On the inversion of submesoscale information to correct mesoscale velocity

March 1, 2011

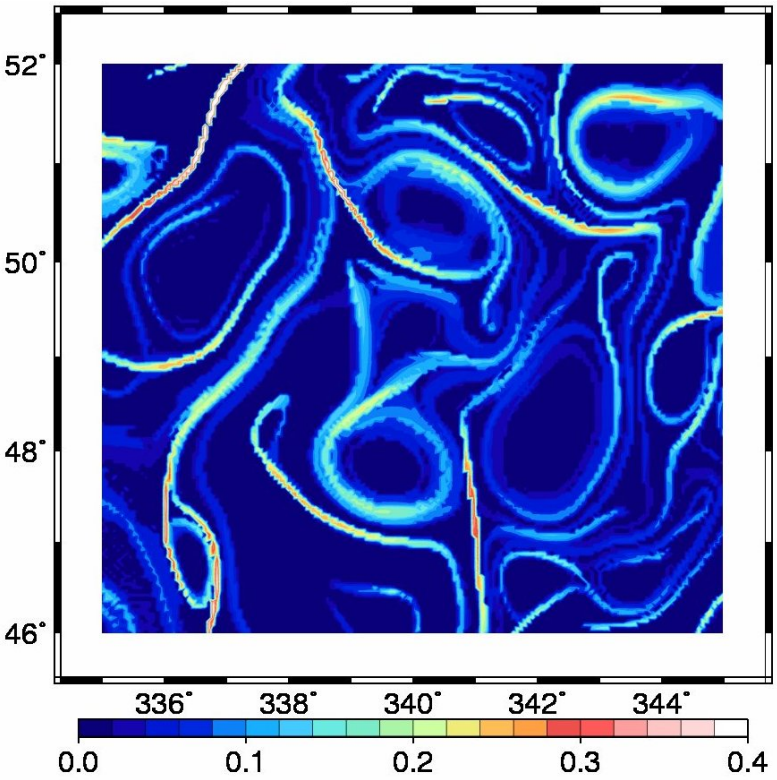
Outline

The objective is to explore the feasability of using tracer information at the sub-mesoscale to controle ocean dynamic fields

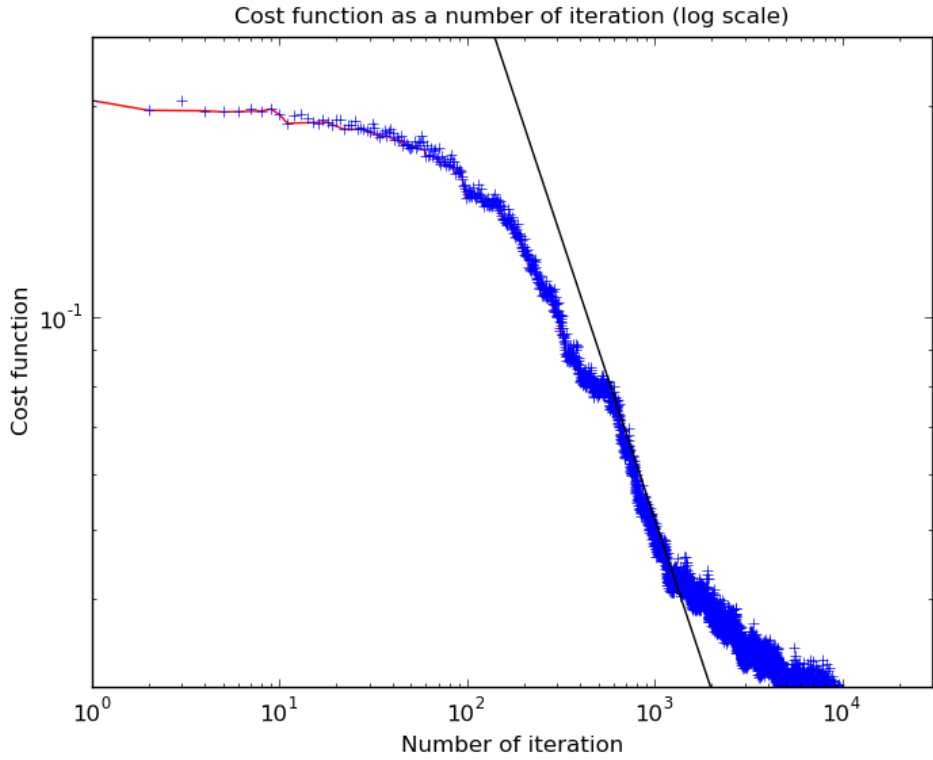
- Use of Lyapunov exponents as a proxy to compare velocity fields and Chlorophyll or Sea Surface Temperature images
- Inversion of submesoscale FSLE images to mesoscale velocity
- Comparison of FSLE and Chlorophyll or SST patterns (d'Ovidio et al, 2004)
- In progress : Inversion of submesoscale SST images to mesoscale velocity

Velocity fields: Aviso altimeter Data
Tracer images: SST and Chlorphyll from MODIS captor

Previsous results: Pomme area

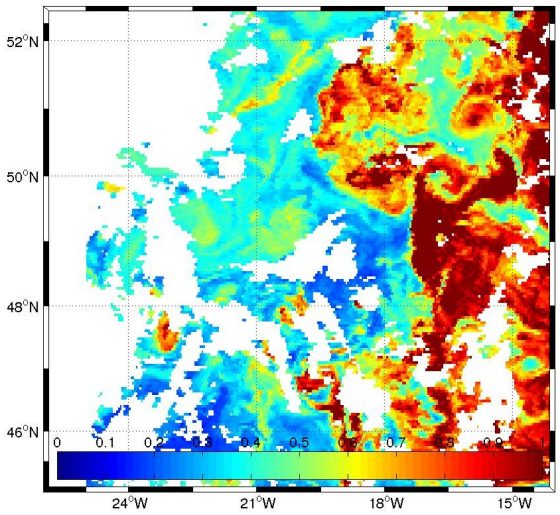


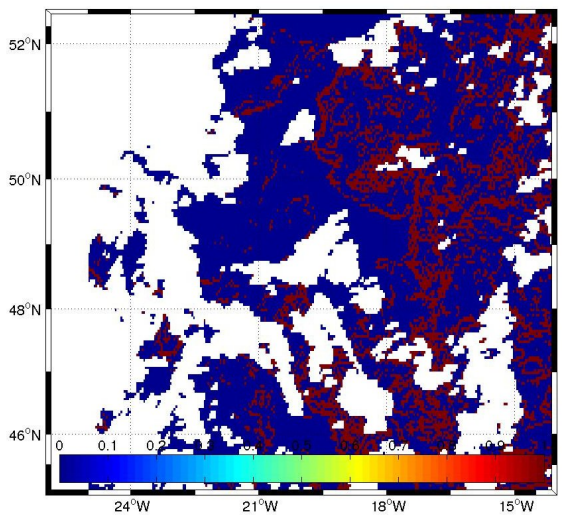
FSLE, Pomme area, January 09, 2002



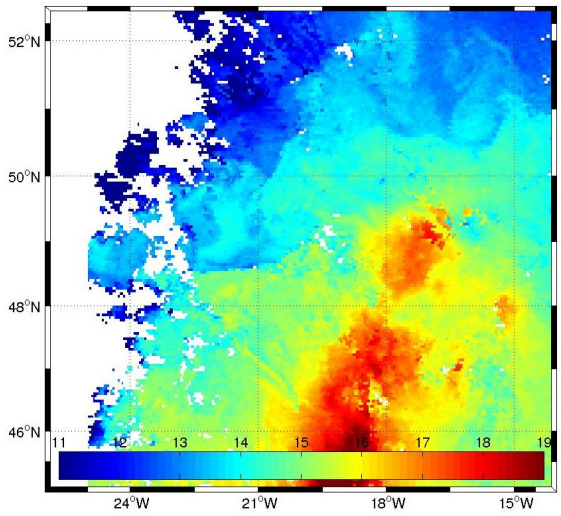
Cost function as a function of Iteration, Pomme area, January 09, 2002

