



Contribution ID: 49

Type: **Talk**

Regional and coastal ocean modelling: toward an operational system for well-informed decision making

Friday, 3 December 2021 12:15 (30 minutes)

Numerical modelling is an essential component of integrated ocean monitoring and, together with in situ observations and remote sensing products, is one of the critical tools informing stakeholders about highly variable regional and coastal environments. Operational ocean modelling becomes particularly valuable in South Africa when one considers the dynamic nature of its surrounding oceans, including but not limited to its proximity to one of the most energetic current systems in the world, the Agulhas Current. The Agulhas Current exhibits intense mesoscale activity in the form of events such as eddy shedding events at the Agulhas Retroflection, the interaction of eddies from the Mozambique Channel with the Agulhas Current proper, and the meandering nature of the Agulhas Return Current. The unpredictability and intensity of the currents represent a direct risk to industrial, commercial and leisure activities, for example, accidental pollutants, such as oil spills, which may advect onshore to the detriment of the coastal environment. Furthermore, the Benguela Current system is known to be sensitive to climate change, and climate variability such as the El Niño Southern Oscillation (ENSO). Understanding these dynamics and their function in the ecosystem, such as associations to harmful algal blooms (HABs) is an important part of resource management. Hence, the development of regional operational modelling capacity is of key interest. This program supports SOMISANA (Sustainable Ocean Modelling Initiative: a South African Approach) whose vision is to facilitate the local development and sustainability of an operational ocean current forecast system for the South African exclusive economic zone and to do so in a transformative fashion. To this end, its two immediate goals are: (1) to develop local numerical ocean modelling capacity via student supervision and (2) to develop high resolution 'hindcast' numerical models, optimized for South Africa's shelf region as well as bay-scale forecast models, downscaled from freely available global products that poorly resolve the processes in these regions. These objectives will not only lay the foundation for the development of South Africa's operational ocean forecasting system, they will also ensure our contribution to UN Decade of Ocean Science endorsed projects: CoastPredict and ForeSea.

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Session Classification: HPC Applications

Track Classification: Earth Systems Modelling