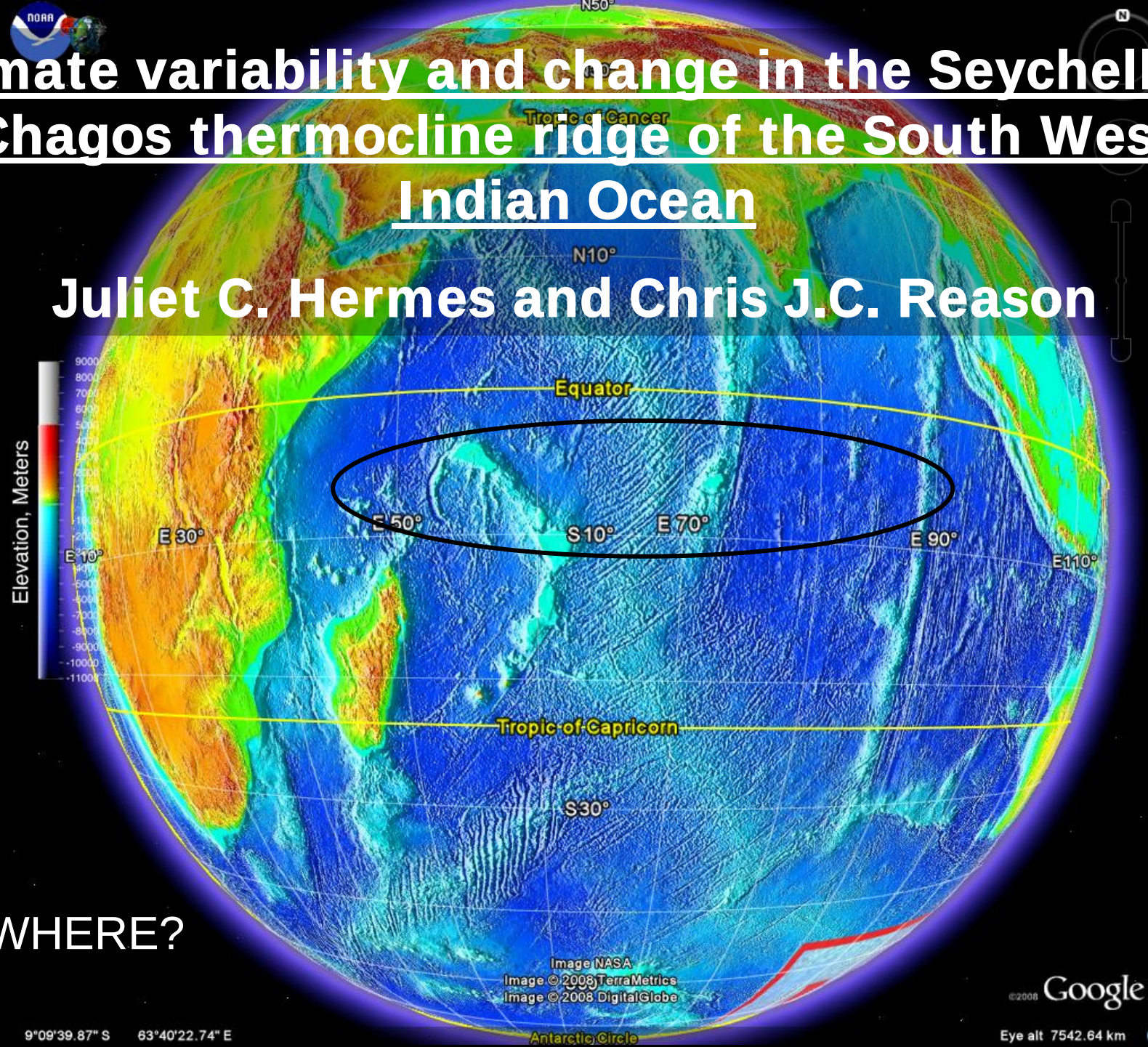
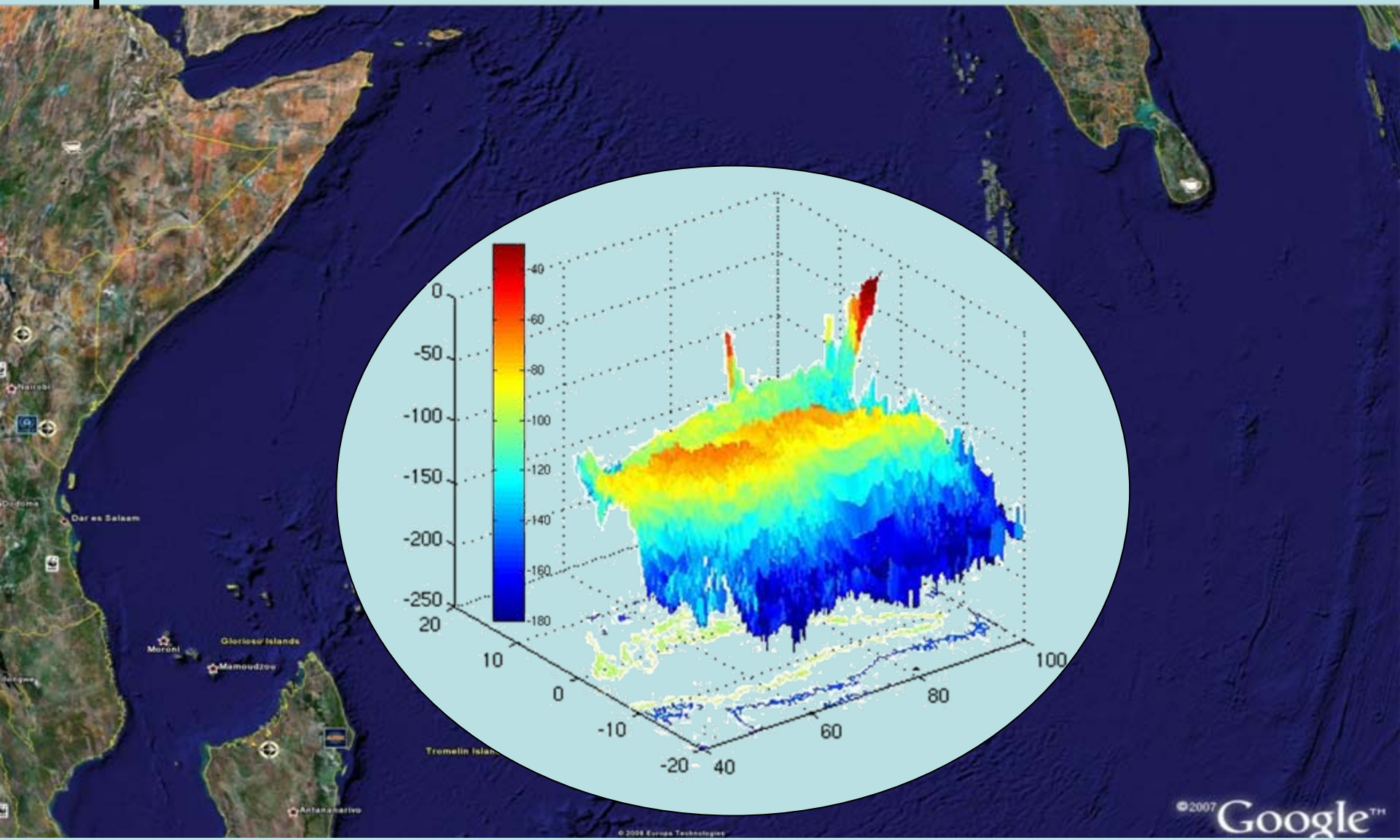
Climate variability and change in the Seychelles-Chagos thermocline ridge of the South West Indian Ocean

Juliet C. Hermes and Chris J.C. Reason



WHERE?