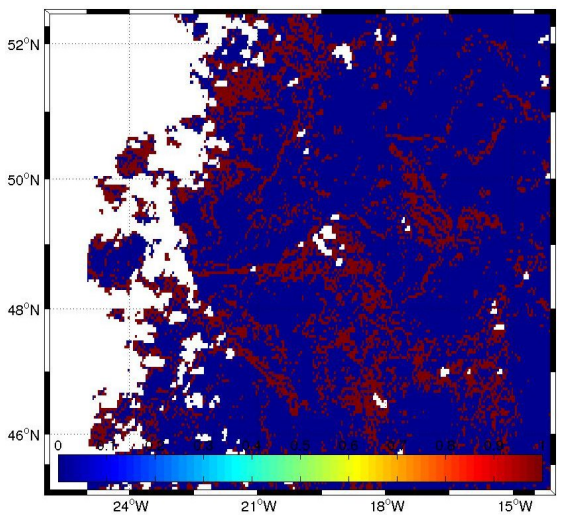
Previous results: Pomme area





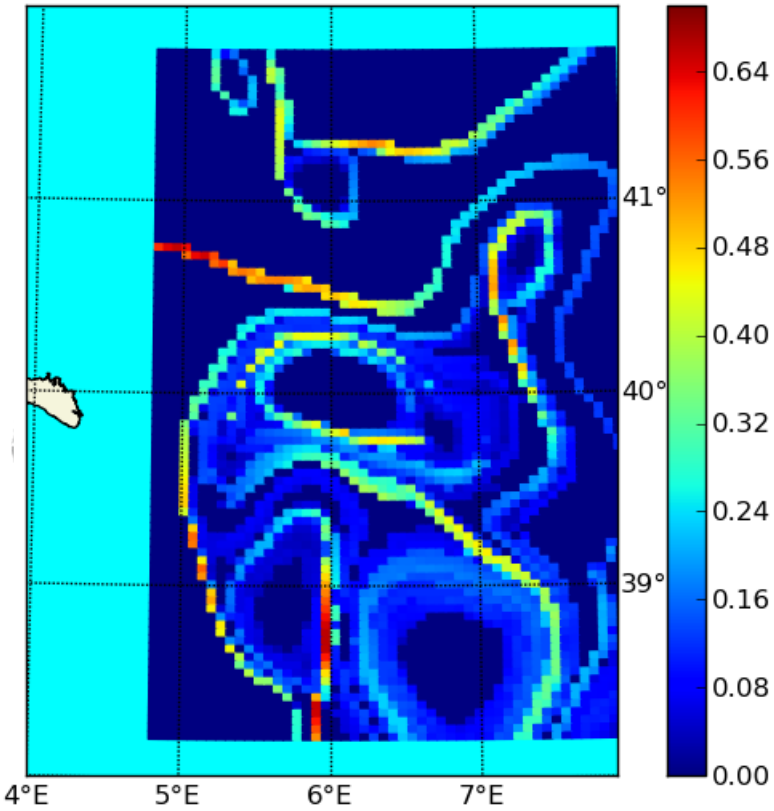
Binarized chlorophyll gradient from Modis captor, June 03, 2007



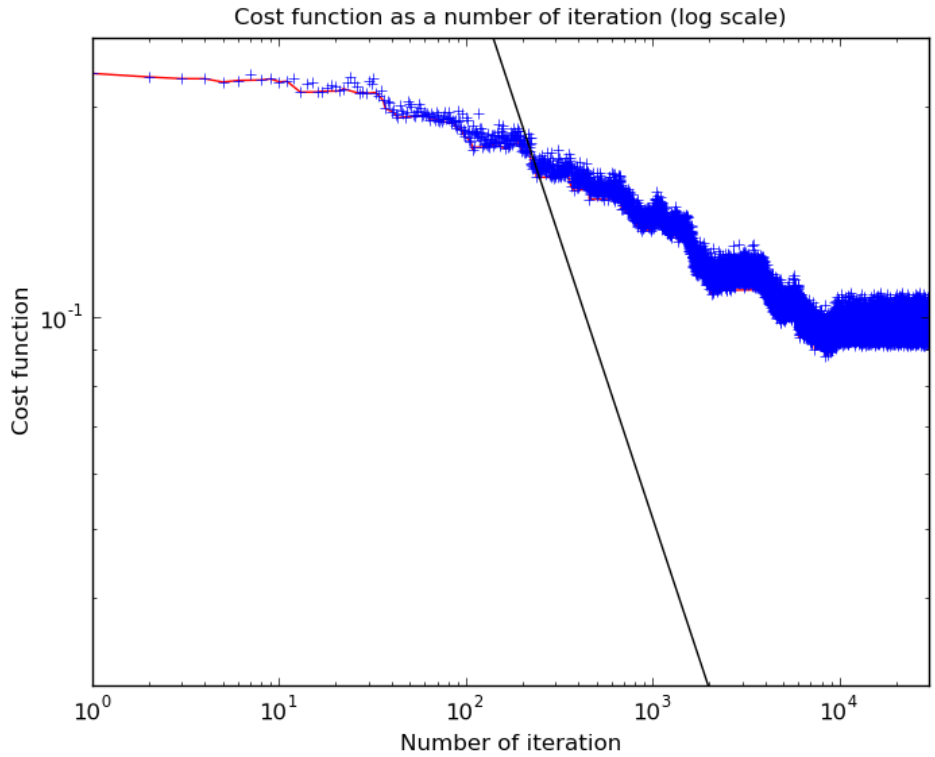


Binarized SST gradient from Modis captor, June 03, 2007

Previous results: Mediterranean area



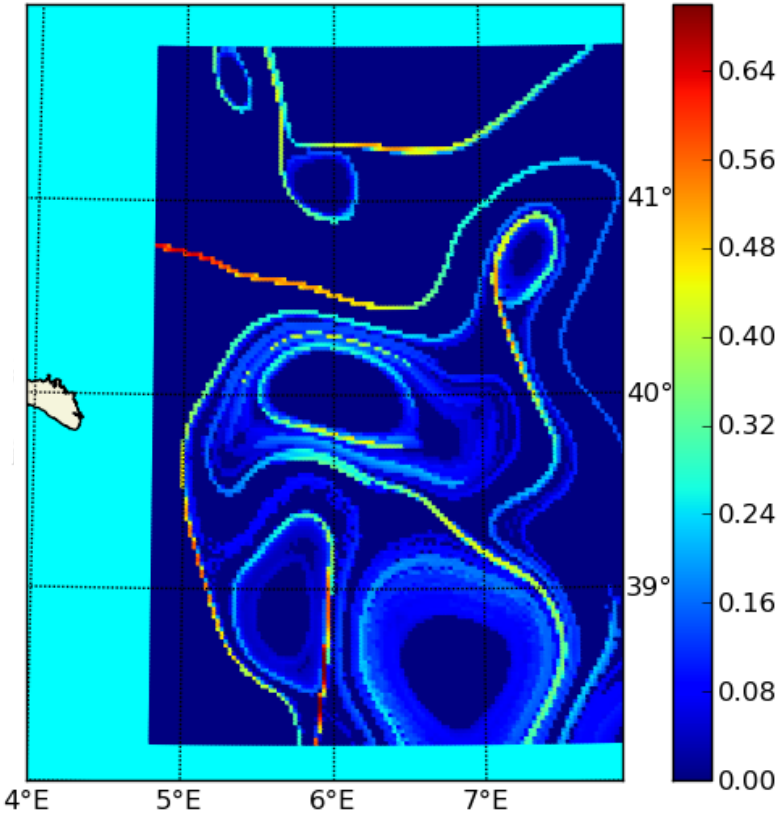
FSLE, Mediterranean Sea, small area, August 14, 2002



