Baroclinic tides in the Southern Indian Ocean from altimetry

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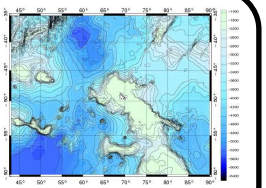
Introduction



Bathymetry of the studied region.

Barotropic tides : indices

The characters of the M_2 barotropic tide have been reviewed to better understand the M_2 baroclinic generation in the southern Indian Ocean.
(a) M_2 energy flux: significant part of tidal energy crosses the northern part of the Kerguelen plateau.
(b) M_2 wave drag dissipation (dissipation of the M_2 barotropic energy trough internal wave generation).
(c) Critical angle : rapport between the angle of characteristics line and the inclination of bathymetry.

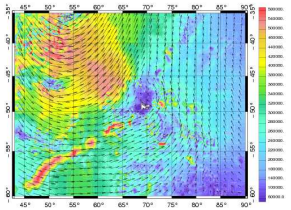
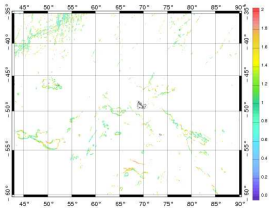
(a)  (b)

Fig of the wave drag dissipation

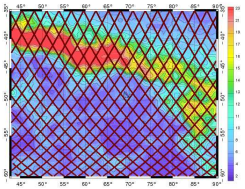
(c) 

Method

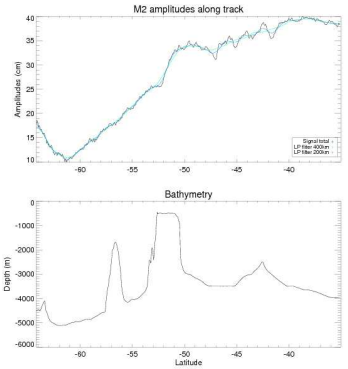
10 years of Topex-Poséidon are used to estimate the M_2 tidal components along each track.
The long wavelength barotropic tides are removed with an along-track filter (cutoff 400 km and less)

Limitation of the method

Time scales of the mesoscale variability of the ACC : **30-90 days**
Aliased period of M_2 : **62.1 days**
→ some of the ACC variability is analyzed as being M_2 tide



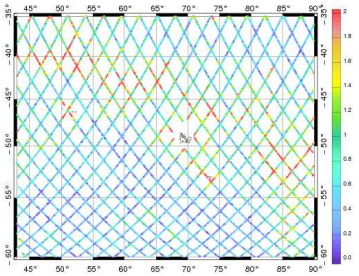
RMS of the SLA over 1992-2006 using AVISO maps.



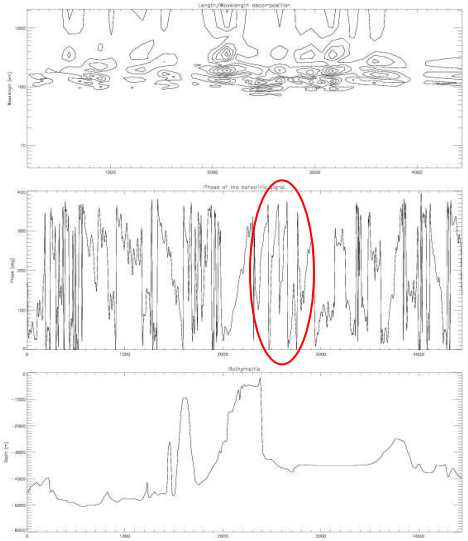
Amplitude of the M_2 barotropic and baroclinic signal before and after low-pass filtering along track 77.

Results

We have computed the residual signal (complex difference of the tidal signal and the filtered signal). It allows us to distinguish regions of large amplitudes :
• along the Kerguelen plateau: internal waves signature
• in the ACC area: mesoscale variability



Amplitudes of residual signal.



Tack 153. Decomposition length/wavelenght of the high-pass filtered signal. Aplitude of the residual signal. Bathymetry.

→ The phase lag of the “residual” tide suggests internal tidal propagation away from the plateau in the North-East direction. The wavelength is coherent with the theoretical first baroclinic mode in this area which is ~90km.

Map of the M2 baroclinic amplitudes along each track
+ comments

Conclusion

Bibliography