Depth of the thermocline – red is shallower



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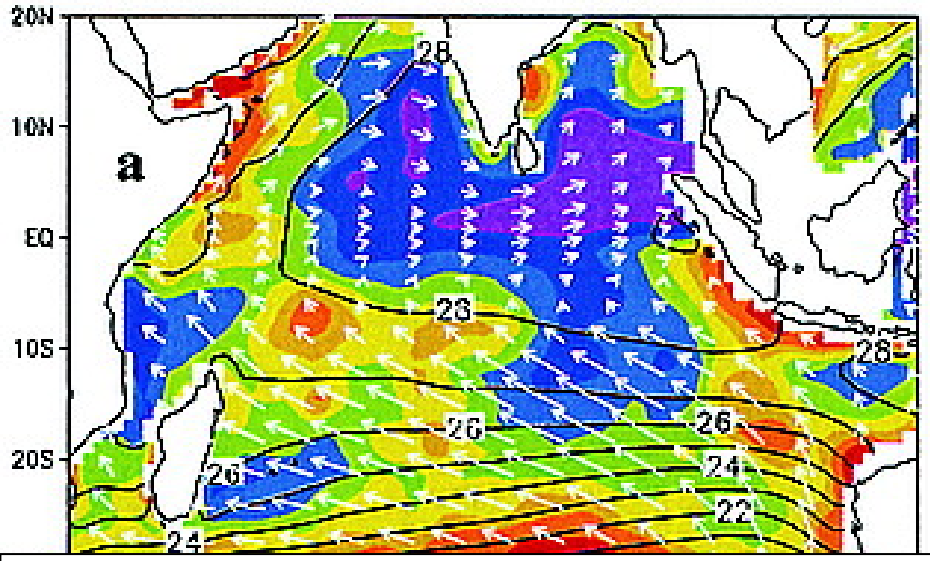
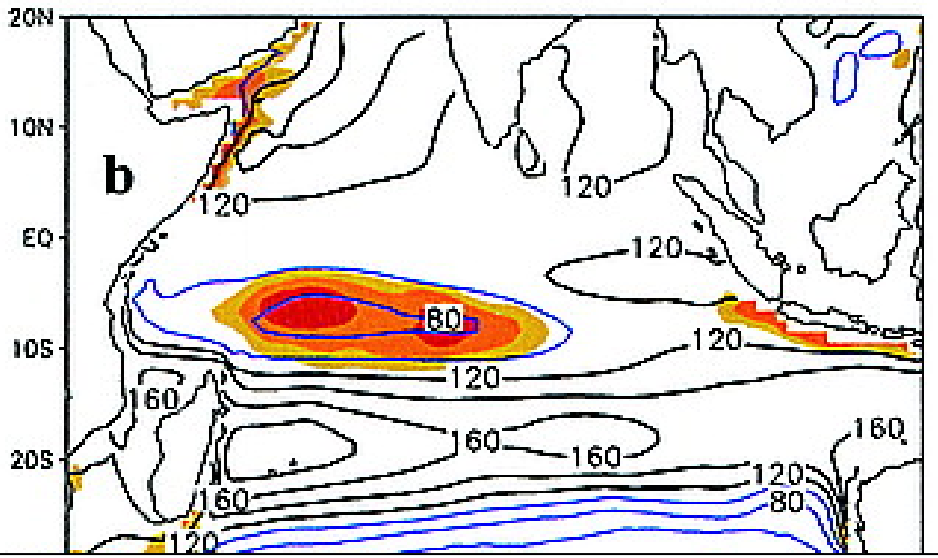
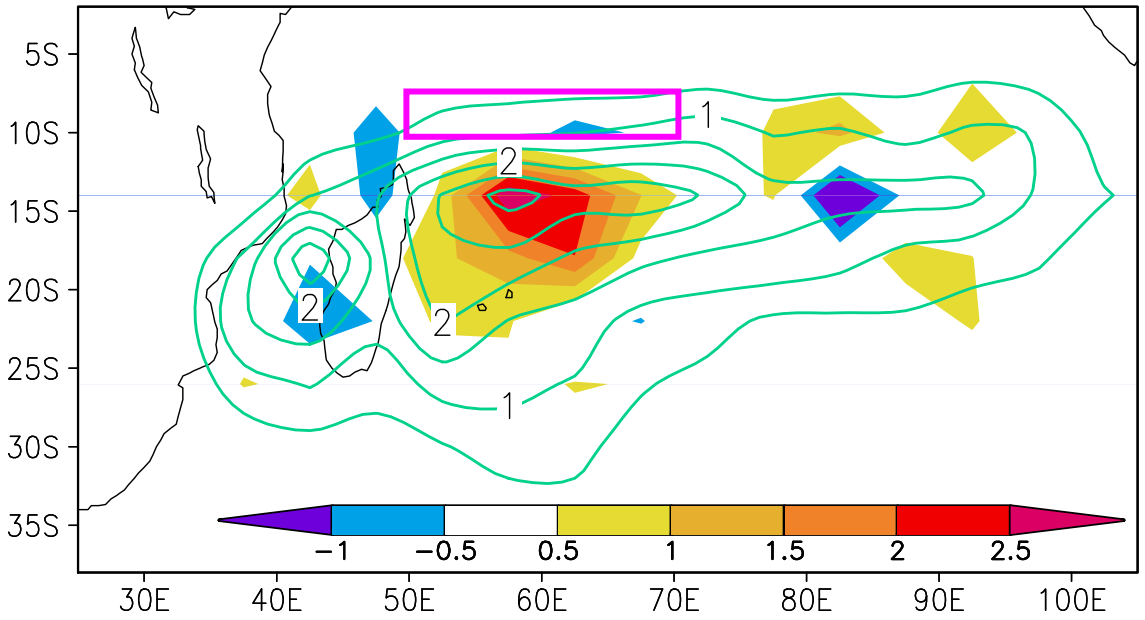
WHAT?





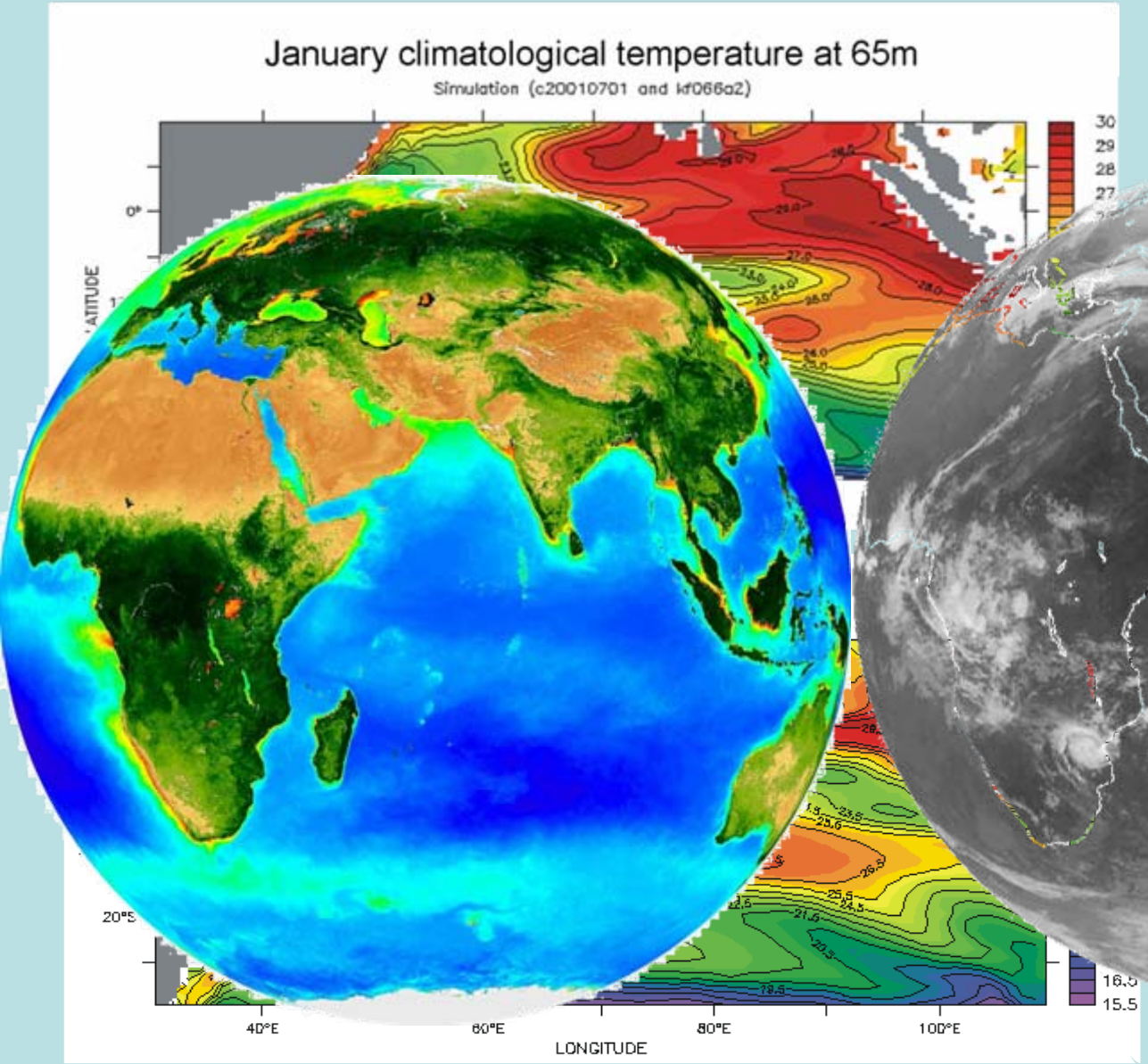
Xie et al. (JC2002) - courtesy Fritz Schott

