

Ocean Modelling at the CHPC: Advancing Southern Ocean and Climate Research

High-performance computing is critical for understanding the ocean's role in Earth's climate system. The Southern Ocean, in particular, plays a vital role in regulating global climate through the transport and exchange of heat and carbon, yet it is one of the most computationally demanding regions to model.

The Southern Ocean Carbon-Climate Observatory (SOCCO), CSIR, has developed a modelling framework that leverages NICIS-Centre for High Performance Computing (CHPC) resources to simulate the Southern Ocean at high spatial and temporal resolution. Through a hierarchy of coupled ocean-ice-biogeochemical model configurations, we investigate physical ocean and carbon-cycle processes driving air-sea CO₂ exchange, storm-driven variability, and ecosystem responses in a changing climate.

The flagship configuration, BIOPERIANT12, is a high resolution model domain that spans the Southern Hemisphere south of 30°S. It represents a complex and scalable computational challenge requiring significant HPC resources for multi-year simulations. Beyond computational cost of the model experiments, key challenges include the efficient analysis and management of the multi-terabyte outputs and the subsequent derived analysis datasets.

SOCCO demonstrates how use of national HPC infrastructure enables cutting-edge Southern Ocean and climate research, while providing transferable insights for earth system modelling and supporting the training of future earth system modellers and researchers.

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Registered for the conference?

CHPC User

Yes

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