

Title: A multi model approach to understanding the Southwest Indian Ocean, with a focus on the greater Agulhas Current

Session could be physical process or coastal and marine tools to support management
Authors:

Juliet Hermes, South African Environmental Observation Network (SAEON), University of Cape Town (UCT), Nelson Mandela University (NMU), South Africa, juliet@saeon.ac.za

Bjorn Backeberg, Nansen-Tutu Centre (NTC) / Nansen Environmental and Remote Sensing Center (NERSC), South Africa/Norway, backeb@gmail.com

Julie Deshayes, CNRS-LOCEAN-IPSL, France, julie.deshayes@locean-ipsl.upmc.fr

Fehmi Dilmahamod, GEOMAR, UCT, Germany, fehmi.dilmahamod@gmail.com

Jonathan Durgadoo, GEOMAR, Germany jdurgadoo@geomar.dr

Jennifer Jackson-Veitch, SAEON, Department of Environmental Affairs (DEA), NTC, South Africa, jenny@saeon.ac.za

Issufo Halo, Cape Peninsula University of Technology (CPUT), South Africa, halo@cput.ac.za

Michael Hart-Davis, NMU, NTC, SAEON, South Africa, mhartd@gmail.com

Katherine Hutchinson, UCT, SAEON, South Africa, kath.hutchinson@gmail.com

Zoe Jacobs, National Oceanography Centre, Southampton, UK, zoe.jacobs@noc.ac.uk

Neil Malan, University of New South Wales (UNSW), SAEON, Australia, neilmalan@gmail.com

Pierrick Penven, Institute for Research and Development (IRD), France, Pierrick.Penven@ird.fr

Stephane Pous, LOCEAN-MNHN, France, spolod@locean-ipsl.upmc.fr

In the last decade, the strategic landscape around South African national marine research and development has changed considerably, moving towards a focus on the provision of high-value and actionable information in support of the blue economy. The research contributing to this strategy is of interest internationally not only because it is in line with the current international research and policy and hence contributing to a global thrust towards a sustainable blue economy, as highlighted in the Sustainable Development Goals, as well as the United Nations' decade of the Ocean, but also due to the international importance of the oceans surrounding South Africa with regards to weather, climate, fisheries and biodiversity. In particular, modelling the Agulhas Current remains a challenge which both the South African and international oceanographic community are determined to work together to solve. Expanding on this are the key features in the southwest Indian Ocean which influence the Agulhas, its source regions and the atmospheric and biogeochemical aspects of importance to the region. With increasing computational power, the ability for numerical model simulations to resolve spatial scales in the order of a few hundred metres to a few hundred kilometres is improving at the regional and, in some cases, global level. When such models include data assimilation, they are able to provide more accurate forecasts of the ocean ranging from days to weeks, supporting operational oceanography serving a number of socio-economic marine and maritime sectors.

This presentation will give an overview of physical ocean modeling being carried out within South Africa and with international collaborators, the availability of these

model data and some key results relevant to the western Indian Ocean. In particular, the use of the models - ROMS (Regional Ocean Modelling System), NEMO (Nucleus for European Modelling of the Ocean) and HYCOM (HYbrid Coordinate Ocean Model) in the region. The applications include theoretical modeling and the seasonal cycle of the Agulhas Current, biogeochemical coupled modeling with a focus on the South-East Madagascar bloom, physical and biogeochemical modeling (including future projections) to understand the dynamics on the Agulhas Bank and the implications on the chokka squid fishery, particle trajectory modelling supporting a variety of marine sectors as well as understanding shortcomings of the different models being used. These models are also used to address fundamental balances (including energy, momentum, heat and nutrients) and processes in the system (such as air-sea or current-topography interactions, and eddy generation/dissipation) also at play in other parts of the global ocean, which remain shortcomings in most ocean and climate models. Finally the development strategy of a Southern African ocean modeling hub (SOMISANA; Sustainable Ocean Modelling: a Southern AfricaN Approach) will be showcased. The vision of SOMISANA, meaning ‘to work together’ in Sepedi, is to build local modelling capacity in a transformative way such that the implementation and sustainability of an operational ocean forecast model of the Southern African Exclusive Economic Zone is ensured.