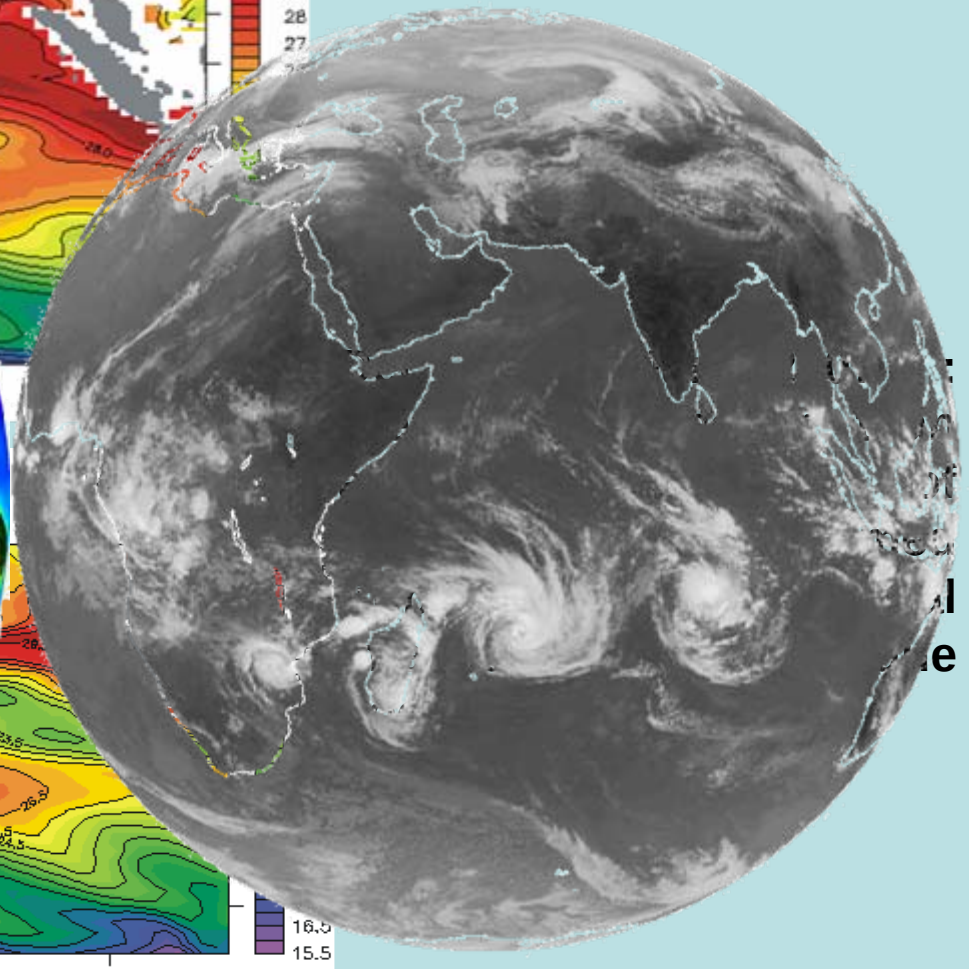
Tropical cyclone days for Dec-Apr **when mixed-layer particularly deep (=high SST) NE of Madagascar (8-12S, 50-70E): More cyclone generation and anomalous rainfall**



Climatological mean of number of cyclone days (contours) difference between deep and shallow mixed layer (shading)

WHY?

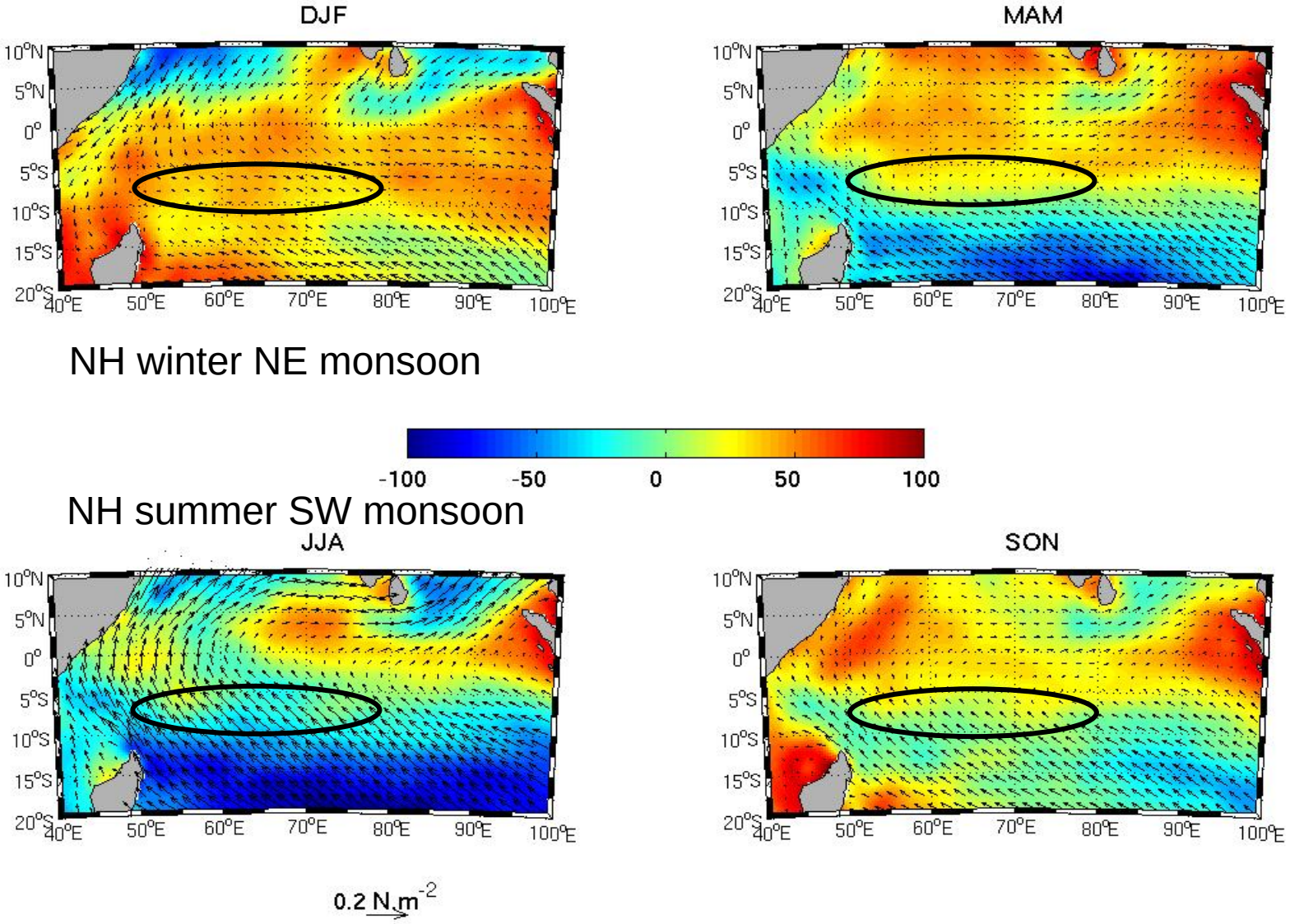




METEOSAT IR 2 23 2007 0530Z

WHY?

