IOGOOS Piloting project: Modelling for Ocean Forecasting and Process Studies (MOFPS)

28-30 March 2012, UNESCO IOC Perth Regional Programme Office, Perth, Western Australia.

Report back by: Sarah-Anne Nicholson

Acknowledgments:

Appreciation and gratitude is extended to the important hosting and generous co-sponsorship support of this meeting given by Commonwealth Government of Australia: Bureau of Meteorology (BoM), UNESCO IOC Perth Regional Programme Office, sponsored by BoM, UNESCO IOC, Western Australian Government. Extended thanks to CSIRO for the support of this workshop.

Thank you to SAEON and SAWS for allowing the opportunity to participate in the MOFPS workshop.

Participants:

- UNESCO IOC Perth Office: overall project leadership, coordination and local hosting:
    - Dr Nick D'Adamo, UNESCO IOC Perth Office.
    - Dr Sarah Grimes, UNESCO IOC Perth Office.

- Australian BLUElink> Bureau of Meteorology and CSIRO: scientists and applications experts:
    - Dr Peter Dexter, BoM, Melbourne, Australia.
    - Dr Gary Brassington, BoM, Melbourne, Australia.
    - Dr Andreas Schiller: CSIRO, Hobart, Australia; Co-Chair GODAE OceanView.
    - Dr Justin Freeman, BoM, Melbourne, Australia.

- IOGOOS key stakeholders in sub-regional 'demonstration' areas (where relevant systems/models will be applied in demonstration mode):
    - IOGOOS: North Indian Ocean (Central) demonstration area:
        - Dr M Ravichandran, INCOIS, Hyderabad, India (and Co-Chair, Indian Ocean Panel of GOOS/CLIVAR) (to be represented by Nick D'Adamo and S Mazaheri).
    - IOGOOS: North Indian Ocean (Arabian Sea) demonstration area:

        - Dr Said Mazaheri, INIO, Tehran, I.R. Iran.
    - IOGOOS: North Indian Ocean (Bay of Bengal) demonstration area:
        - Dr Rudolf Hermes, Bay of Bengal Large Marine Ecosystem program, to be represented by Dr Somkiat Khokiattiwong, (Phuket: Marine Biological Centre) as BOBLME PSC Member for Thailand (Environment)).
    - IOGOOS: South West Indian Ocean demonstration area:
        - Rezah Badal, Director, Mauritius Oceanography Institute, Quatre Bonnes, Mauritius (to be represented by Nick D'Adamo).
        - Sarah Nicholson, South African Environmental Observation Network, University of Cape Town, South Africa.
        - Dr John Mungai, Kenya Meteorological Organisation, Nairobi, Kenya.
    - IOGOOS: South East Indian Ocean demonstration area:
        - Dr Ray Steedman, Chair WAGOOS, Perth, Australia.

Introduction/Background:

During the Indian Ocean Global Ocean Observing System 7th annual meeting (IOGOOS-7) in Perth, Western Australia, 12-15 July 2010, the plans to develop an IGOOS Pilot Project: Modelling for Ocean Forecasting and Processes were discussed.

The objectives of this project are to build capacity in ocean forecasting amongst IOGOOS members, by taking observations through to models through to societal applications. The specifics aims include: the development of ocean prediction systems (operational implementation, modelling and data assimilation), generating ocean forecasts, generating boundary conditions for finer scale nested models in regions of interest, facilitating marine management and conservation of biodiversity, and understanding and adaptation to marine and coastal hazards through ocean forecasting and related ocean modelling.

Financially, to have forecasting running properly it will cost an order of twenty million dollars, five million dollars per demonstration region to develop the forecasting. There is precedence for this money to be found, the project members need to approach the Global Environmental Committee, sustainable fisheries and Global Framework for Climate Services (GFCS) for funding and support.

The workshop commenced with presentation by the demonstration regions, followed by discussions on key stakeholders and related needs in respect to ocean forecasting, observations and the associated data processing/IT.

Presentations and Discussion

BLUElink-3	Dr. Garry Brassington

How do you add value to the observations we are putting out there? There is a chain of places you can draw observational information out from such as IMOS (observations, quality control, meta-data), analysis (RAMSSA/GAMSSA operational), and hind cast and forecasting (BLUELink and POAMA),

The BLUELink project is made up of a number of phases and is currently on the third phase. The key models and systems include: OFAM (Ocean Forecast Australian Model), BODAS and BRAN hind cast mode with data assimilation using mostly remote sensing, Oceanmaps in forecast mode, CLAM-R nested version of data assimilation, ROAM which allows you to choose your own domain and WavewatchIII model coupled with waves.

There has been progress in BLUELink with reanalysis. However, the real challenge is in understanding where the error growth is. Rapid error growth occurs at fronts, where as the model adapts to eddy centers quickly.

The applications of BLUELink include: defense, oil spills, coral bleaching, fisheries, coastal upwelling, hypothermia, sea fog, coastal sea-level and lobster fisheries.

What can BLUElink do for the demonstration regions? BLUELink can provide model data and visualization demonstrating what the oceanography of the region looks like down to the eddie resolving system.
What do BLUElink want? BLUElink wants to validate their products. The demonstration regions could in return validate the reliability of the model in their region. If each region could establish a benchmark dataset then BLUElink could measure their models against it.

Inter comparison projects	Dr.Garry Brassington, Matt Martin

Validation techniques such as observation-based comparison could be used to explore the reliability of model results. Observation-based comparisons use a chosen number of variables that are reasonably well observed and compare every model against that particular observation. Then one can look at the biases between different models once on the same observational common space.

Another validation approach is downscale inter comparisons. This is uses different global models (BLUELink, Mercator etc.) as boundary conditions and then a comparison of the outputs.

There are some key issues regarding modelling, forecasting and in particular nesting forecasting. The two major issues are firstly, the skill of the atmospheric

model in your regional domain must be superior to that forcing the global ocean and secondly data assimilation (high-resolution).

CLAM – Coupled Limited Area Model	Dr.Gary Brassington

The Coupled Limited Area Model has been developed with in BLUELink. At the coupled point the downscaling is next milestone. The CLAM is made up of MOM4, atmospheric (ukmet could also use wrf), BODAS and is now open source. For research purposes only all the data, code etc. would be made accessible.

GODAE Oceanview	Dr. Schiller

The footsteps of GODAE finished in 2008 with the feasibility of ocean forecasting. Following on, the Oceanview scope is much broader. The objective is to lead the scientific development of the implementation of forecasting systems and to try to improve the accuracy of ocean forecasting products. Furthermore, the objective is to promote the development of a downstream use of ocean data and information products.

They are currently trying to negotiate a new membership with South Africa and GODAE oceanview.

Focus on Indian Ocean:

www.ecmwf.int/products/forecasts.ocean/documentation/index.html
www.ncof.co.uk/FOAM-System-Description.html
www.hycom.org/
www.mercator-ocean.fr

GODAE has applied to AusAID, to enable the running of a workshop on progress, validation and application of ocean forecast systems. This workshop will be very closely related. The main limitation for most demonstration regions was the lack of skills in data assimilation.

Opening function for Modelling for Ocean Forecasting and Process Studies (MOFPS)