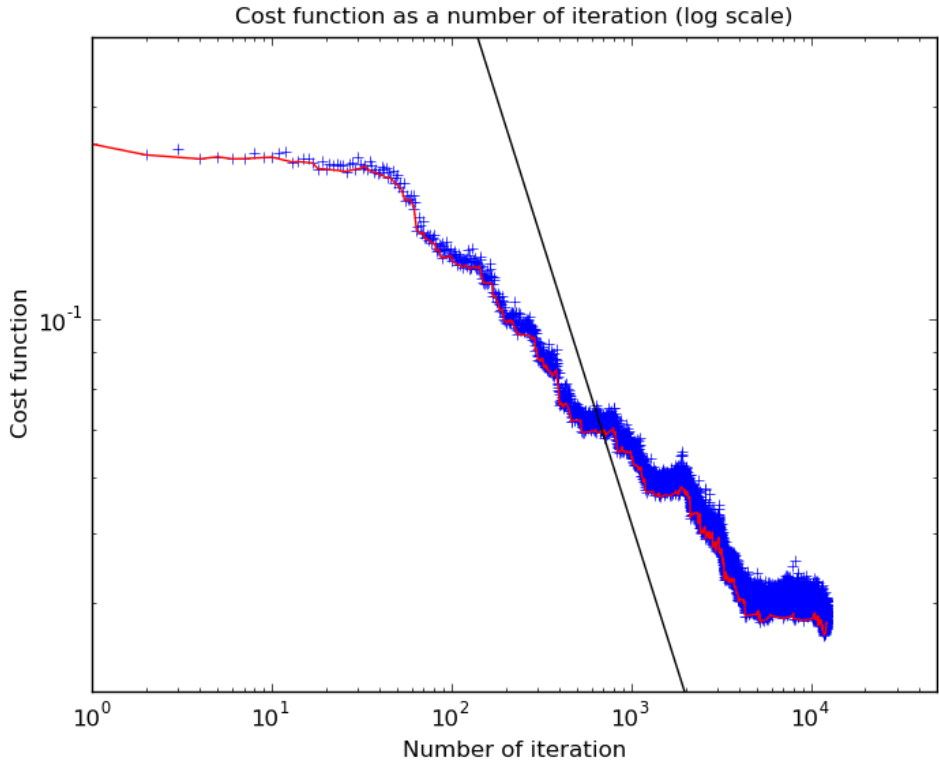
Cost function as a function of number of iteration, T=200, neof=075

Problems when minimizing the cost function

Resolution of FSLE divided by two in Mediterranean area



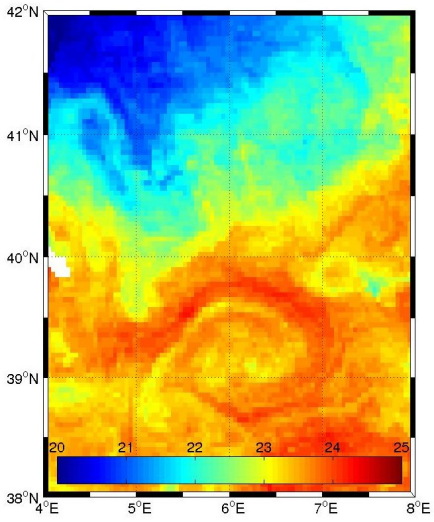
FSLE, Mediterranean Sea, small area, August 14, 2002

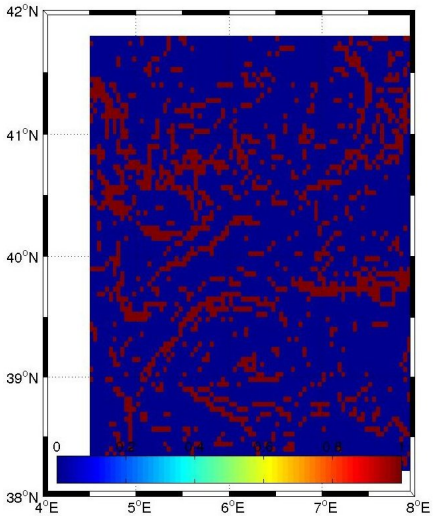


Cost function as a function of number of iteration, T=200, neof=075

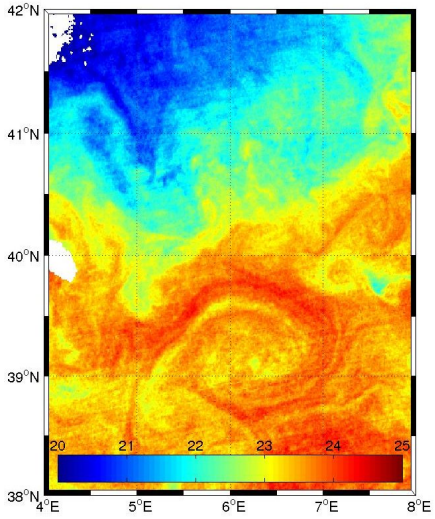
Problems when minimizing the cost function

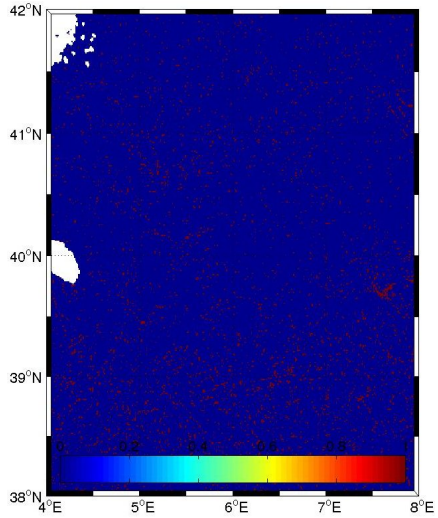
Previous results: SST in Mediterranean area from MODIS