NCEP surface net heat fluxes W m2 (positive is heat gain by the ocean), with QuikSCAT wind stress vectors (N m2) overlaid

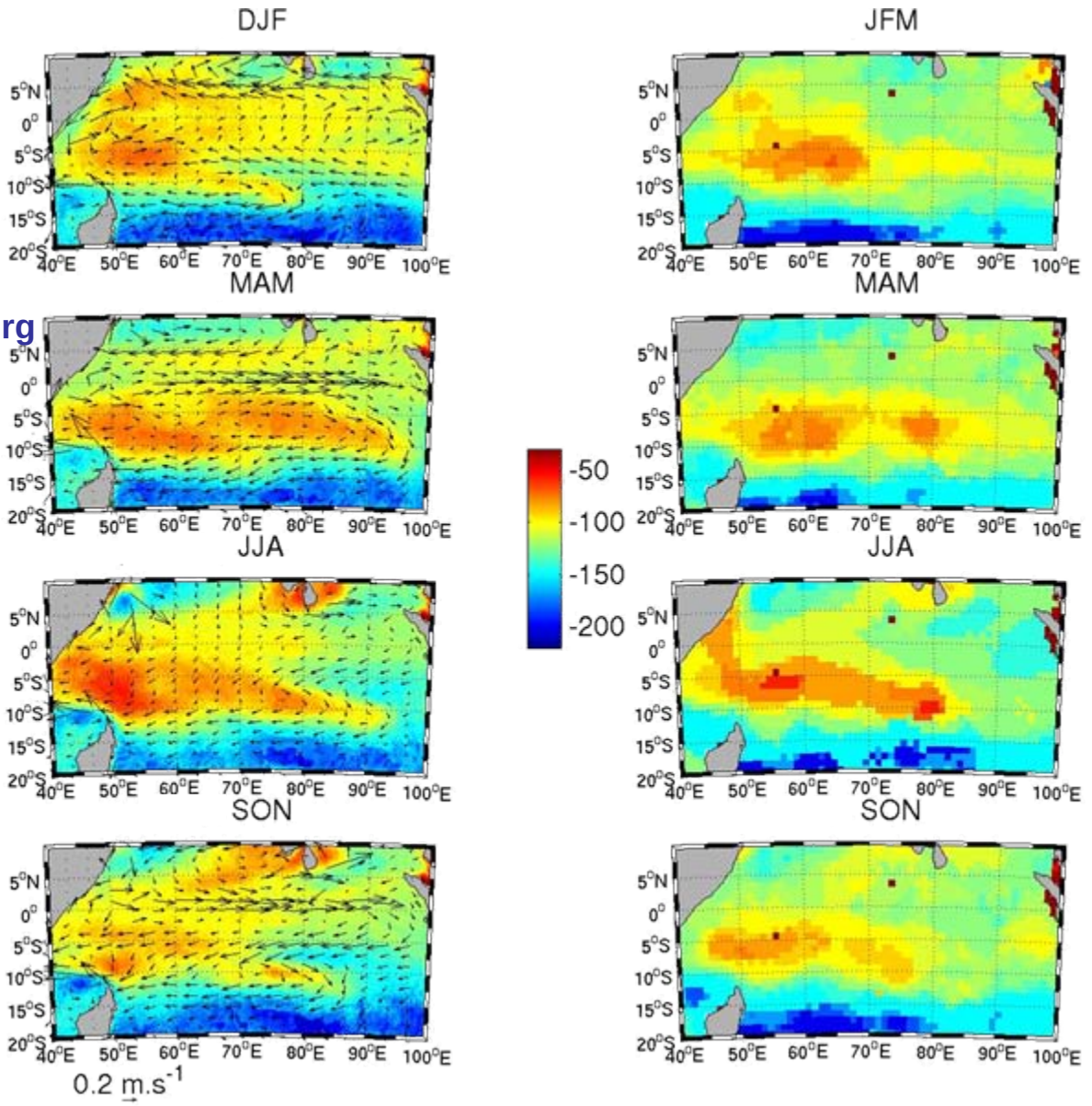


NH winter NE monsoon

NH summer SW monsoon

ROMS

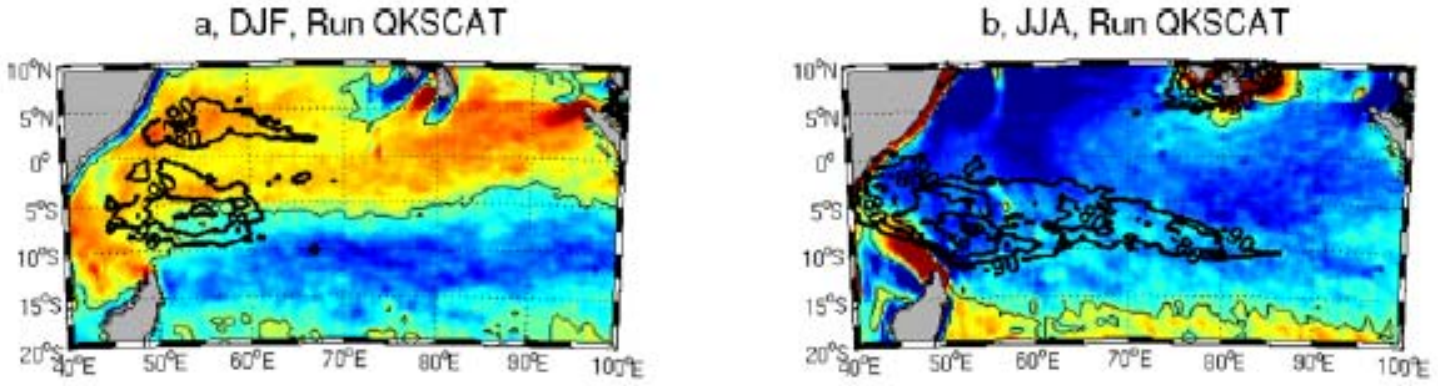
http://www.myroms.org



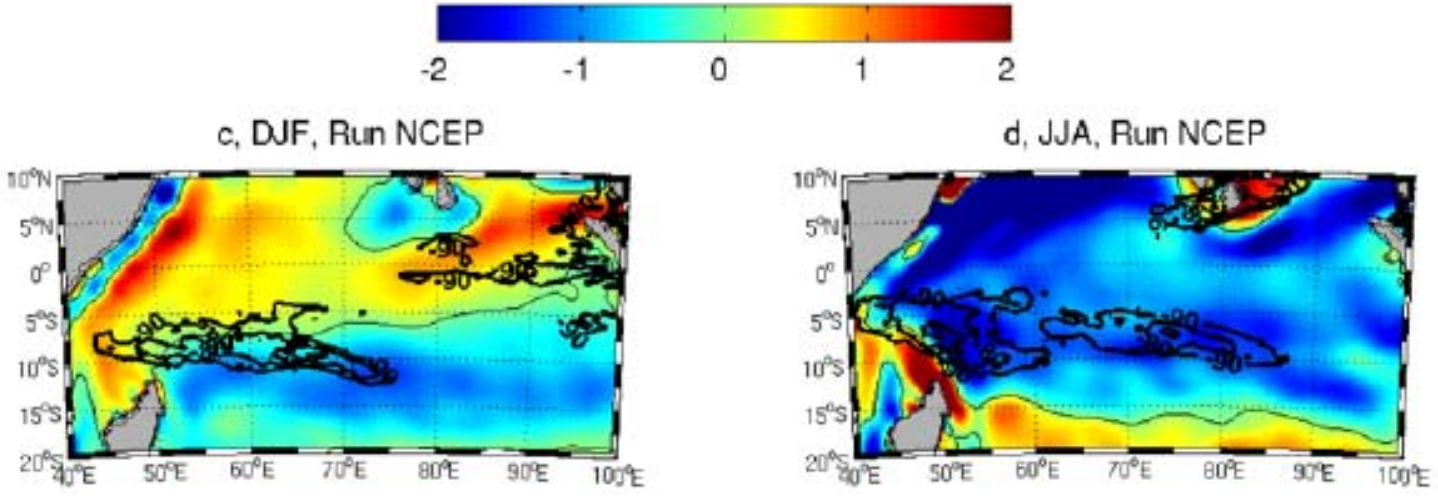
OBSERVATIONS

Upwelling present throughout the year, more defined in MAM, JJA

WHEN?



