probe data using standard techniques. Importantly, MMP uses pumped conductivity probes, unlike most other microstructure profilers, giving much better precision in salinity estimates.

Report Documentation Page

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WORK COMPLETED

We obtained two ship days on *R/V Thomas G. Thompson* from the University of Washington last April to conduct pilot measurements with SWIMS in Juan de Fuca Submarine Canyon. Measurements were successful. In the next few weeks we will be testing MMP from our local work boat, the *R/V Jack Robertson*.

RESULTS

We observed beautiful breaking lee waves in repeated alongchannel transects over a sill in the canyon (Figure 1). We are currently writing these measurements up in a GRL note.

IMPACT/APPLICATIONS

TRANSITIONS

RELATED PROJECTS

SWIMS and MMP are being used in our Washington coastal nonlinear internal waves project.

REFERENCES

PUBLICATIONS

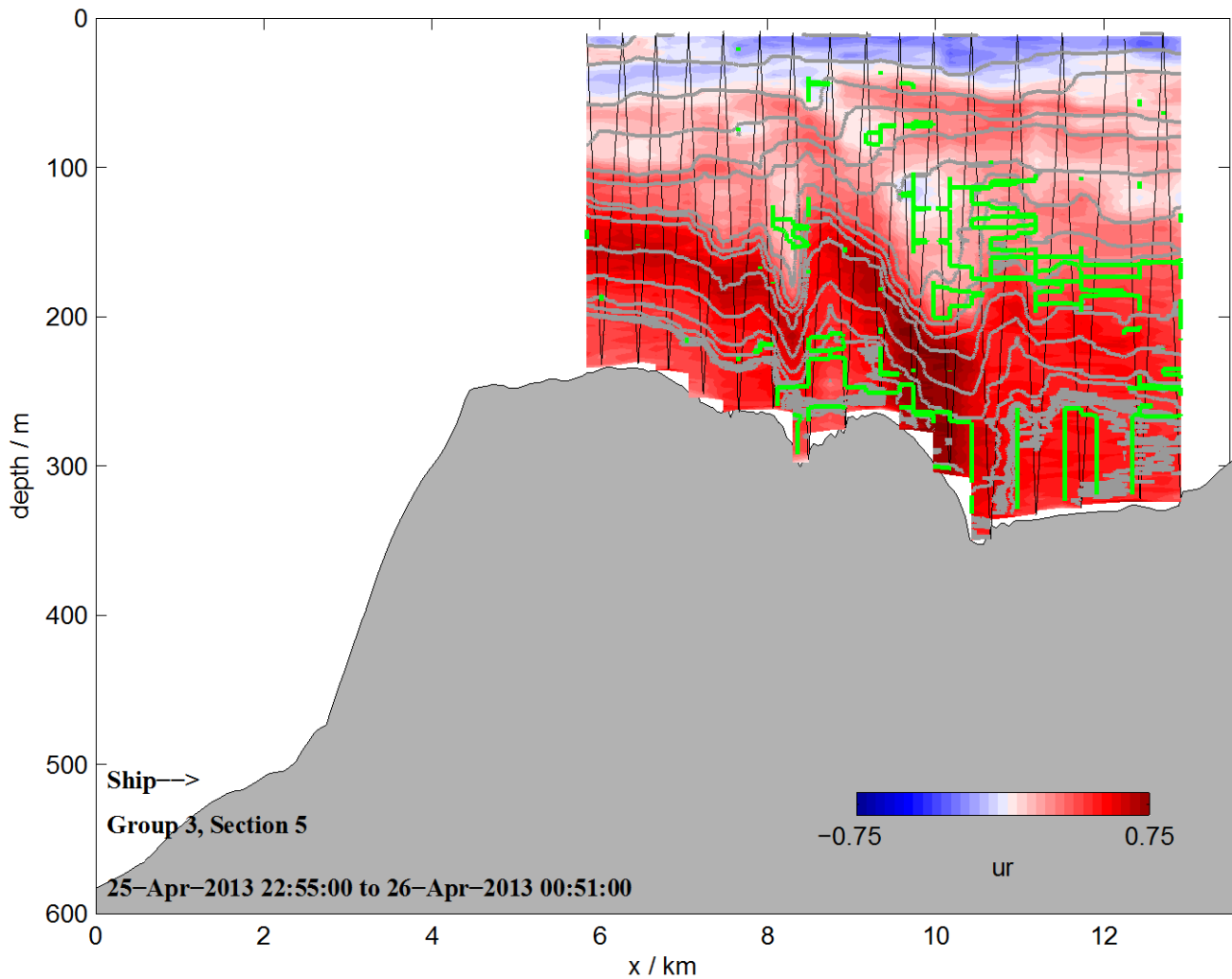


Figure 1: Alongcanyon velocity from a one-hour tow from left to right with SWIMS over a sill in Juan de Fuca submarine Canyon, Washington. Flow is strongly accelerated transiting the sill at km 6, reaching over 75 cm/s as it descends. Internal lee waves are seen near km 8 and 11, whose breaking gives rise to strong turbulence (estimated from Thorpe scales; green contours indicate $\epsilon > 10^{-6} \text{ W/kg}$). The sawtooth lines indicate SWIMS's track.