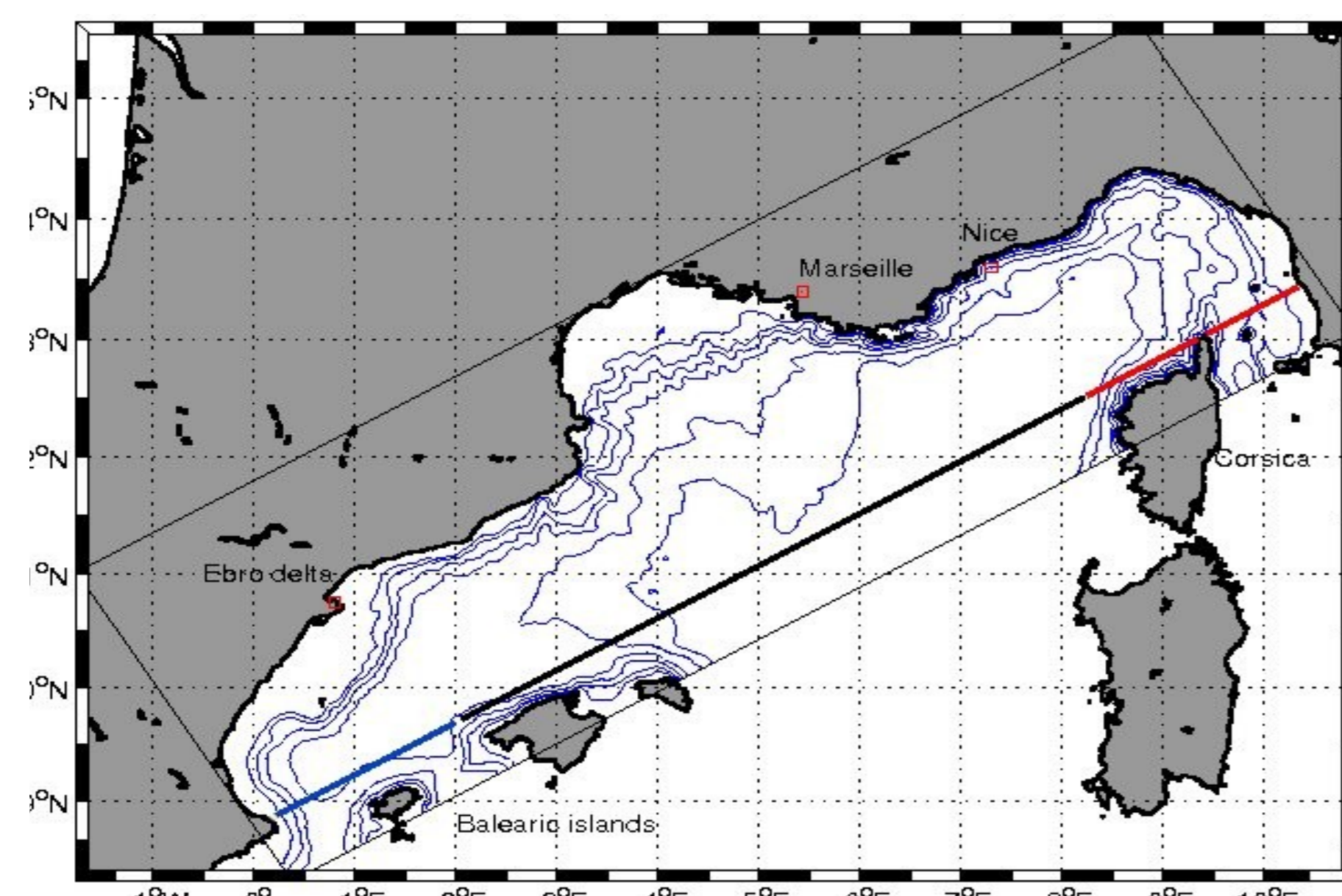


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**ABSTRACT :** The numerical Lagrangian tool Ariane is used to determine the main pathways in the North Western Mediterranean Sea and their associated transports. Quantitative and qualitative simulations are made for this region with Eulerian outputs from the ocean regional circulation model Symphonie for years 2001 to 2003. A clear correlation is shown between the mean position of the Northern Current and the bathymetry. The transport for the pathway linking Corsican waters and the Balearic Channel is evaluated around 0.25 Sv. A strong recirculation in the Ligurian sea appears in our diagnostics, we named it Ligurian Recirculation.