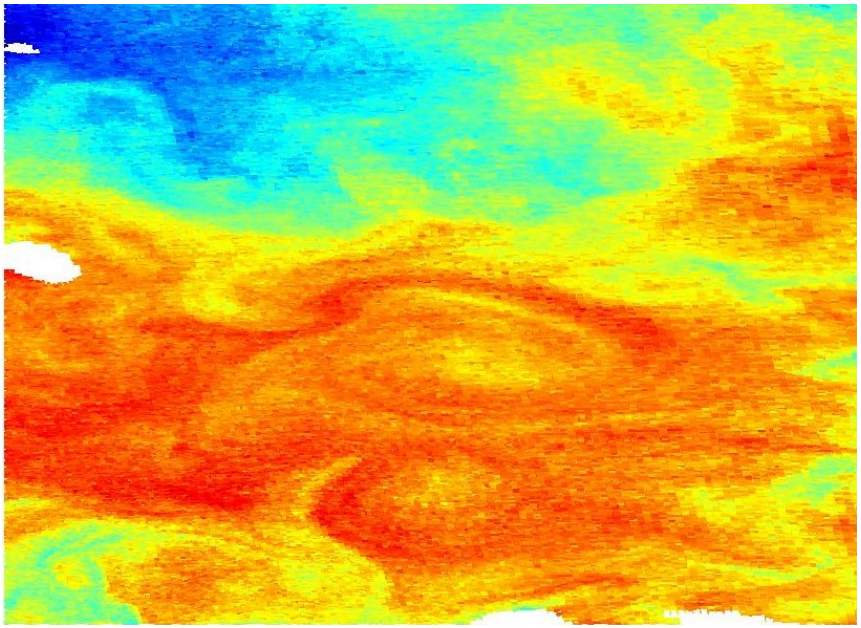
Low Resolution



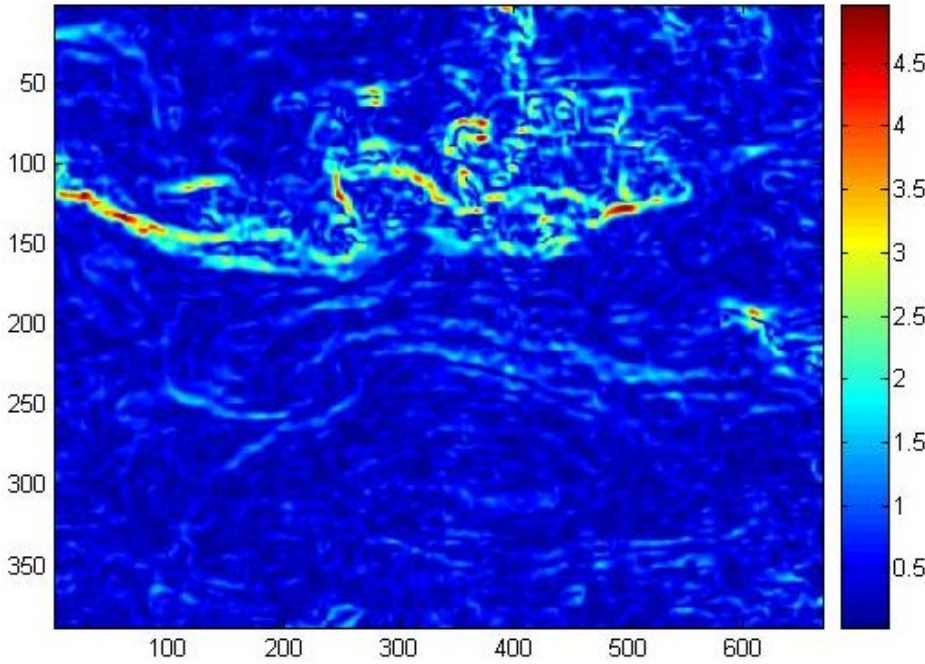


High Resolution

Tests from Didier Auroux



SST in Mediterranean area

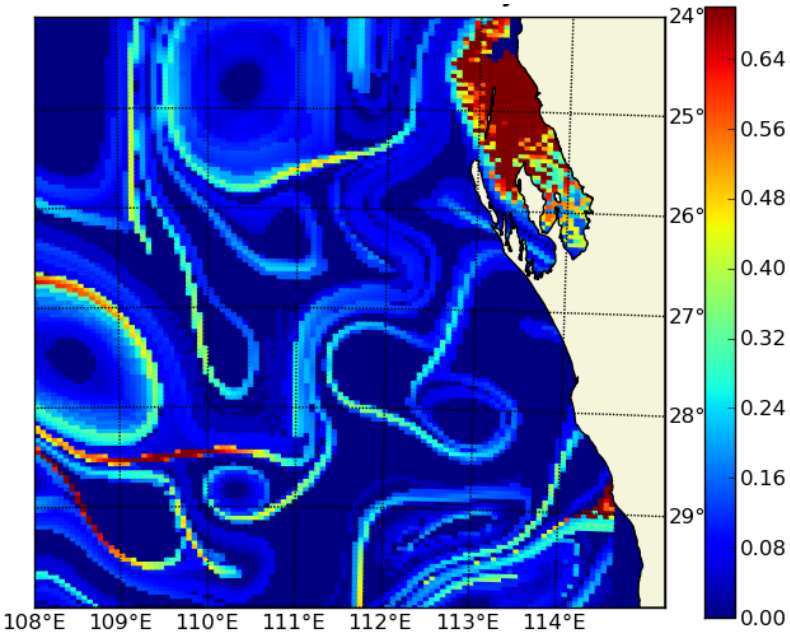


Test from Didier Auroux

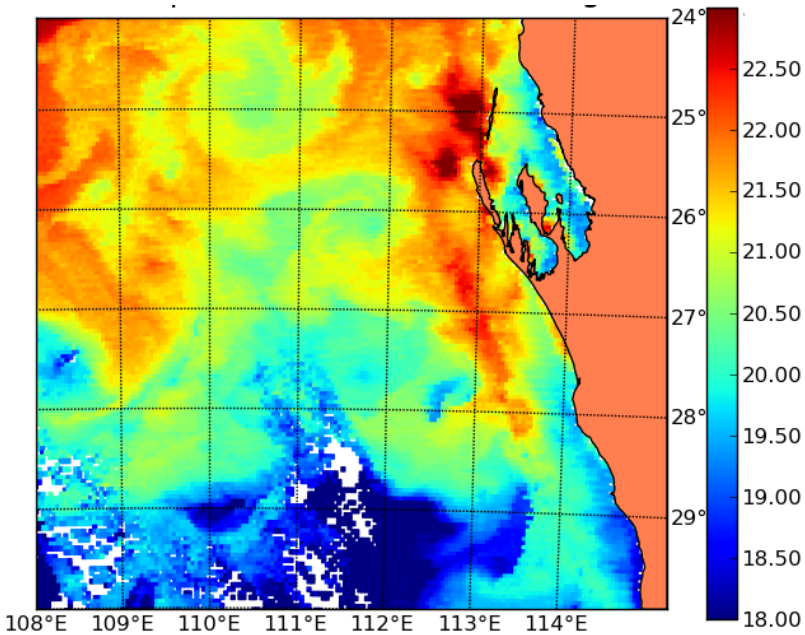
Previous difficulties

- FSLE are not accurate near the coast
- Find the simulating annealing factors that make the minimization of the cost function possible
- Find an area with few clouds, presence of passive tracers and mesosale stirring
- Structures highlights by binarization not continuous

Leeuwin Current



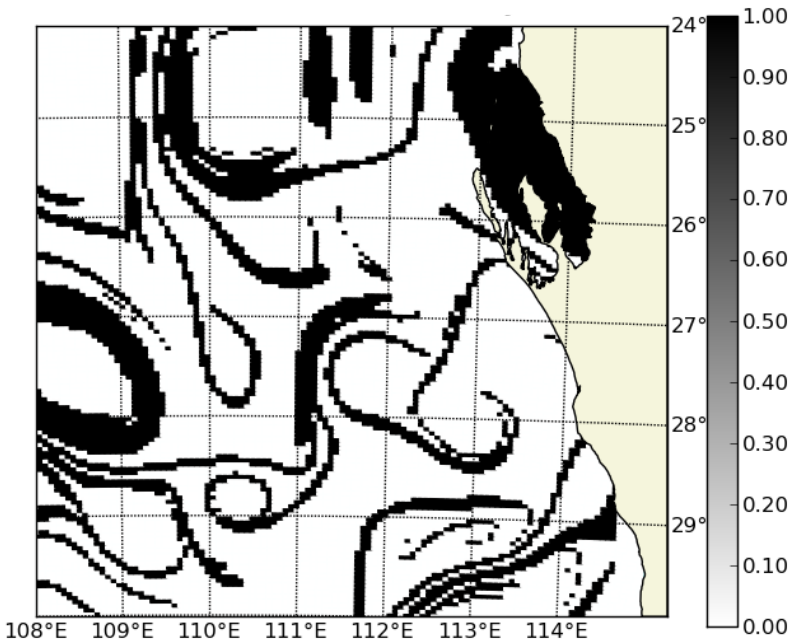
FSLE, Leeuwin Current



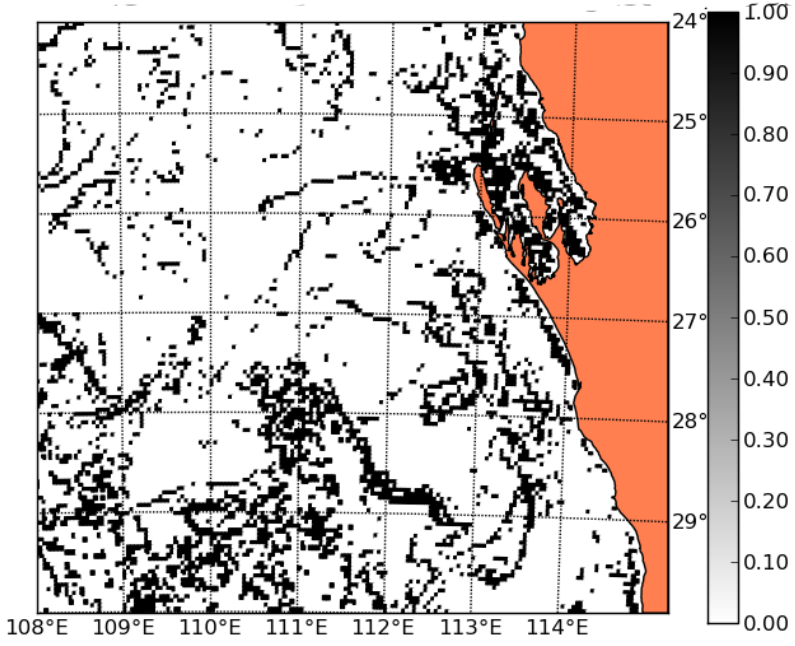
SST, Leeuwin Current

Mesoscale structures visible, no submesoscale activity found in the litterature
Unaccurate in the vicinity of the coast

