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Barotropic zonal jets induced by islands in the southwest Pacific

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The SWP has probably the world's more complex bottom topography, with many ridges and trench associated with numerous islands. Islands can have two effect on the oceanic circulation, there is of course a direct effect of the Island on the current which follow island rule dynamics but, there is also an island effect on the wind who leads to wind stress curl dipole on each tips of Islands, this dipole may also contribute to Jets formations (Kessler and Gourdeau 2006). Assuming that atmospheric Island effect is including in the wind data used, this paper focus only on blocking effect and associated zonal jets located on northern and southern tips of major Coral Sea islands as Fiji, Vanuatu and more particularly New Caledonia.

We employed a modeling approach starting with a low resolution linear flat bottom model to compare with the Sverdrup Circulation up to a full dynamics high resolution model of the SWP where we observed a global northward shift of the circulation leading to the disappearance of the South Caledonian Jet. We will show that there is a major driving effect of bottom topography associated to the slope-related stretching effect, which has so far been neglected. We will also demonstrate the role of non-linearities on the circulation and rectification of the zonal jets.

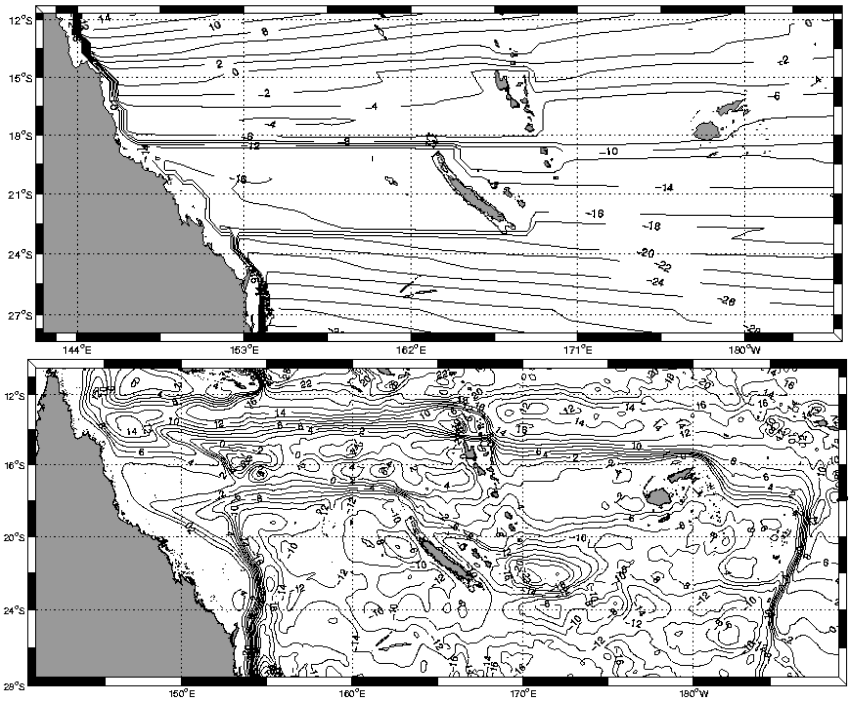

Figure: top) Sverdrup Streamfunctions (Sv) with island rule [Godfrey 1989, Wajcowizck 1993] on Fiji, Vanuatu, New Caledonia and Austra1ia computed with Quickscat scatterometter windstress. Bottom) Barotropic streamfunction from the Roms model on a 1/12° grid including non-linearity and realistic bottom topography. The presence of realistic bottom topography induces a global northward shift of the circulation.

(For more details, see : J. Phys.oceanogr., 38, 2185-2204, 2008.)