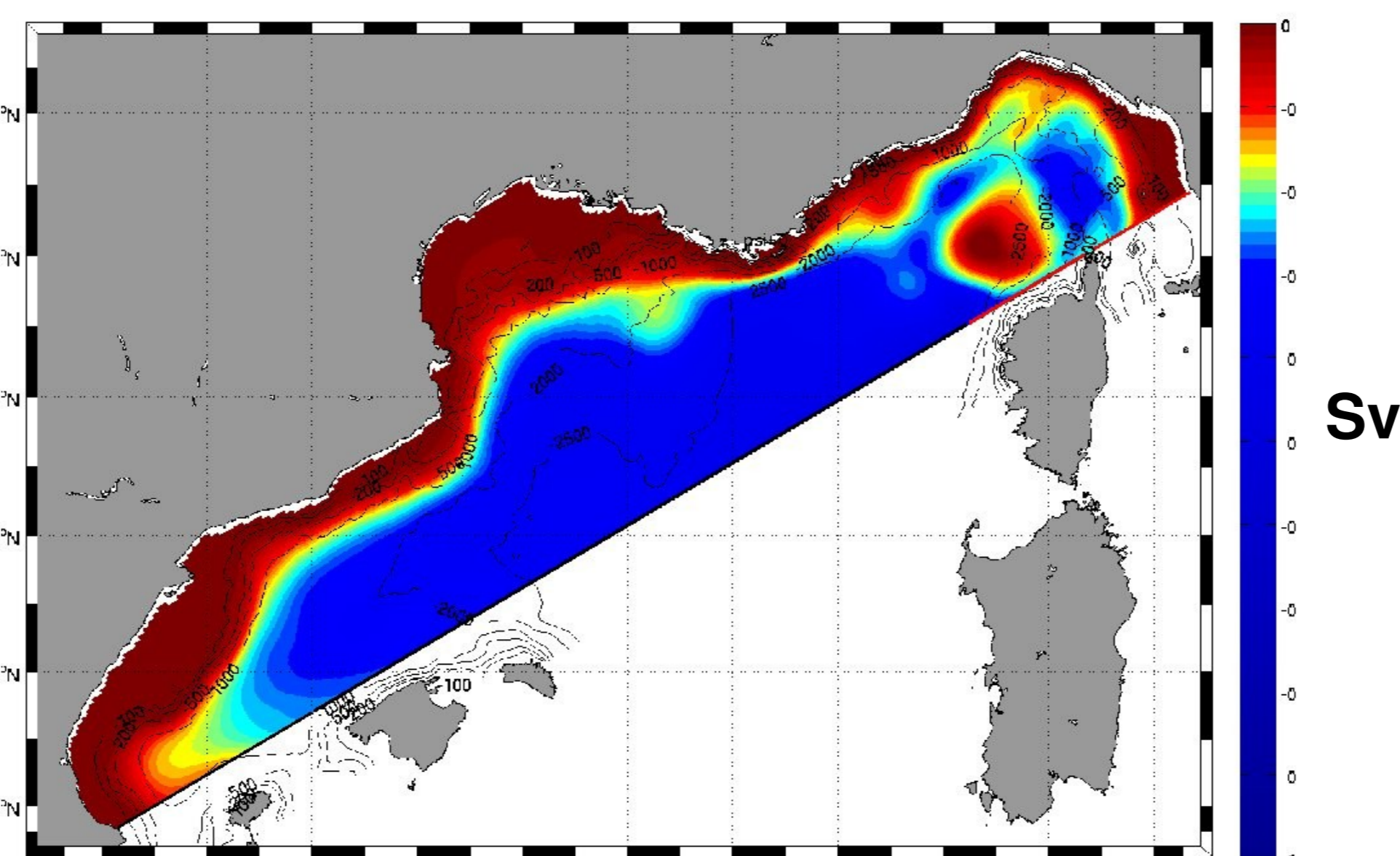
### MODEL DOMAIN



The Eulerian model Symphonie has a 3 km horizontal resolution, 40 vertical levels and simulates years 2001 to 2003 [Hu, 2009].

