TRANSVERSE STRUCTURE OF TIDAL AND EXCHANGE FLOWS IN A MAGELLAN GLACIAL FJORD

Maria Fernanda Gastelu-Barcena*, Arnoldo Valle-Levinson*
University of Florida, Gainesville, FL, USA

Glacial mass losses in recent decades have sparked attention to the study of glacial fjord hydrodynamics. The freshwater derived from glacier melting drives a feedback loop in exchange of water and heat that accelerates its contribution to global sea-level rise. The increased rate of submarine melting in tidewater glaciers has been linked to heat transport from the ocean through fjords. Despite the global relevance of ice melting in glacial fjords, little is known about their dynamics and transverse structure. The objective of this study was to challenge the typically viewed geostrophic dynamics in fjords. The objective needed resolution of the spatial structure of tidal and exchange flows in a glacial fjord off the Strait of Magellan, Chile. Data from a towed current profiler and temperature-salinity casts were collected along two transects during one semidiurnal tidal cycle in December 2003. Salinity profiles showed an easy-to-miss 3 m buoyant layer over a homogeneous water column. Tidal flows displayed marked transverse and vertical variations caused by geometry and stratification. Residual (or tidally averaged) flows showed Inflows of only a few centimeters per second, distributed underneath the buoyant outflow. Both, tidal and residual flows described a clockwise surface gyre that invalidates the geostrophic approximation.

PRESENTER BIO: Fernanda Gastelu is a PhD student at ESSIE-UF, a 2019-WIGF Fellow and a member of the interdisciplinary NSF funded SILA project. Her PhD research focus in fjord hydrodynamics. Fernanda collaborates with the CCS-UF working on estuarine hydrodynamics in Sanibel Island. She is also a 2021-Fellow Mesoamerican Reef leadership program