Leeuwin Current



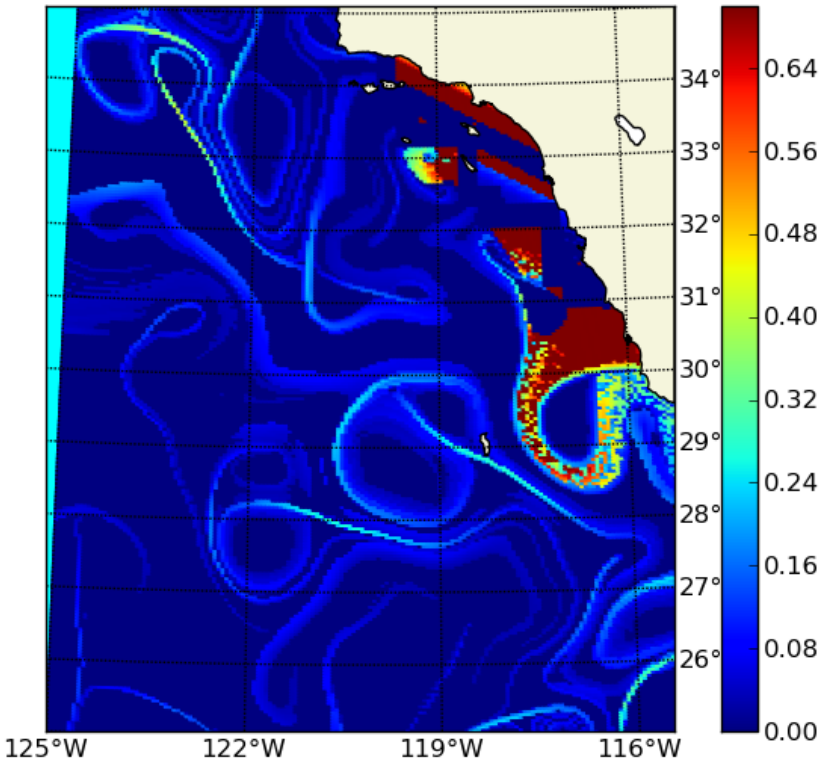
Binarized FSLE, Leeuwin Current



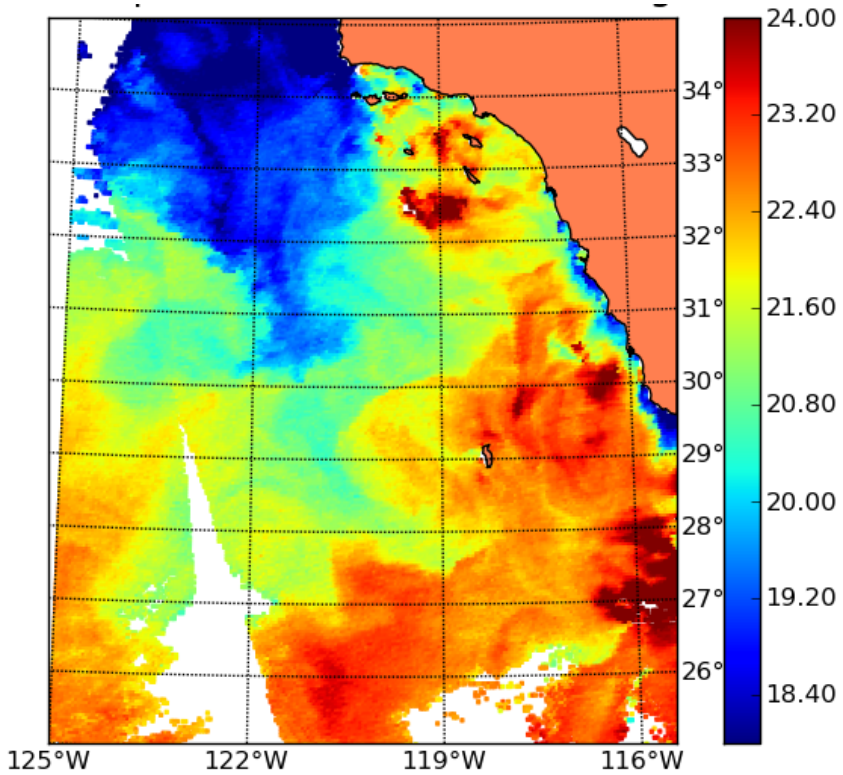
Binarized SST, Leeuwin Current

Mesoscale structures visible, no submesoscale activy found in the litterature
Difficulty with the vicinity of the coast

Californian Current



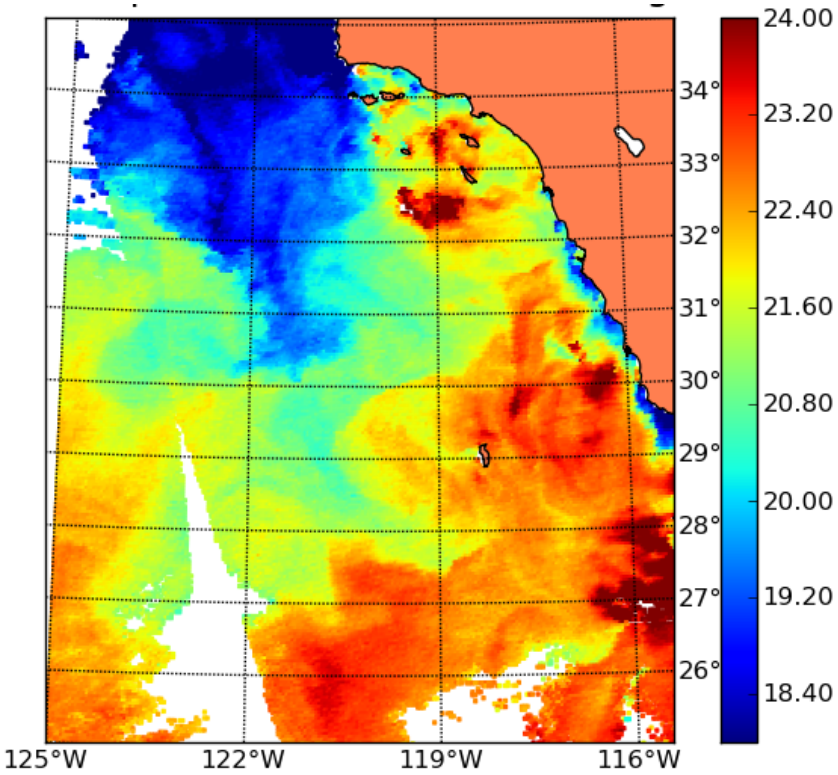
FSLE, Californian Current



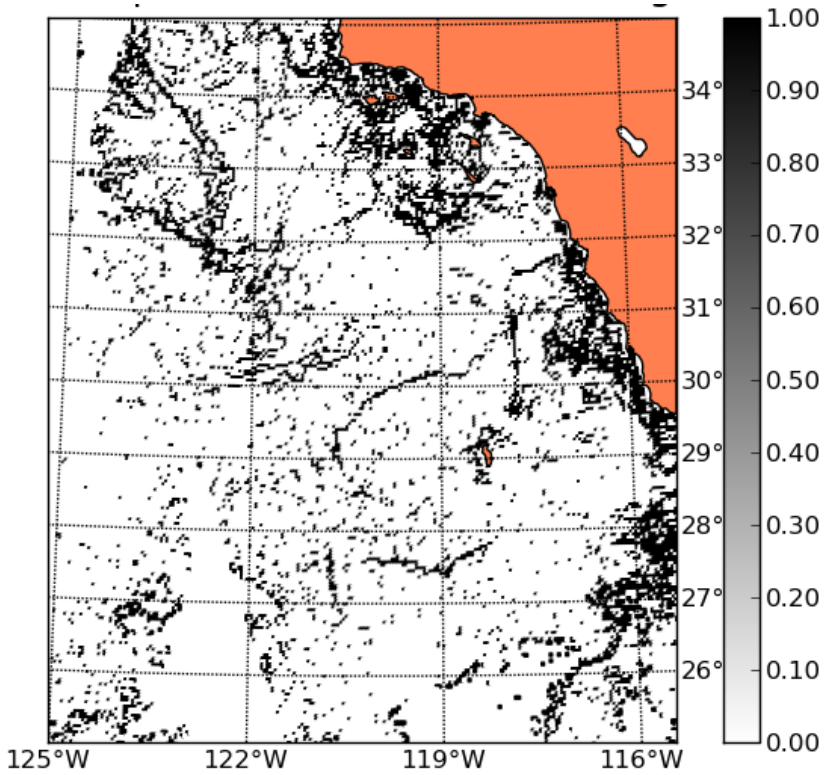
SST, Californian Current

Coastal current, the filaments are too close to the coast.

