>>The BLUElink ReANalysis BRAN

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BLUElink is an Australian partnership between CSIRO, the Bureau of Meteorology and the Royal Australian Navy. The main objective of BLUElink is to develop a forecast system for the mesoscale ocean circulation around Australia.

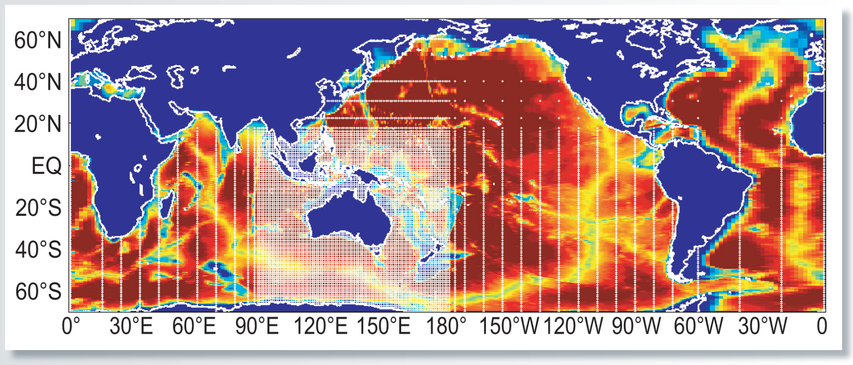


Figure 1: OFAM topography; white dots show every 10th grid point.

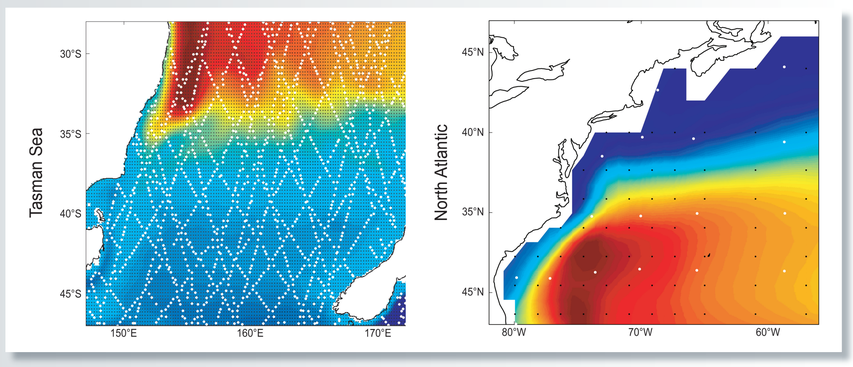


Figure 2: OFAM mean sea-level in the Tasman Sea (left) and North Atlantic (right); white dots show the locations of sea-level super-observations and the black dots show every 2nd grid point.

OFAM

The Ocean Forecasting Australia Model (OFAM), based of version 4.0 of the Modular Ocean Model, is a global ocean general circulation model with 10 km resolution around Australia (**Figure 1**).

BODAS

The BLUElink Ocean Data Assimilation System (BODAS) is an ensemble-based multivariate optimal interpolation system that assimilates observations of sea-level, temperature and salinity into OFAM. BODAS is built within the framework of an ensemble Kalman Filter, but uses a stationary 72-member ensemble of modelled intraseasonal anomalies to estimate the covariances between model state variables.

Figure 3:
A sequence of maps of analysed sea level anomaly (metres; 15-day averages) from BRAN and surface drifter tracks for the 15-day period centered at the specified date in early 2000.

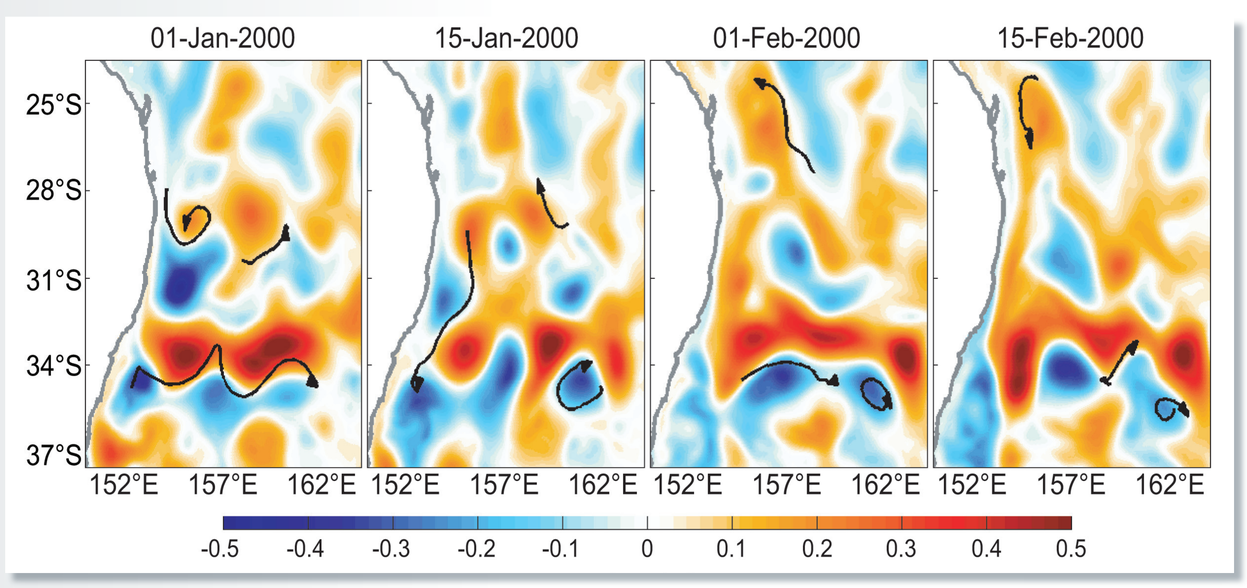


Figure 4:
A sequence of maps off Java, showing daily averaged SST from BRAN (left) and from a 3-day composite from AVHRR (right) and surface drifter tracks for the 7-day period centered at the specified date.