QuikSCAT wind stress curl (N m3) with the minimum thermocline depth contours (70, 80, 90 m)

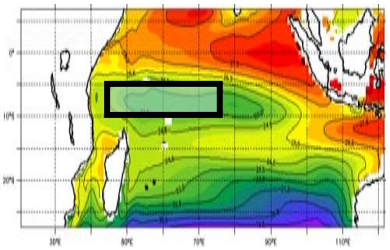


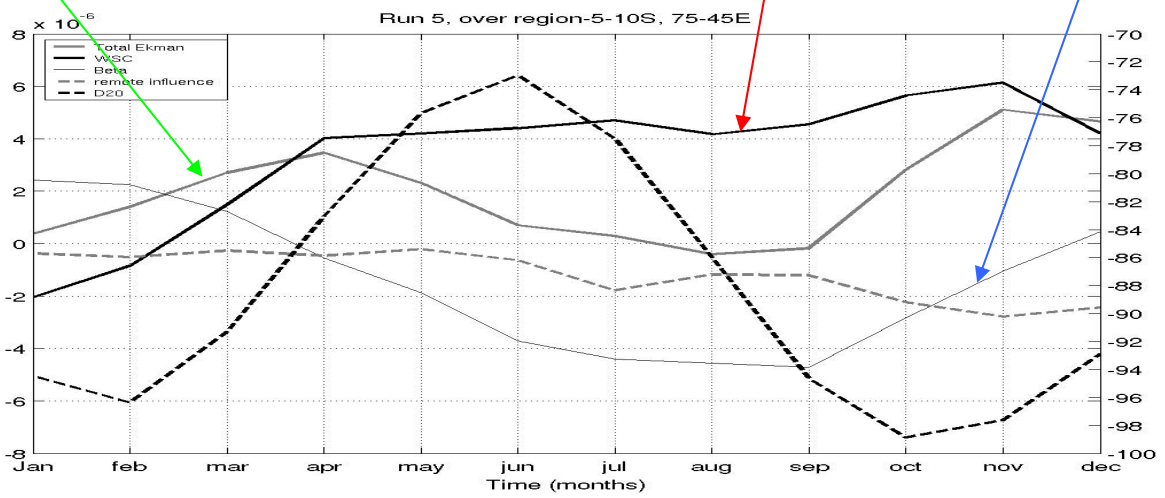
NCEP wind stress curl (N m3) with the minimum thermocline depth contours (70, 80, 90 m)

HOW?

Upwelling equation:

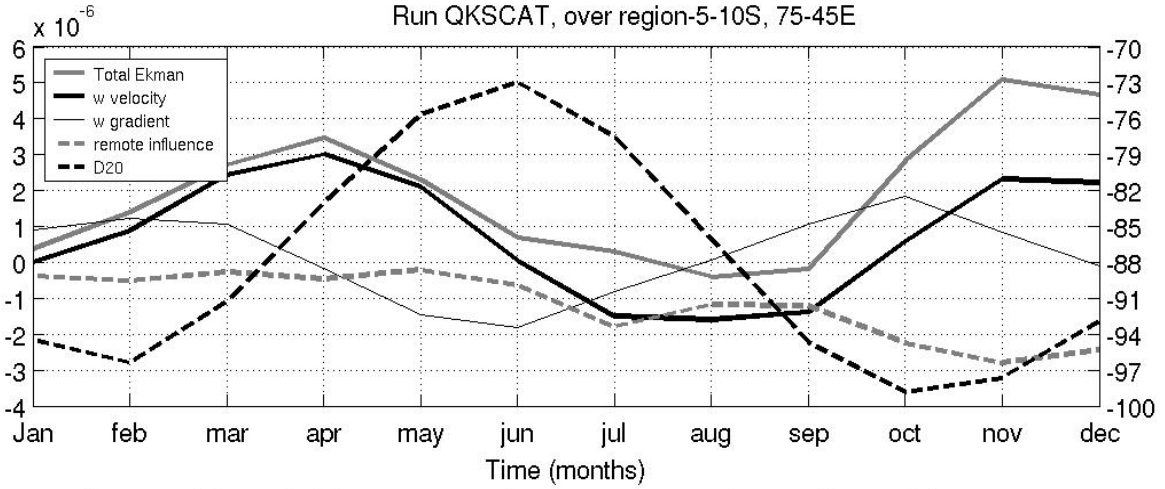
$$\frac{1}{\rho_0 f} curl\,\vec{\tau} + \frac{\beta \tau^x}{\rho_0 f^2}$$





Shallow

Deep



HOW?

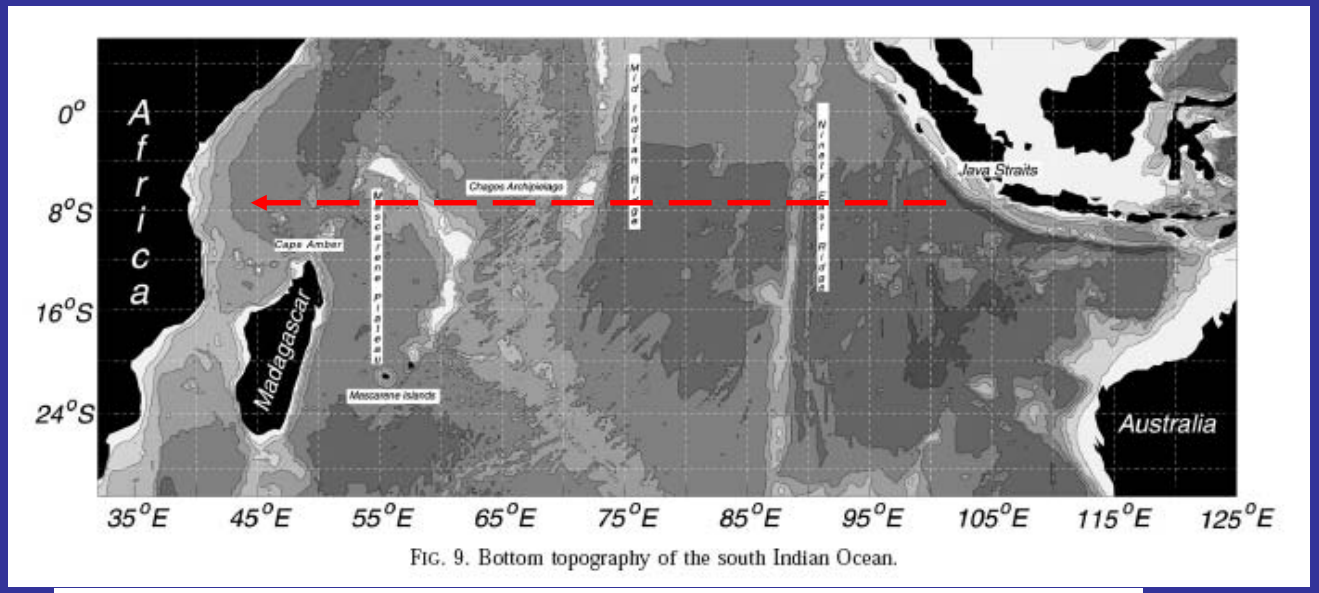
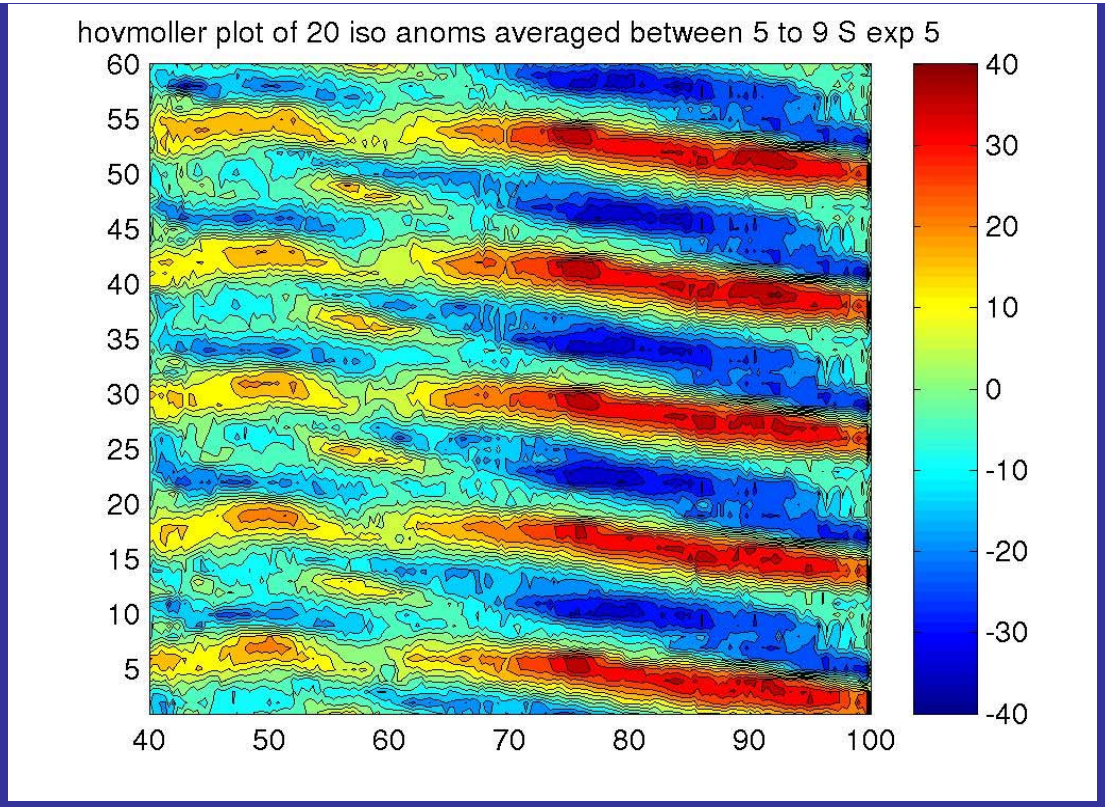