Californian Current

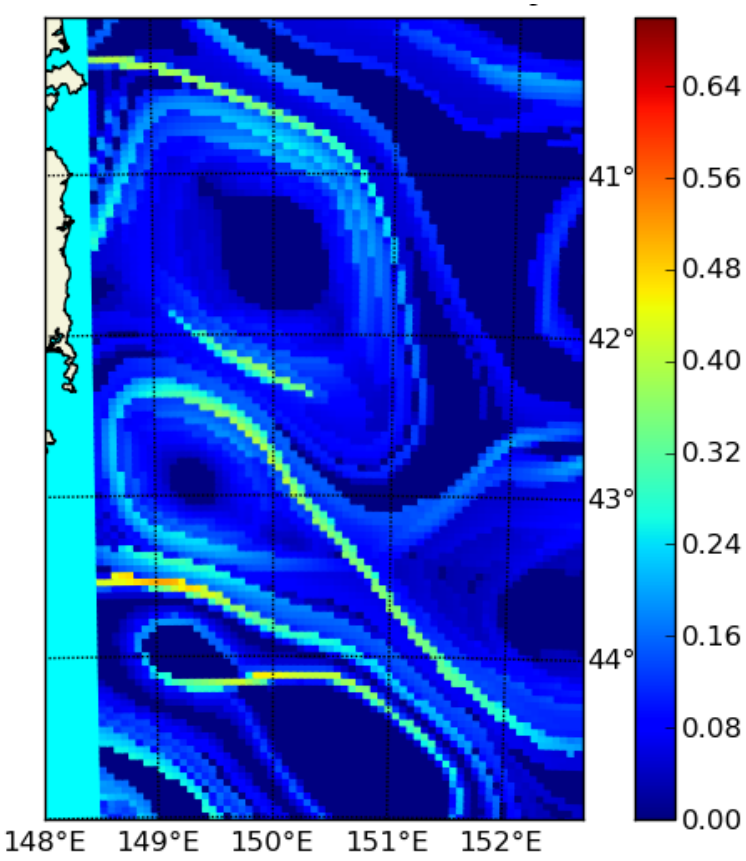


SST, Californian Current

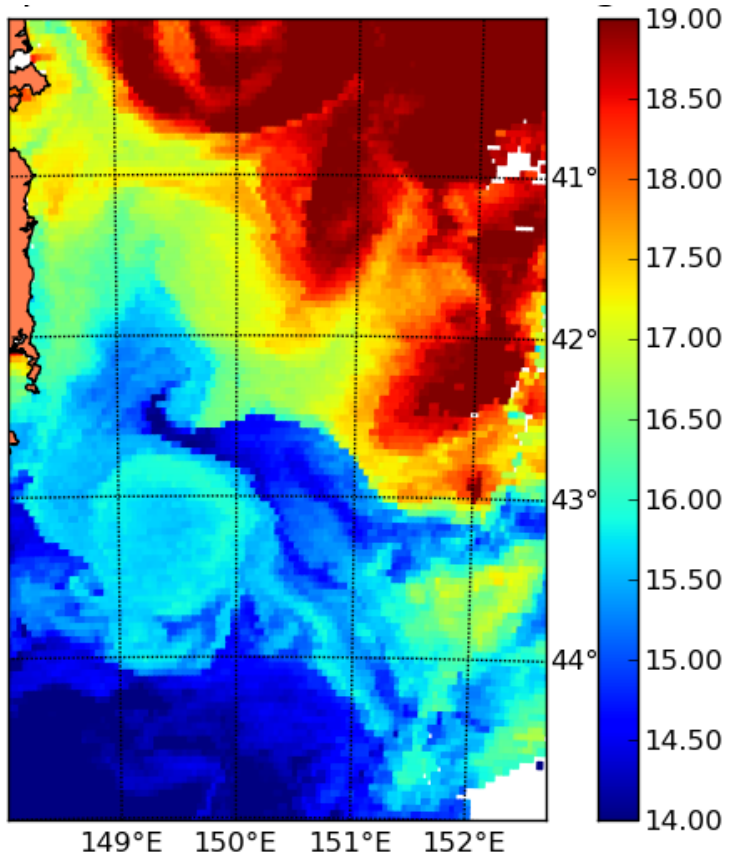


SST, Californian Current

South Atlantic, East of Tasmania

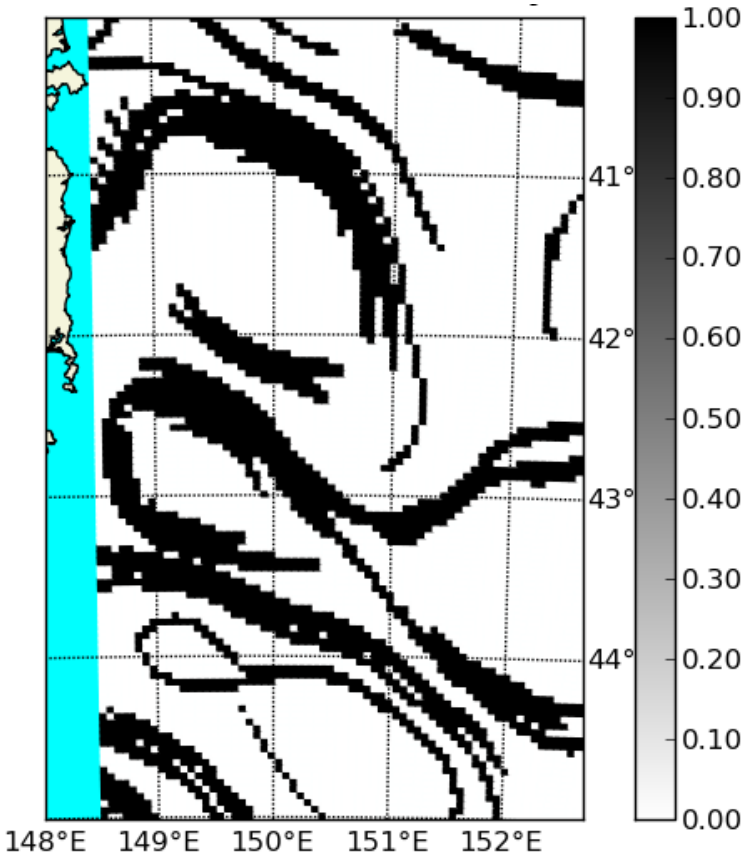


FSLE, South Pacific

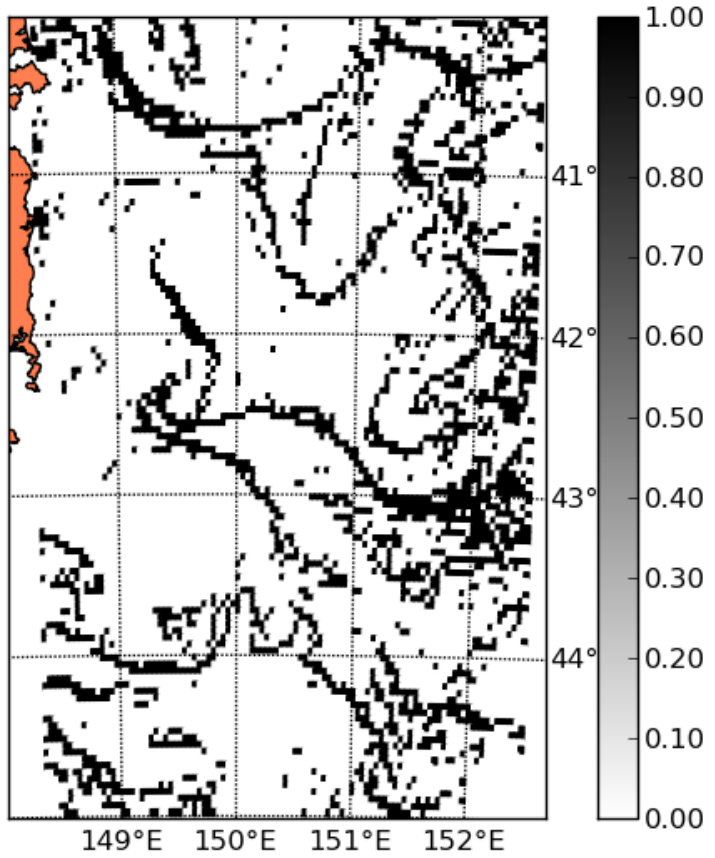


SST, South Pacific

South Pacific, East of Tasmania

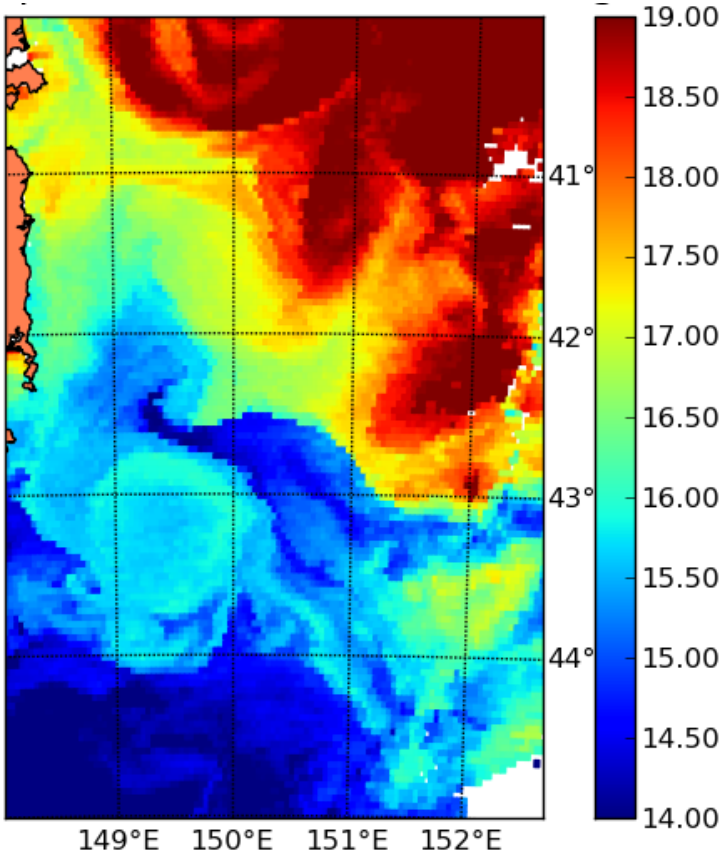


FSLE, South Pacific