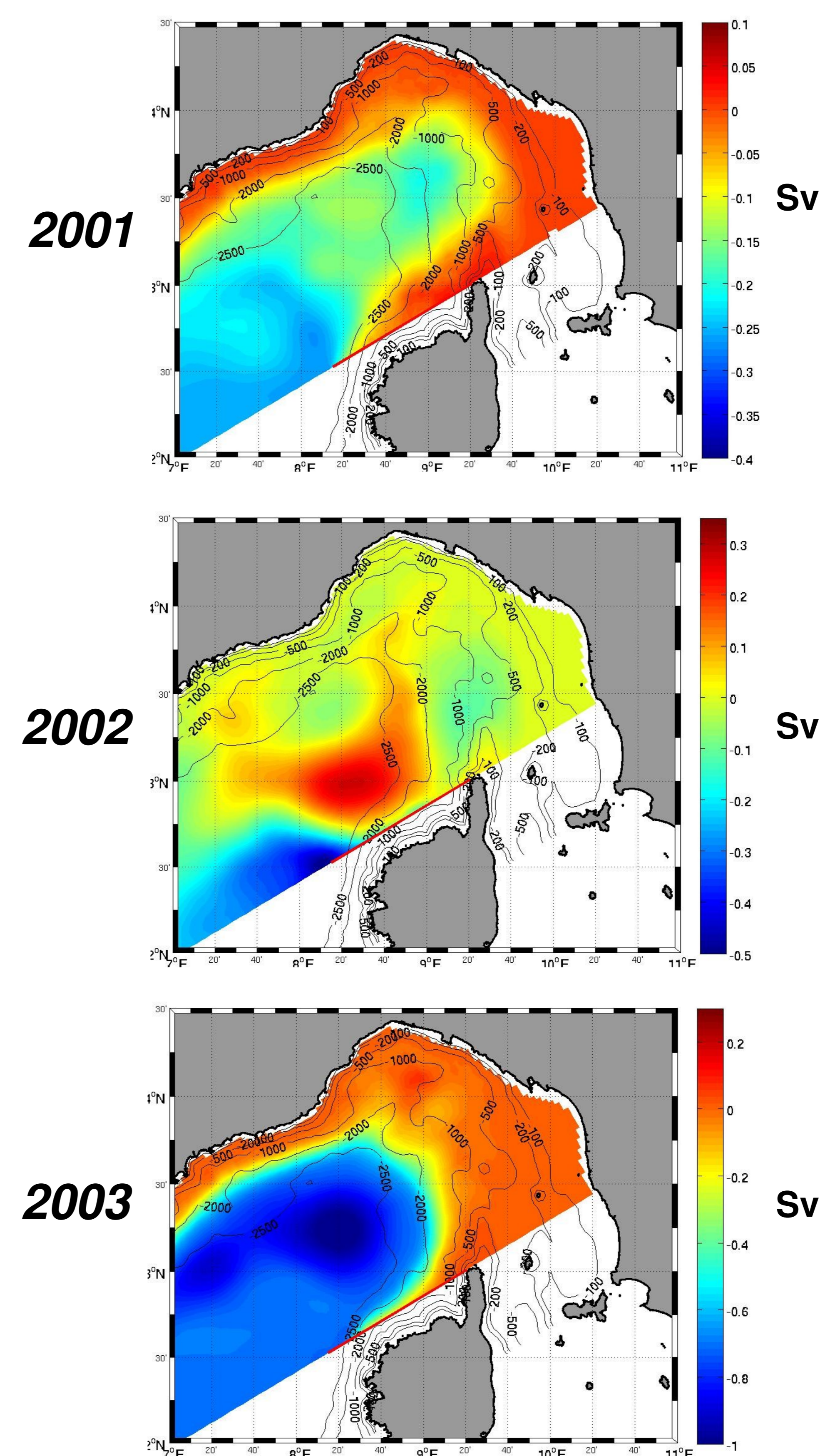
Corsican sections 1 & 2 (in red) are used for initialization with forward integration. The Balearic Channel section (in blue) is used for initialization with backward integration. In black the "Offshore" section closes the domain. The extension of each section covers all the water column, from the surface to the bottom.

### BASIN CIRCULATION CHARACTERISTICS



In the stream function field, 2 mean pathways appear. The first one, cyclonic, flows from Corsica to the Balearic islands along the coast. It is the Northern Current which constitutes the northern branch of the Western Mediterranean Gyre [Millot, 1999]. The second one, anticyclonic, flows northwest of Corsica and we named it Ligurian Recirculation. The forcing of the bathymetry appears clearly for both circulations.

### INTERANNUAL VARIABILITY



2001

2002

2003

### VALIDATION

In-situ measurements in the Ligurian Sea give transport between 0.5 Sv and 1.5 Sv depending on the season [Astraldi, 1990]. These values, currently associated to the pathway linking Corsica and Balearic islands, are higher than the 0.25 Sv we determine for this pathway. However, the values we find correspond to the Lagrangian transport for the pathway. If we compare the Eulerian transport determined in the Corsican sections 1 & 2, we observe that our value of 1.04 Sv is close to the measured transport.

### CONCLUSION & PERSPECTIVES

This first Lagrangian diagnostic for the North Western Mediterranean brings to light some interesting results :

- an evaluation of the transport linking Corsica and Balearic island, equal to 0.25 Sv associated to the Northern Current
- the observation of the Ligurian Recirculation and its variability
- the forcing of the bathymetry on the different circulations.

The methodology used for this diagnostic will be adapted to study the LATEX eddy in the Gulf of Lions to determine the exchanges between coastal and offshore waters. A high resolution model, with an higher extension offshore could be used to determine the characteristics of the Ligurian Recirculation and its origins.