FIG. 9. Bottom topography of the south Indian Ocean.

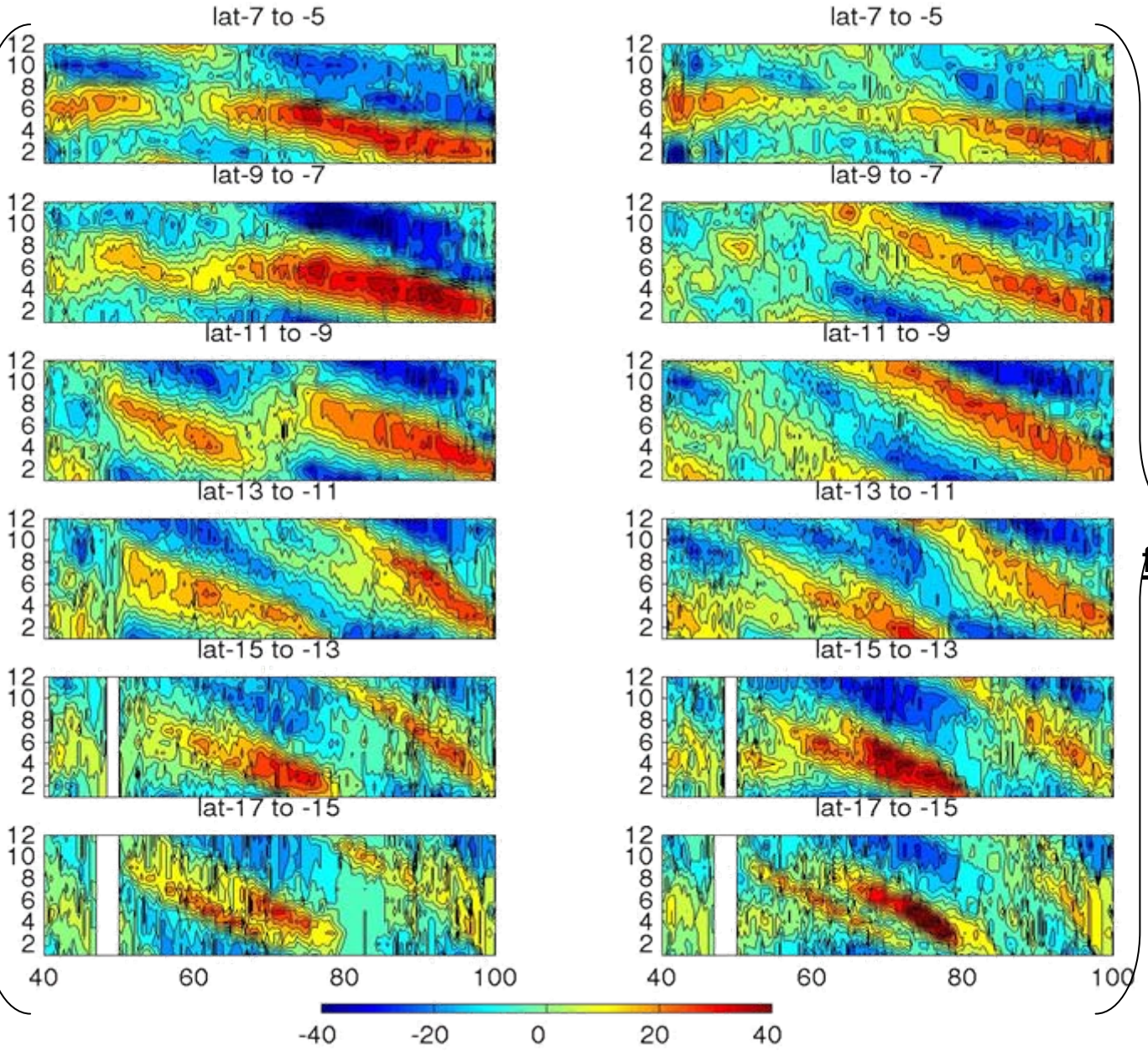
Bottom topography



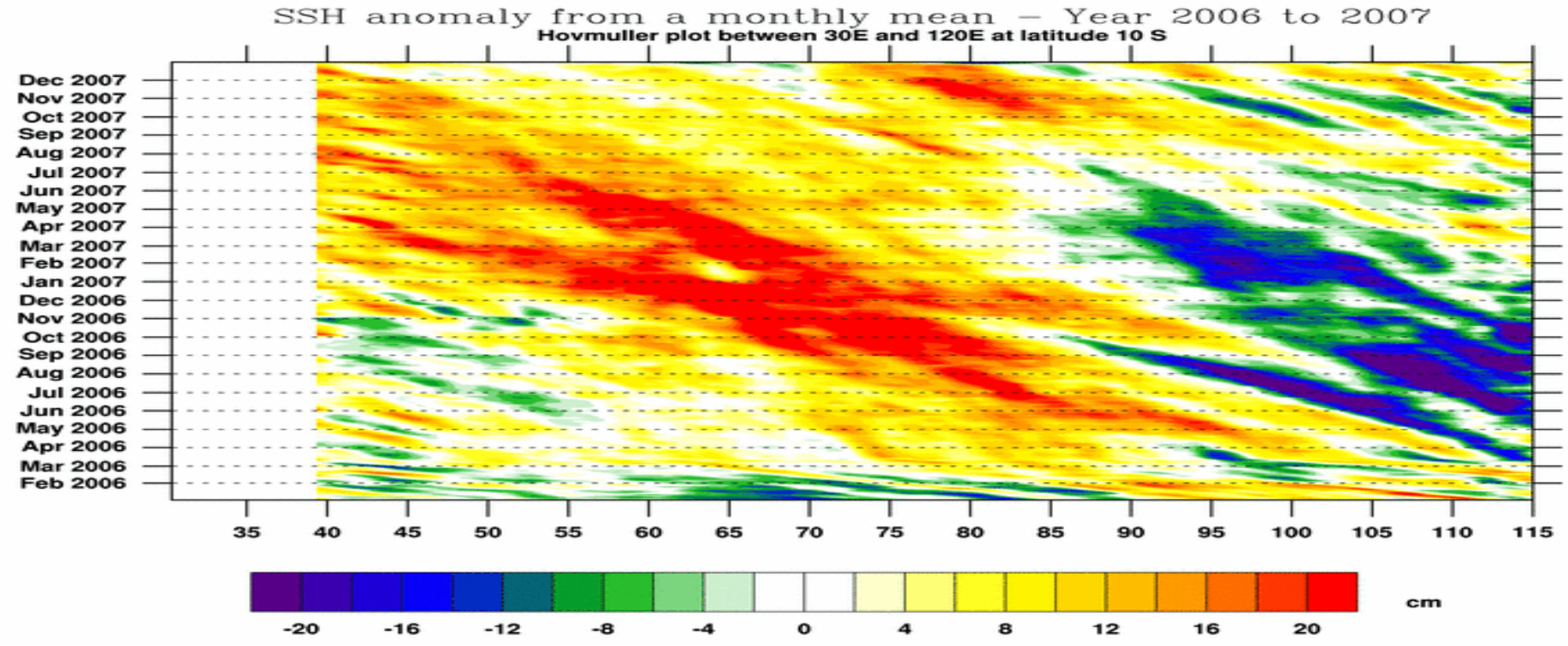
Rossby waves

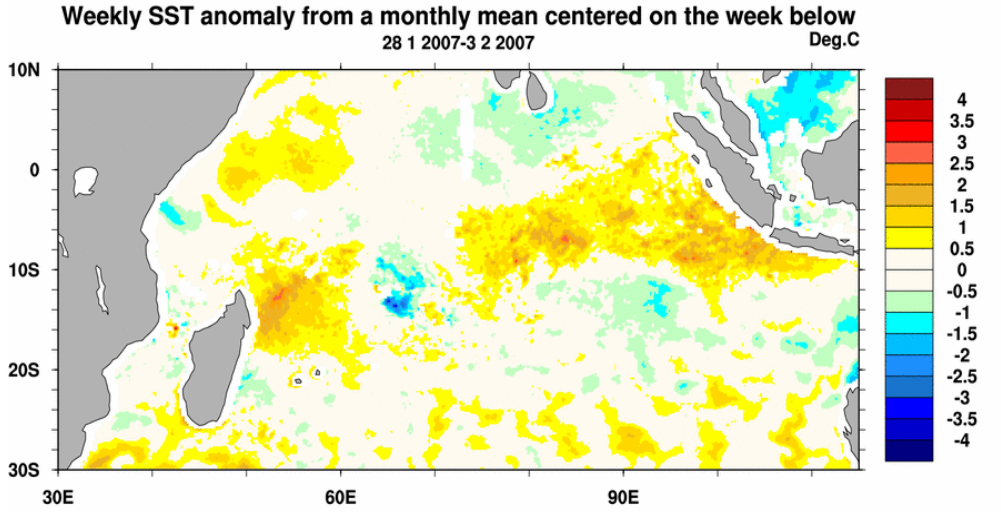
Anomalies in z20 depth for run with

Quikscat wind forcing