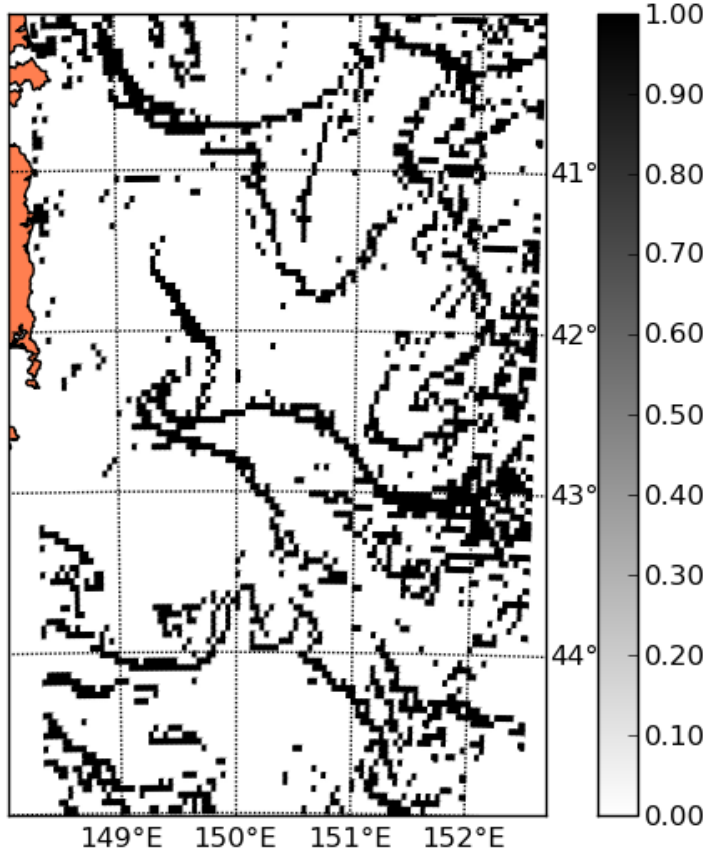


SST, South Pacific

South Atlantic, East of Tasmania

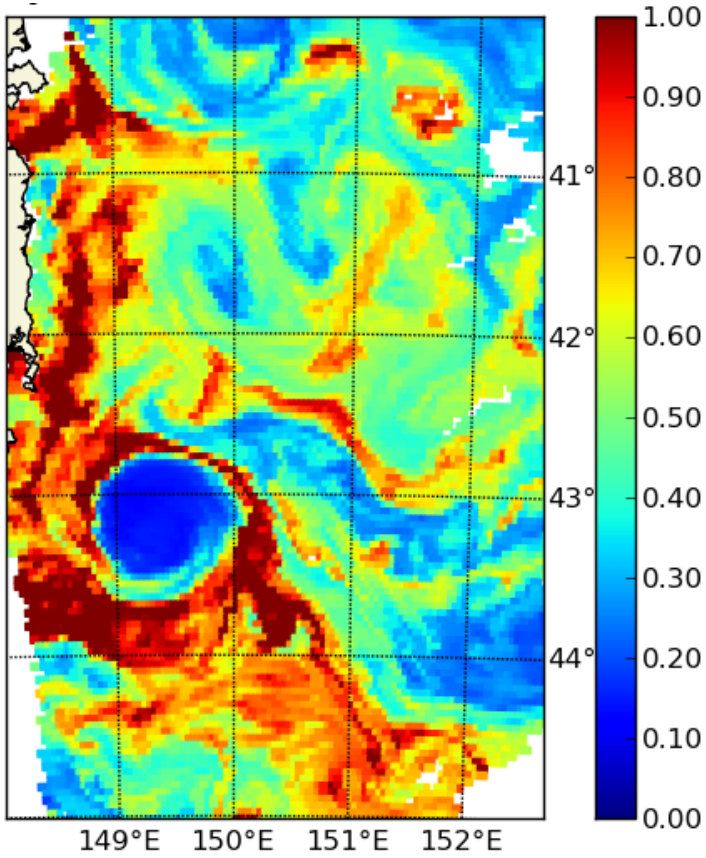


SST, South Pacific

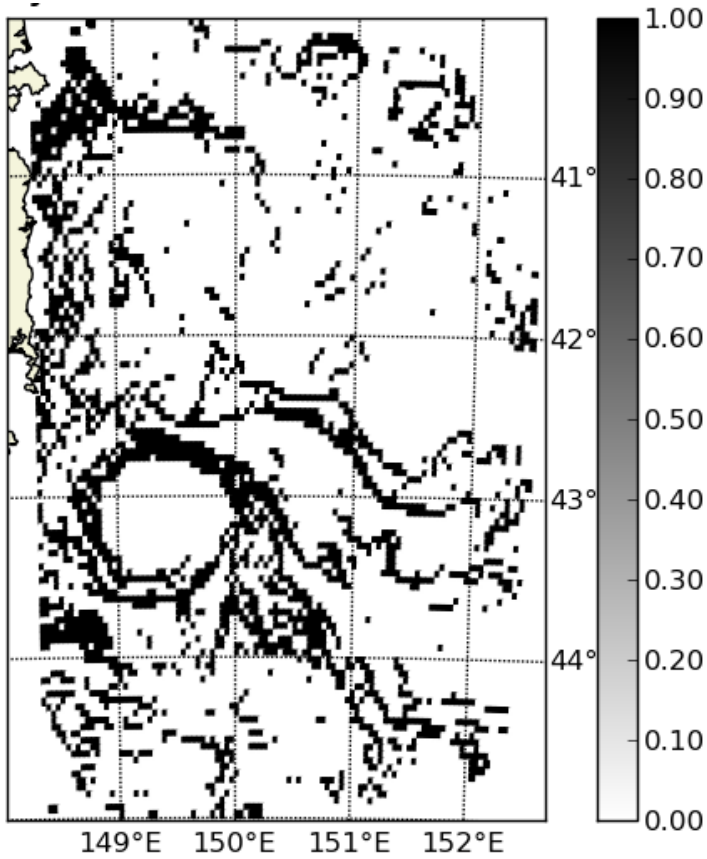


SST, South Pacific

South Atlantic, East of Tasmania

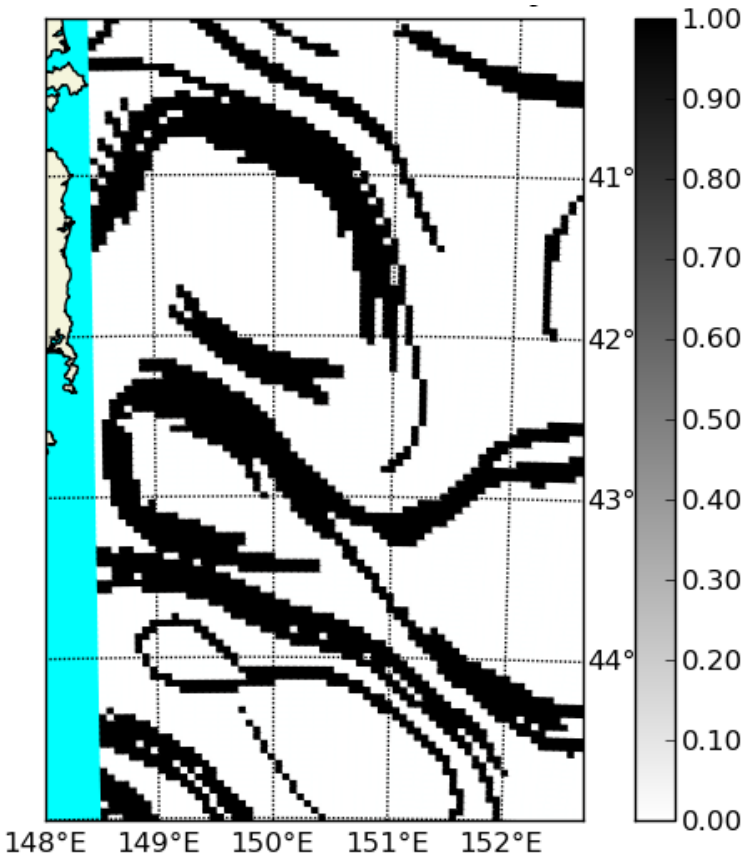


Chlorophyll, South Pacific

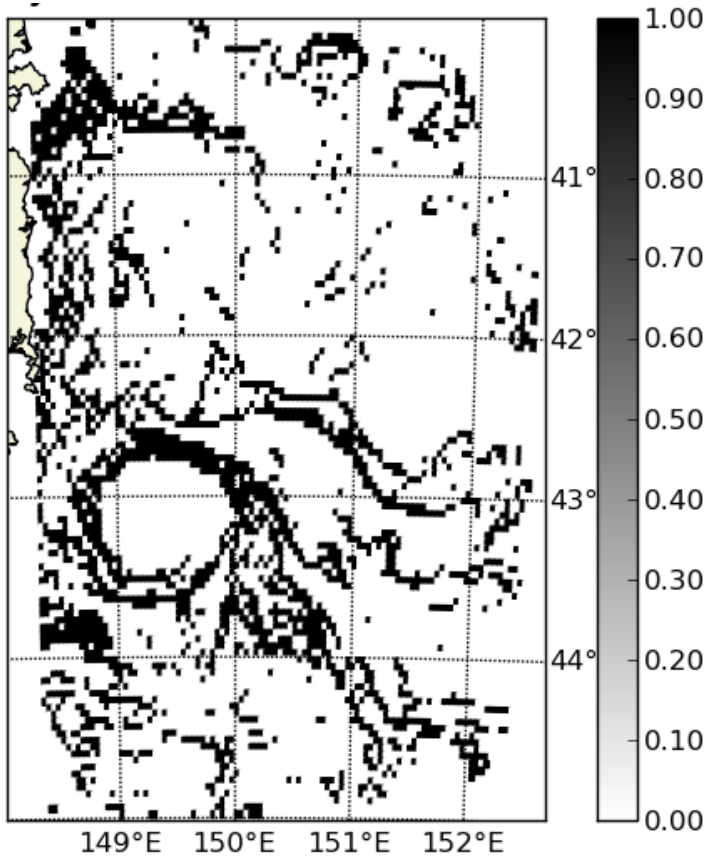


Chlorophyll, South Pacific

South Pacific, East of Tasmania