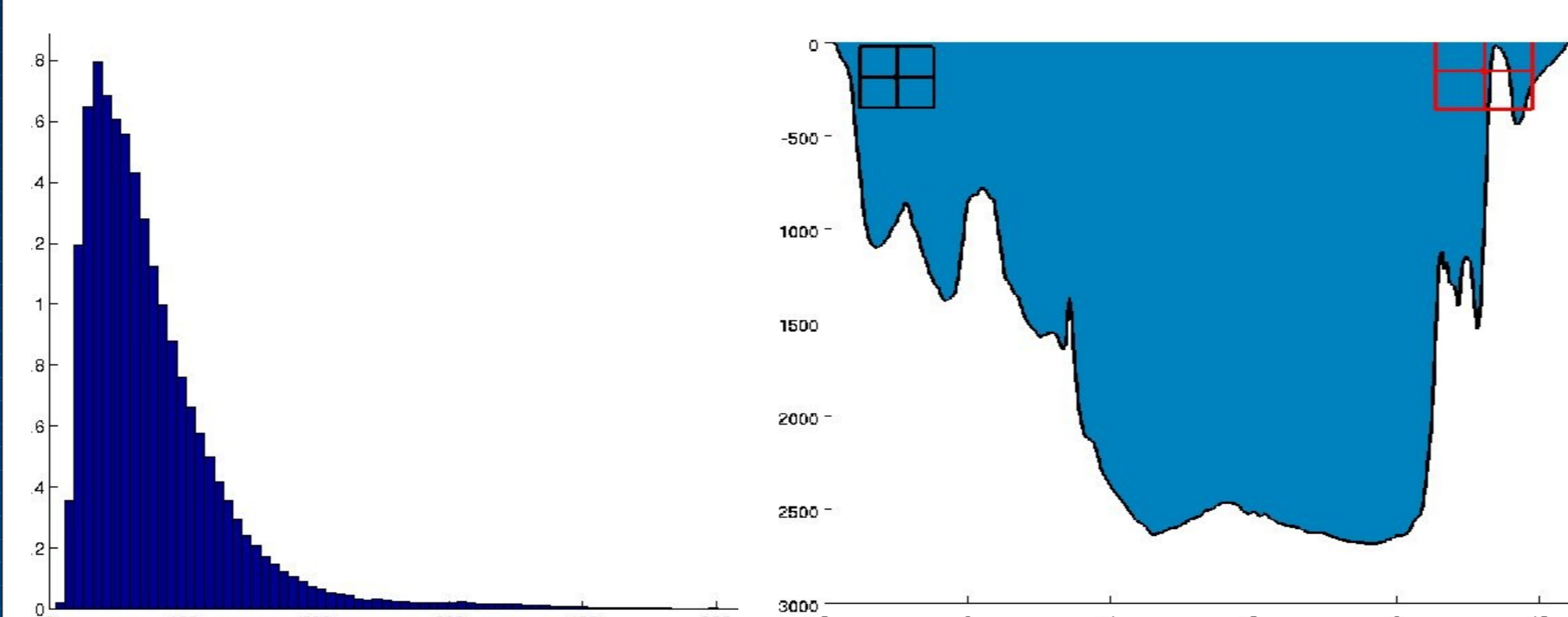
**Ariane** is a Lagrangian diagnostic tool used to integrate particles trajectories in the velocity field from stored outputs of OGCM with forward or backward integration [Blanke, 1997]. It can be used for two types of diagnostics : qualitative, to determine trajectories, quantitative, to determine the stream function and the transport.

### TRANSPORT ESTIMATION

Section of initialization	Time averaged Eulerian transport (SV)	Linking transport (Sv)		
		Corsica 1 & 2	Balearic Channel	Offshore
Corsica 1 & 2	1.04	0.55	0.25	0.24
Balearic Channel	1.3	0.28	0.55	0.47

Averaged transport computed for each pathway during the 3 years simulation. Results come from forward and backward integration of the velocity field, with initialization in both Corsican and Balearic sections.

### CORSICA – BALEARIC ISLANDS PATHWAY



Histogram of the age of particles which contribute to the Corsica - Balearic islands pathway. The mean duration of the trajectories is 75 days. Being the trajectory of approximately 1200 km, the resulting speed is about 0.2 m/s.

Mean position and standard deviation of the particles at Balearic and Corsican sections show that the link takes place mainly between 0 and 500 m.

The Ligurian Recirculation shows different characteristics in position and shape. In 2001 it is not present. In 2002 it is anticyclonic whereas in 2003 it is cyclonic but the thermohaline properties of the water in this region can not explain the great variability we observe. The bathymetry forcing appears evident. The origins of this circulation and its variability stay an open question.

### ACKNOWLEDGEMENTS

We thank Z. Hu for Symphonie outputs for the North Western Mediterranean Sea.  
We thank B. Blanke and N. Grima for their help with Ariane.

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