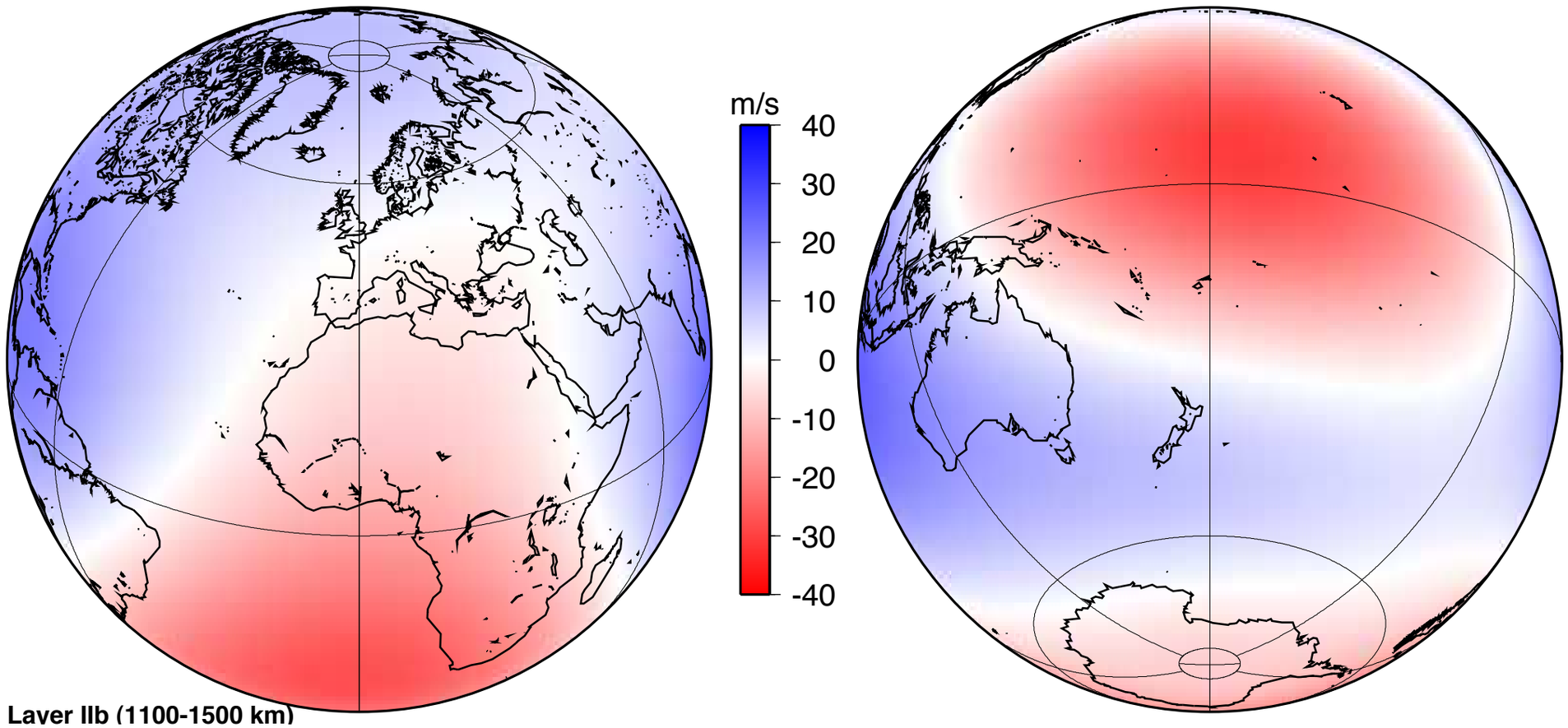
Project GLOBALSEIS

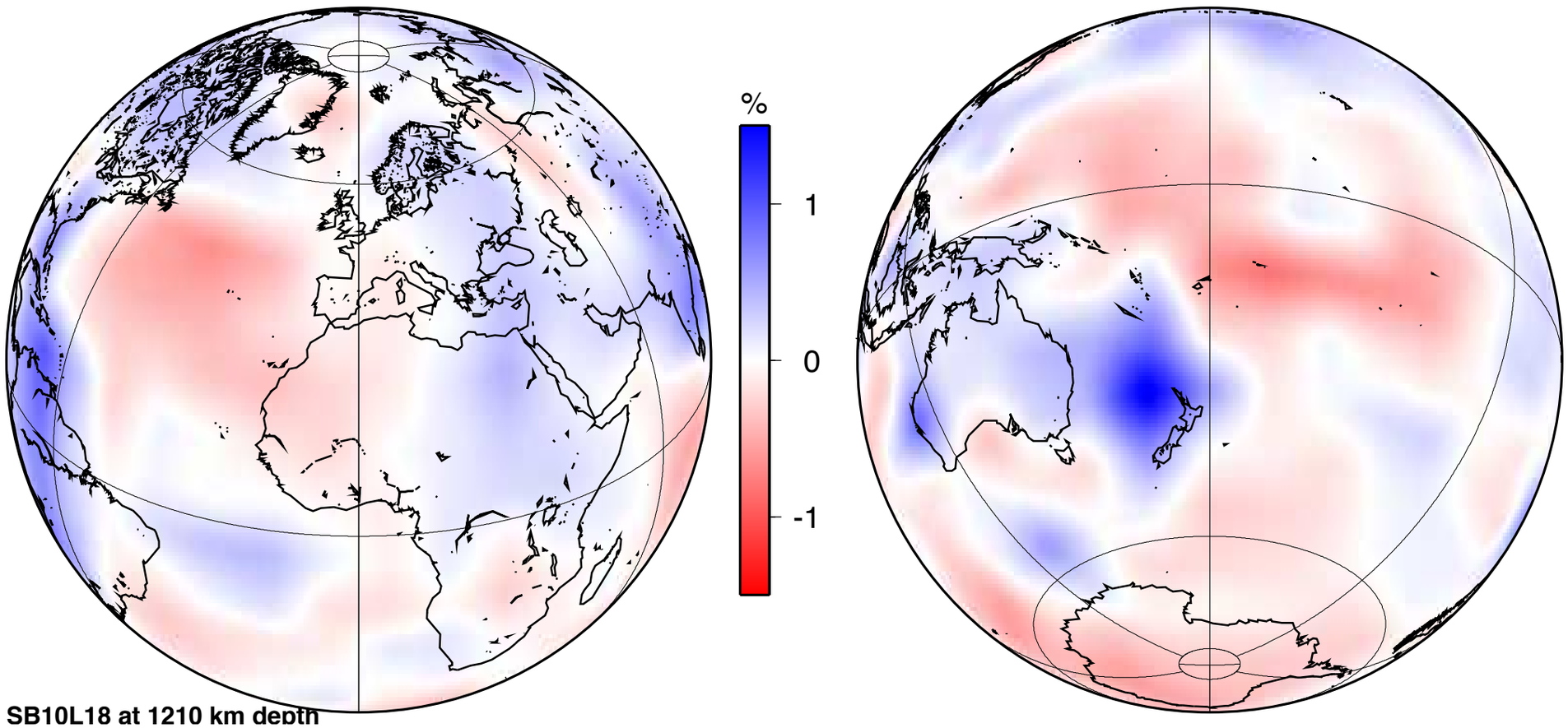
Geoazur (Nice, France)

Jean Charlety, Michel Foundotos, Catherine Gourdin, Yann Hello, Marianne Marot, Diego Mercerat, Guust Nolet, Masayuki Obayashi, Anthony Ogé, Bernhard Schuberth, Laurent Stehly, Alexey Sukhovich, Christophe Zaroli.