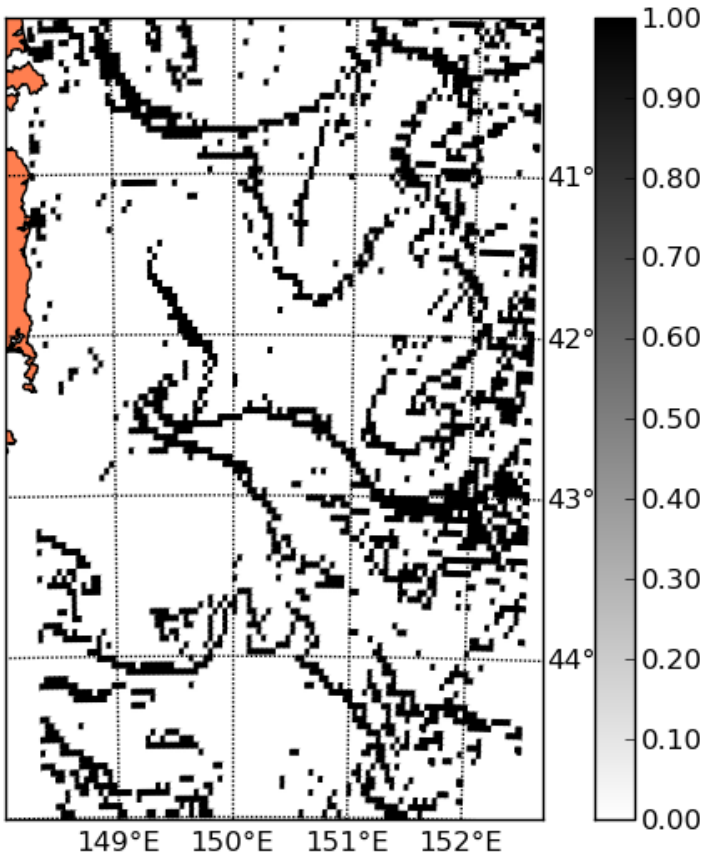


FSLE, South Pacific

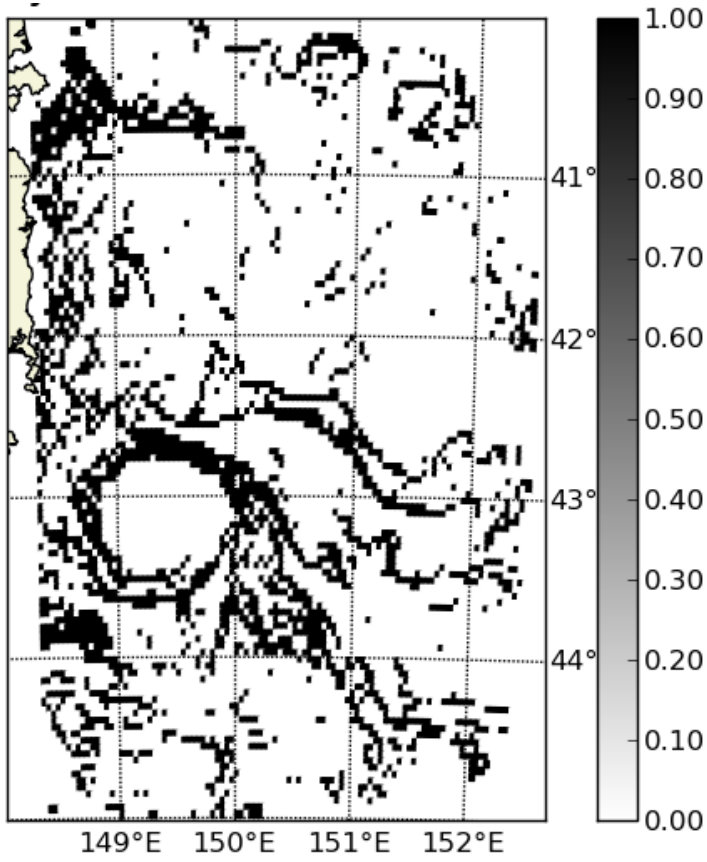


Chlorophyll, South Pacific

South Pacific, East of Tasmania



SST, South Pacific



Chlorophyll, South Pacific

TO DO LIST

- Inversion of FSLE images on Tasmania area
- Meeting with Francesco d'Ovidio
- Binarization method need to be improved
- Singularity Exponents?
- Choice of a model to study
- Meeting with Marina Lévy