NCEP wind forcing

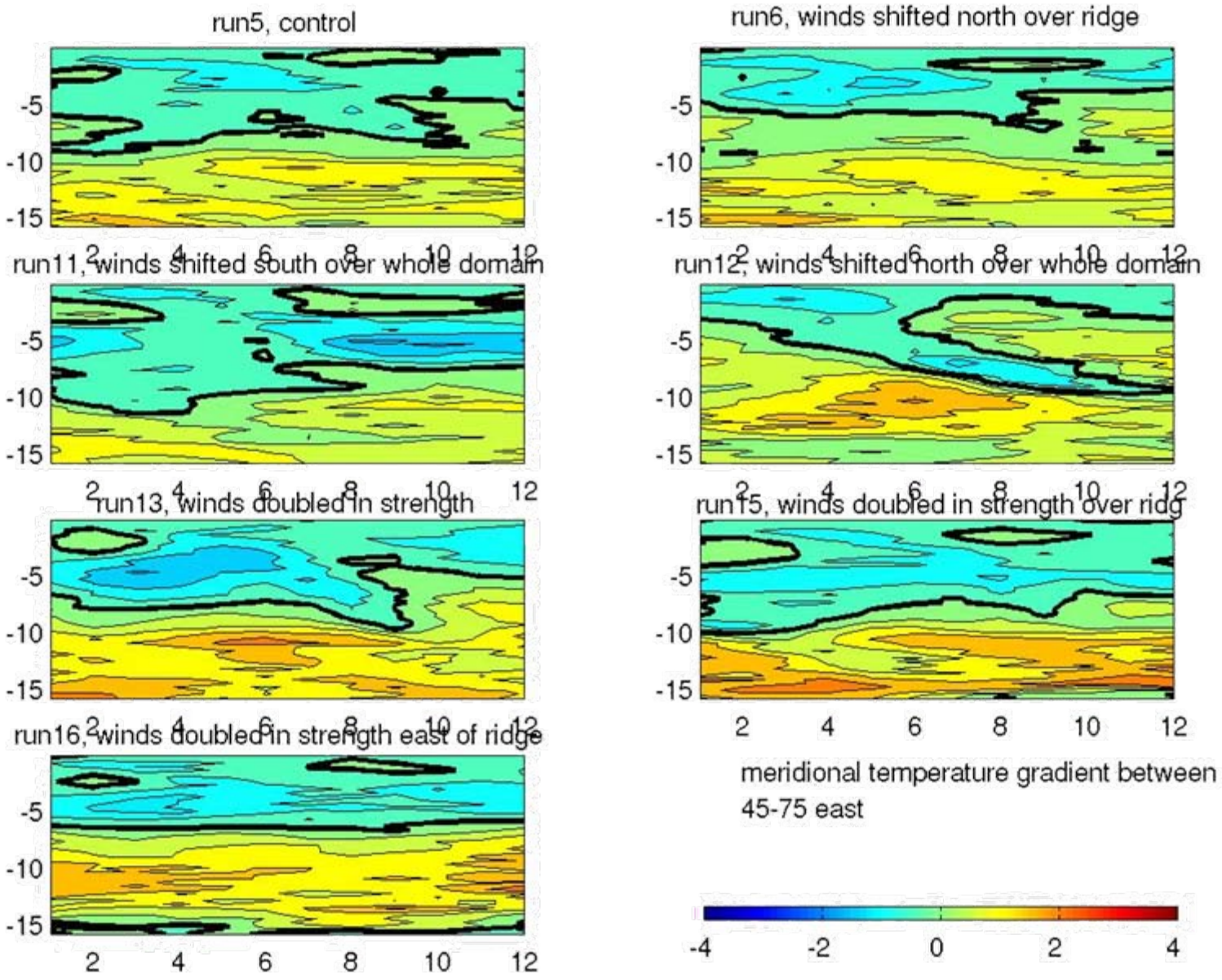




Near real-time monitoring of SSH, SST, winds, rain

http://realtime.sea.uct.ac.za/realtime/indian

Marjolaine Rouault



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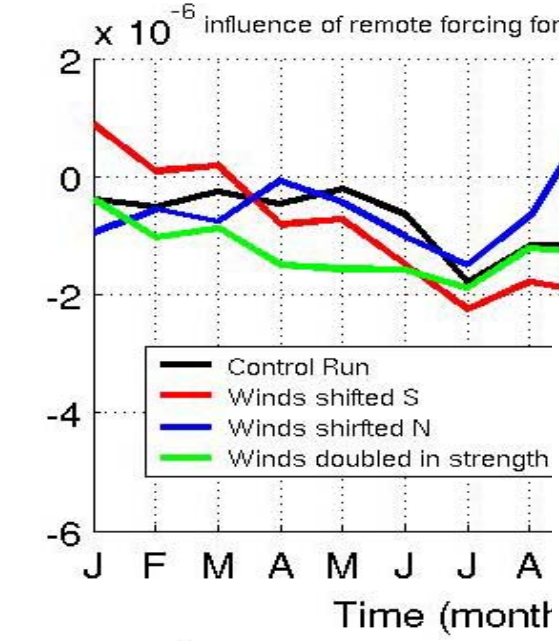