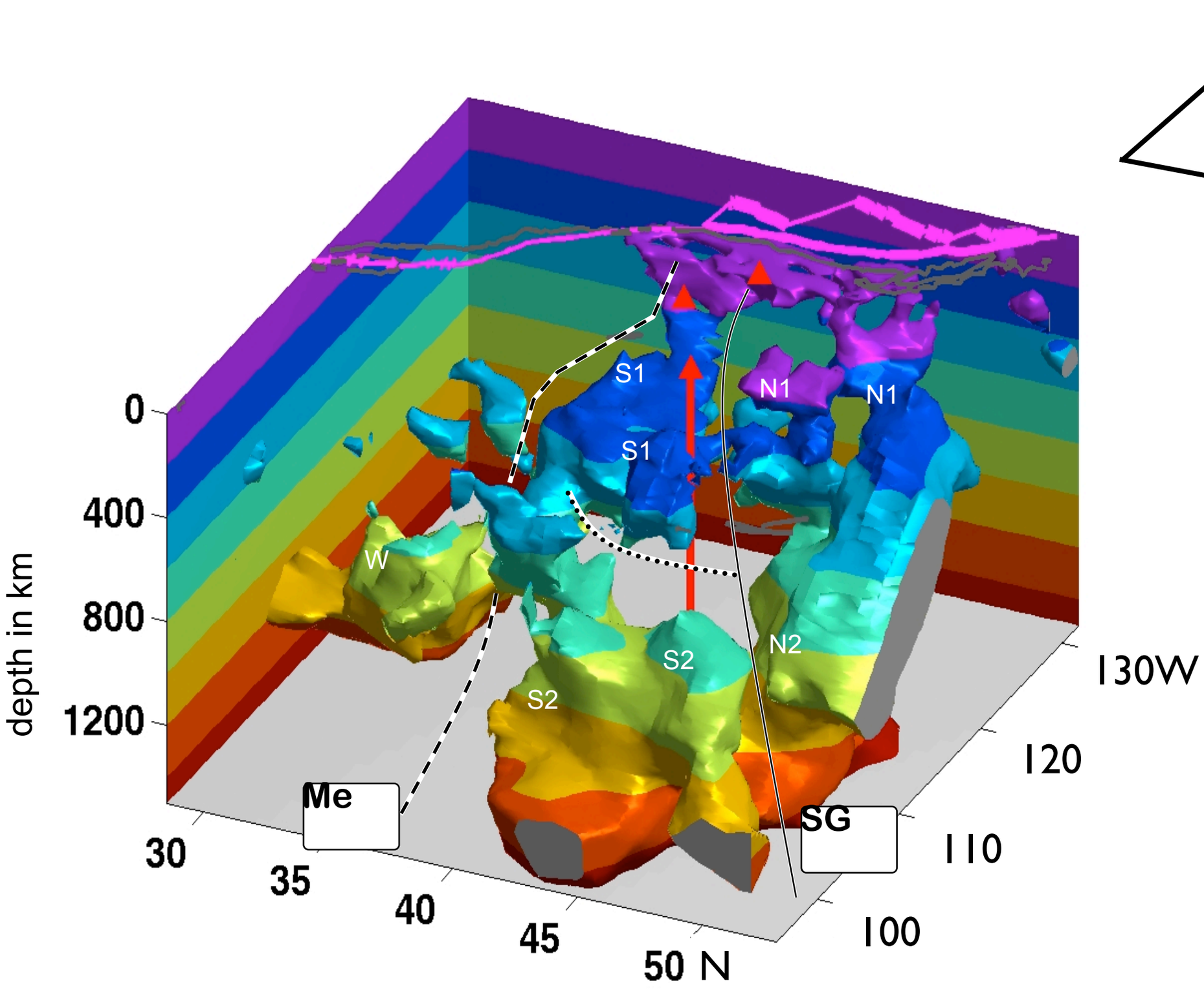
The past (Dziewonski et al., 1977)



The past (Masters et al., 2000)



Present (Sigloch et al., 2008)



The future

1. Move away from ray theory
2. Include amplitudes (or full waveforms)
3. Super-arrays
4. New inversion techniques
5. Ocean coverage with robots
6. Web services for data

Project Globalseis

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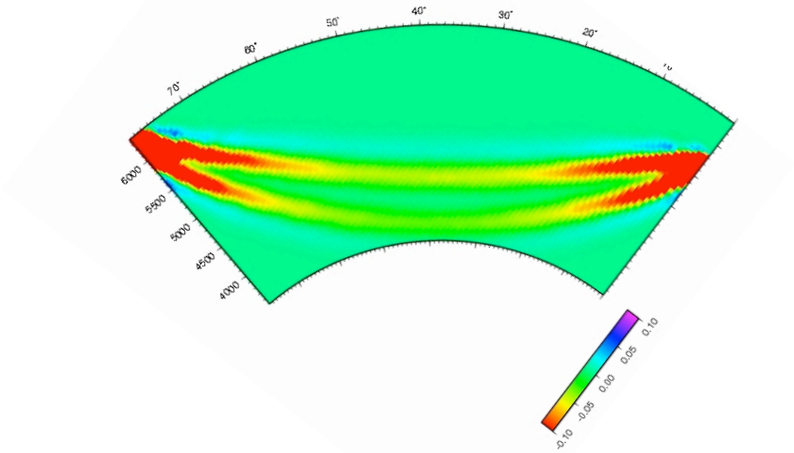
Software

https://www.geoazur.net/GLOBALSEIS/Soft.html

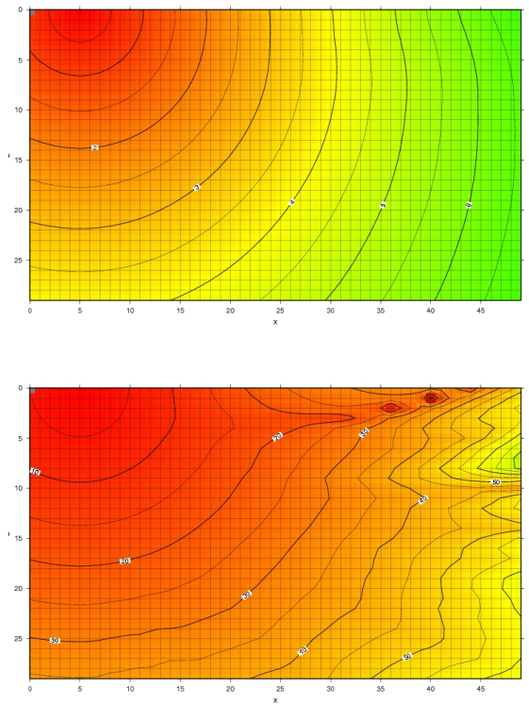
Raydyntrace: dynamic ray tracing in a spherical Earth

