ORIGIN AND FATE OF SURFACE DRIFT IN THE CONVERGENCE ZONES OF THE SUBTROPICAL PACIFIC OCEAN

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Motivations & methodology

- The methodology is based on a source and target sections to intercept the journey of real and numerical particles.
- Lagrangian tool is ARIANE (http://www.univ-brest.fr/ops/ariane).
- The coordinates of the convergence zones are given by the definition of the main subtropical collection areas determined by Maximenko et al. [2012]
- Surface currents are provided by three different ocean models (2007-2010), the latter are operating in curvilinear mode:
  - NEMO DRAKAR (1/4°)
  - HYCOM (1/12°)
  - NLM (1/12°)

**ORIGIN**

The geometric of the transfers is diagnosed following Blanke et al. [1999], first recording the passage of each particle and summing algebraically its weight at each velocity point of the grid, then deriving a Lagrangian stream function of the resulting non-divergent two-dimensional transport field. For a given contour interval, the number of contours is directly related to the intensity of the connection toward consideration.

- For the convergence (left), we note that there is a direct transfer from the low latitudes in NLM, whereas the equivalent connection in HYCOM and NEMO appears more as an anticyclonic circulation on the scale of the domain with a limited contribution from the western side of the Southern Ocean. Variations in amplitude reflect the fact that the response of each model to the wind stress is a key element to consider.

**FATE**

For the convergence (left), computations are made in a forward mode, and our attempts with NEMO could not diagnose any connection to the outer edge of the domain, meaning that all the particles recirculate toward the central box within the three years of integration (see the cartoons on top-right).

Interestingly, the Lagrangian integrations made with NLM and HYCOM show very different behaviors, with the connection of particles toward the remote convergence zones in both hemispheres. The NLM velocity field connects mostly the central box to the east of the domain, i.e., the vicinity of the American continent. The intensity of the connection is small in the North Pacific (it amounts to about 6% of the convergence diagnosed in the backward calculations), with a minor secondary southward export. In the South Pacific, the connection is almost exclusively an eastward pathway from the central convergence zone toward the continent and now amounts to 3% of the remote supply by convergence.

The origin of the NEMO and HYCOM pathways are quite different. NEMO and HYCOM are both used in an ocean drifter study, where the trajectories of drifters are used to study the flow dynamics and the impact of the convergence on the drifters. HYCOM is a global model, while NEMO is a regional model. The HYCOM model is used to study the flow in the South Pacific, while NEMO is used to study the flow in the North Pacific.

**Perspectives**

- Study the impact of high resolution ocean models for the origin and, more importantly, the fate of particles within the subtropical gyre convergence.
- Increase our knowledge of the main features of the subtropical convergence zones.
- Apply our approach to the contamination of the marine environment by plastic litter.