Altimetric lagrangian advection to reconstruct fine scale tracer fields in the Pacific Ocean

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Lagrangian lateral advection with altimetric geostrophic velocities can be used to stir large scale tracer fields at the ocean surface, and reconstruct mesoscale fronts and eddies. Dencausse et al., (2013) have tested this technique in the energetic Southern Ocean region south of Tasmania. Here we apply and evaluate the technique's performance in the tropical and subtropical Pacific Ocean.

Data and methods

**Technique**: passive horizontal stirring of tracer fields with altimetric velocities.
- Initial fields: large scale tracer fields interpolated on high resolution grid
- Lagrangian calculation of particle trajectories (D'Ovidio et al)
- Passive horizontal stirring

**Data**: 
- SSS and SST Coriolis derived from an objective analysis of in-situ data for large scale tracer fields (http://www.corislis.eu.org).
- Altimetric geostrophic speed from AVISO (http://www.aviso.oceanobs.com/duaic/) to compute Lagrangian advection.

**Filtrage**: 25km

**Advection time**: ~14 days

**Optimal parameters** for this region: Optimal advection time to best represent the finer scales: ~2 weeks in the Southern Ocean region south of Tasmania. What is the optimal advection time in the subtropical Pacific ocean?

Pacific results: 1-way or 2-way advection?

Does the 1-way or 2-way advection work best?

Limitsations: 
1) Tracer bias: depends of accuracy of initial conditions
2) Advection bias: passive stirring can introduce bias due to missing physics (air-sea fluxes, mixing...)

Reduce advection bias with backward-forward method with a spatial filtrage

**First results in the south of Tasmania** are promising. Dencausse et al (in press)

**Dencausse et al. (2013)**: optimal advection time to best represent the finer scales: ~2 weeks in the Southern Ocean region south of Tasmania. What is the optimal advection time in the subtropical Pacific ocean?

The backward – forward method is not very conclusive for this kind of comparison. However, the filtering window used (that Dencausse et al. (in press) found most suitable for the region south of Tasmania) can be changed because the dynamics of the region is different.

**Conclusion and perspectives**

The backward – forward method seems to decrease seasonal biases and the value of the bias.

Optimal advection time here seems to be 7 days with this comparison.

**Results south of Tasmania**

Mean bias reduced by a factor of ~ 10 with the backward – forward method

Optimal parameters for this region:
Advection time : ~14 days
Filtrage : 25km

**Results subtropical Pacific Ocean**

Reduction of seasonal bias with the backward – forward method.
Optimal parameters for this region are not yet refined. Tropical and subtropical Pacific regions have a different dynamic.

More investigation and improvement needed.

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