Multidisciplinary **S**imulation, **E**stimation, and **A**ssimilation **S**ystems

Seminar Series

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Transport and Mixing by Quasi-Coherent Ocean Structures

Abstract: The ocean is dominated by kinematic features, such as gyres, fronts, and mesoscale eddies, that persist for much longer than typical dynamical timescales. Due to their capacity to transport heat, salt, carbon, and other biogeochemical tracers over long distances, these coherent structures play an important role in climate, biology, and small-scale mixing. However, because of their Lagrangian (or flow-following) nature, identifying and tracking these features, and ultimately quantifying their contribution to transport processes, is challenging. In this talk, I will examine transport and mixing in the ocean by coherent structures through the framework of finite-time coherent sets. Coherent sets describe regions of phase space that minimise mixing along their boundaries over a finite time window. They identify barriers to transport and provide the skeleton around which more complex or turbulent dynamics occurs. I will present the results of three applications of the framework to: (i) study the persistence and material coherence of an Agulhas ring; (ii) extend the framework to domains containing multiple ocean eddies; and (iii) investigate and quantify cross-front transport in the Southern Ocean.

Biography: Michael Denes is a Ph.D. student in the School of Mathematics and Statistics at the University of New South Wales, supervised by Professor Gary Froyland and Dr Shane Keating. He holds a BSc. (Honours 1) in Applied Mathematics and Computer Science from the University of Sydney. His current research interests include mathematical oceanography, geophysical fluid dynamics, and dynamical systems.

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3:00 PM; Rm. 5-314

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