Vienna School of Mathematics

PhD Colloquium

Christian Puntini

Mathematical Models for Some Nonlinear Flows at the North Pole

Abstract: The Arctic Ocean, albeit being the smallest ocean basin, is crucial for the Earth's oceanography and climate. However, due to its severe atmospheric condition and the constant presence of sea ice, physical measurements are particularly difficult to obtain. Therefore the careful study of the governing equations for geophysical fluids, eventually approximated at leading order to capture the main characteristics of the flow, is a fundamental tool for understanding the physical processes in this region.

This seminar is devoted to the presentation of two results, and will be divided in two parts: in the first part, after recalling the "rotated" spherical coordinate system developed in [1], suitable for the North Pole, we study the ice-drift current in the uppermost layer of the ocean, driven by the blowing of wind [2]. In the second part instead, we dive deeper of tens/hundreds of meters, and provide an full explicit solution modelling the halocline layer [3].

[1] A. Constantin, R.S. Johnson - On the dynamics of the near-surface currents in the Arctic Ocean. Nonlinear Anal., Real World Appl. 73, 103894 (2023)
[2] C. Puntini - On the modeling of nonlinear wind-induced ice-drift ocean currents at the North Pole. Preprint https://arxiv.org/pdf/2503.12906 (submitted)
[3] C. Puntini - Near-inertial Pollard waves Modeling the Arctic Halocline. Preprint https://arxiv.org/pdf/2504.07129 (submitted)

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