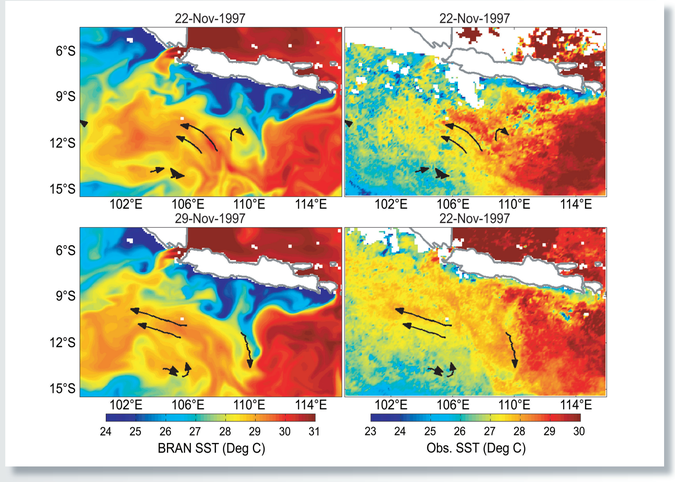
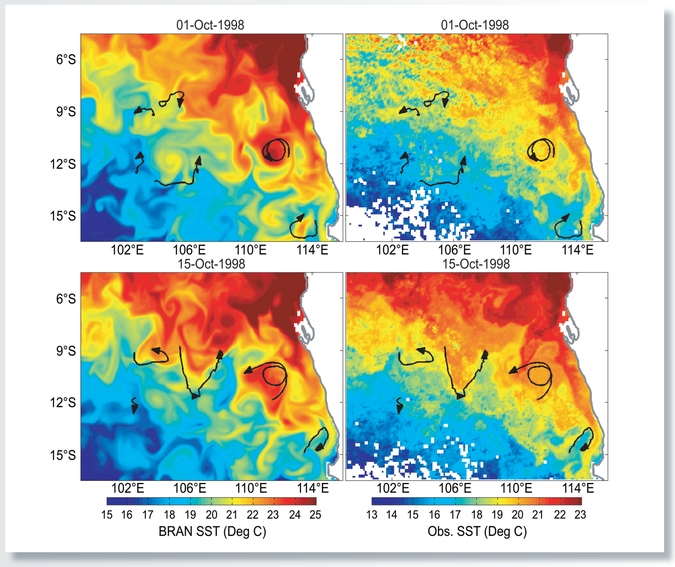


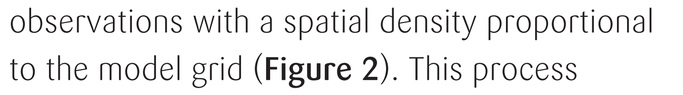
Figure 5:
A sequence of maps Western Australia, showing daily averaged SST from BRAN (left) and from a 3-day composite from AVHRR (right) and surface drifter tracks for the 15-day period centered at the specified date.



BRAN

The BLUElink ReANalysis (BRAN) is a 13 year run of OFAM using BODAS to assimilate ocean observations once every 3 days. Surface fluxes of momentum, heat and freshwater are derived from ERA40 (1992-2002) and ECMWF forecasts (2002-2004). The observations assimilated are sea-level anomalies (SLA) from all altimeters and Australian tide gauges; and in situ temperature and salinity from Argo, WOCE, TAO and other XBT and CTD surveys.

For each assimilation cycle, temperature and salinity observations within ±2.5 days of the analysis time and sea-level observations within ±5.5 days are assimilated. The sea-level observations are processed into super-observations with a spatial density proportional to the model grid (**Figure 2**). This process reduces the number of observations that are explicitly assimilated. It also makes the assimilated observations more compatible with model fields by averaging observed features that are not resolvable by the model (e.g., eddies in the North Atlantic), while retaining observed features that the model should be able to reproduce (e.g., eddies in the Tasman Sea).



RESULTS

Comparison with independent observations indicates that BRAN successfully represents the true history of the near-surface mesoscale circulation around Australia for the past decade. For example, **Figure 3** demonstrates excellent agreement between paths taken by un-assimilated satellite-tracked surface drifters and the BRAN sea level anomaly fields. Similarly, **Figure 4** shows good agreement between the observed and reanalyzed upwelling off Java during the onset of the 1997 El Niño. A similar comparison off the coast of Western Australia (**Figure 5**) also demonstrates good qualitative agreement between modeled and observed sea surface temperature (SST) features that both reflect the independent drifter paths.

WHAT'S NEXT?

The next phase of BLUElink involves a thorough analysis and assessment of the performance of BRAN; and operational trials of the OFAM/BODAS forecast system at the Bureau of Meteorology. The first operational forecasts using this system are scheduled for 2006.

ACKNOWLEDGEMENTS

Financial support for this project has been provided by CSIRO, CBoM, RAN and ONR (Award Number: N00014-04-0345, including partial support from ONR Global's NICOP). Other BLUElink team members are thanked for their important contributions to the development of OFAM and BODAS; and to the compilation and quality control of the observations used in BRAN; they include Russel Fiedler, Jim Mansbridge, Pavel Sakov, Ken Ridgway, Jeff Dunn, Madeleine Cahill, Ian Barton and Chris Rathbone.

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