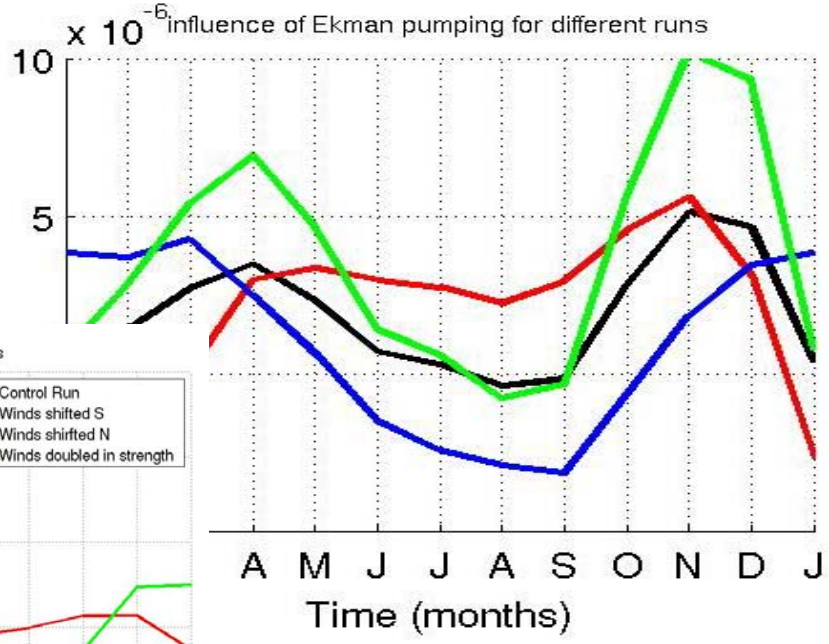

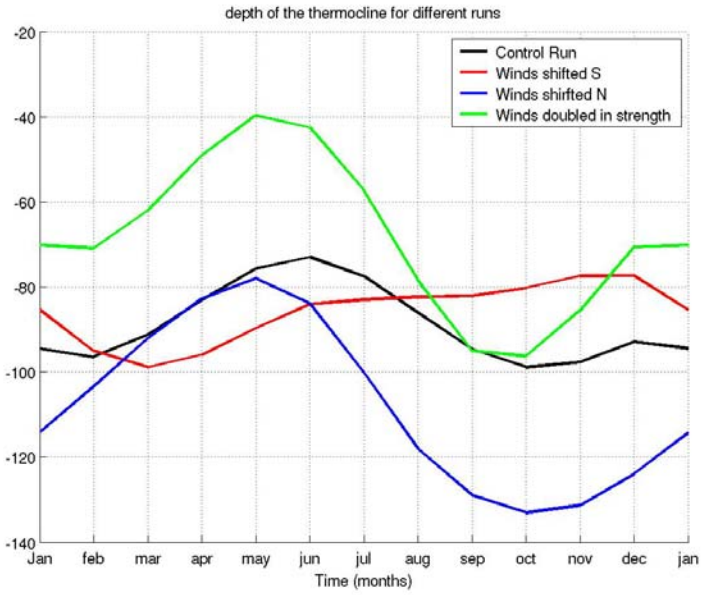

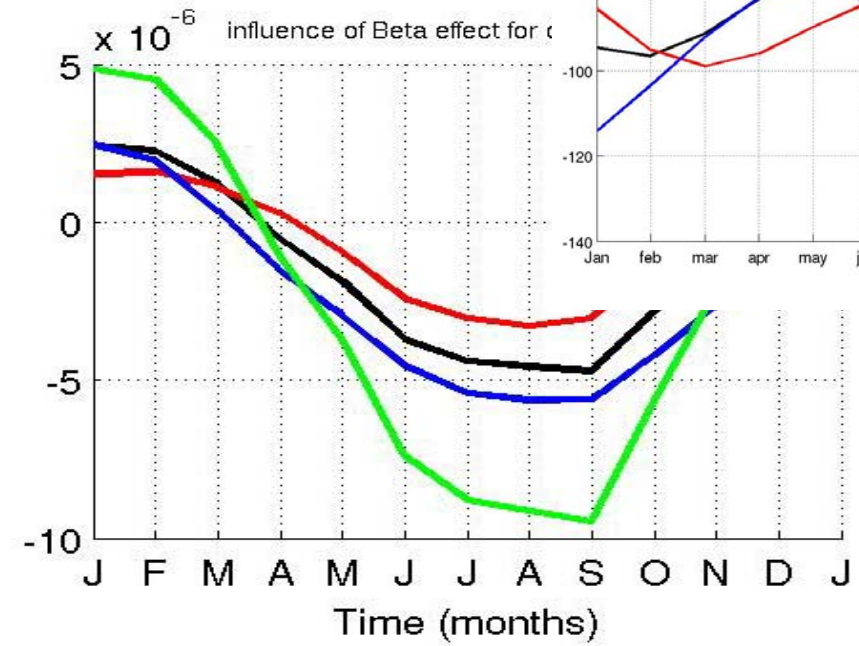

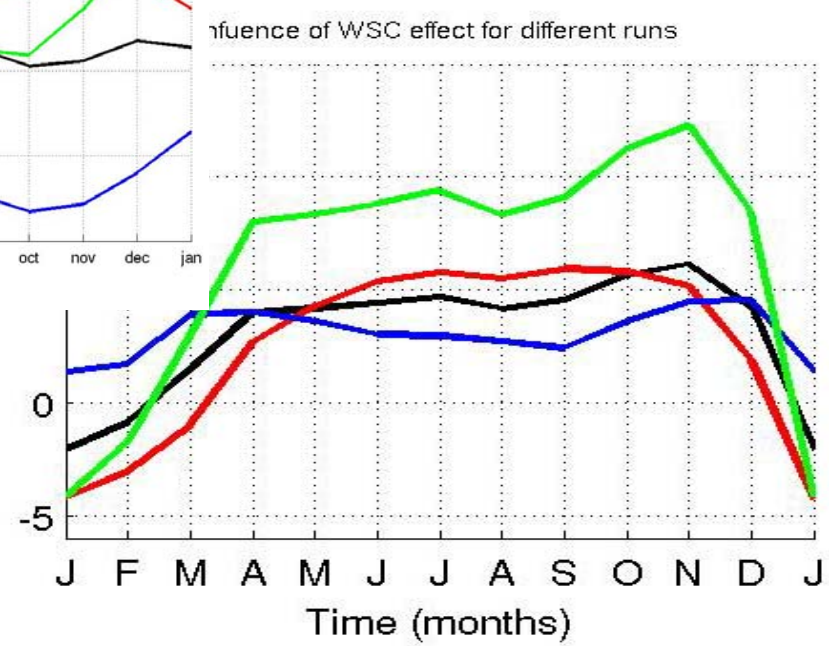

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Summary

- Region of open ocean upwelling in the tropical South Indian Ocean, showed that the term ridge (**Seychelles-Chagos ridge)** was more appropriate than dome. Boundaries approx 5-12S, 50-70E, varies throughout the year
- Ridge straddles a complex region of forcing
- Semi-annual signal in upwelling
- Not simply forced by wind stress curl, combination of WSC and Beta effect (meridional gradient of the Coriolis parameter)
- Impact of remotely forced Rossby waves, modified by local wind, both annually and inter-annually. More complex due to change in speed of Rossby wave with latitude
- Shift in South Indian Ocean high will affect the depth of the thermocline either directly or through impact of remote forcing. This is likely to impact on weather and biology.

Further information:

Hermes J. C. and C. J. C. Reason, **2008**: Annual cycle of the Tropical Indian Ocean (Seychelles-Chagos) thermocline ridge in a regional ocean model. *J. Geophys. Res., doi: 10.1029/2007JC004363.*

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