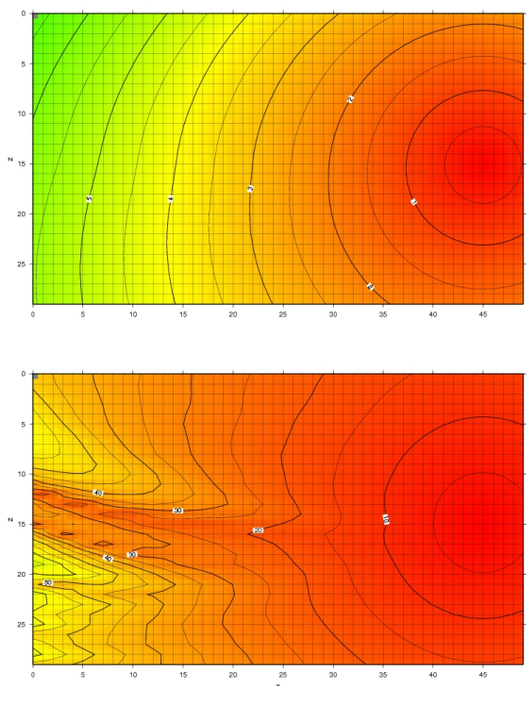


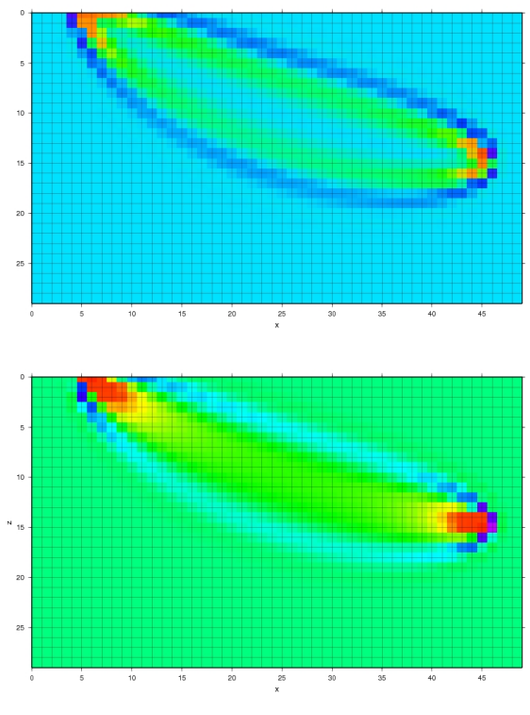
BD3D: dynamic ray tracing and kernel computation in local models (Cartesian coordinates).

BD3D (Cartesian)

- Computes travel time fields in 3D by ray bending
- Computes geometrical spreading fields
- Computes time and amplitude kernels







Extensive tutorial still in progress....

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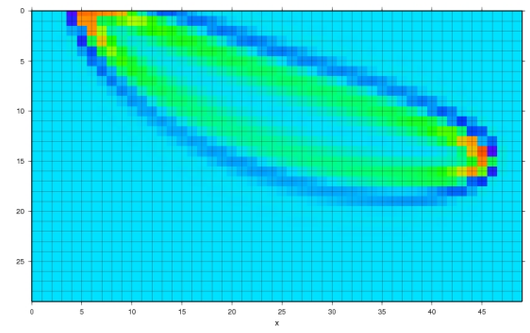

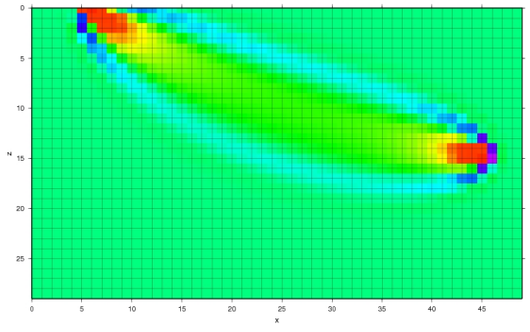

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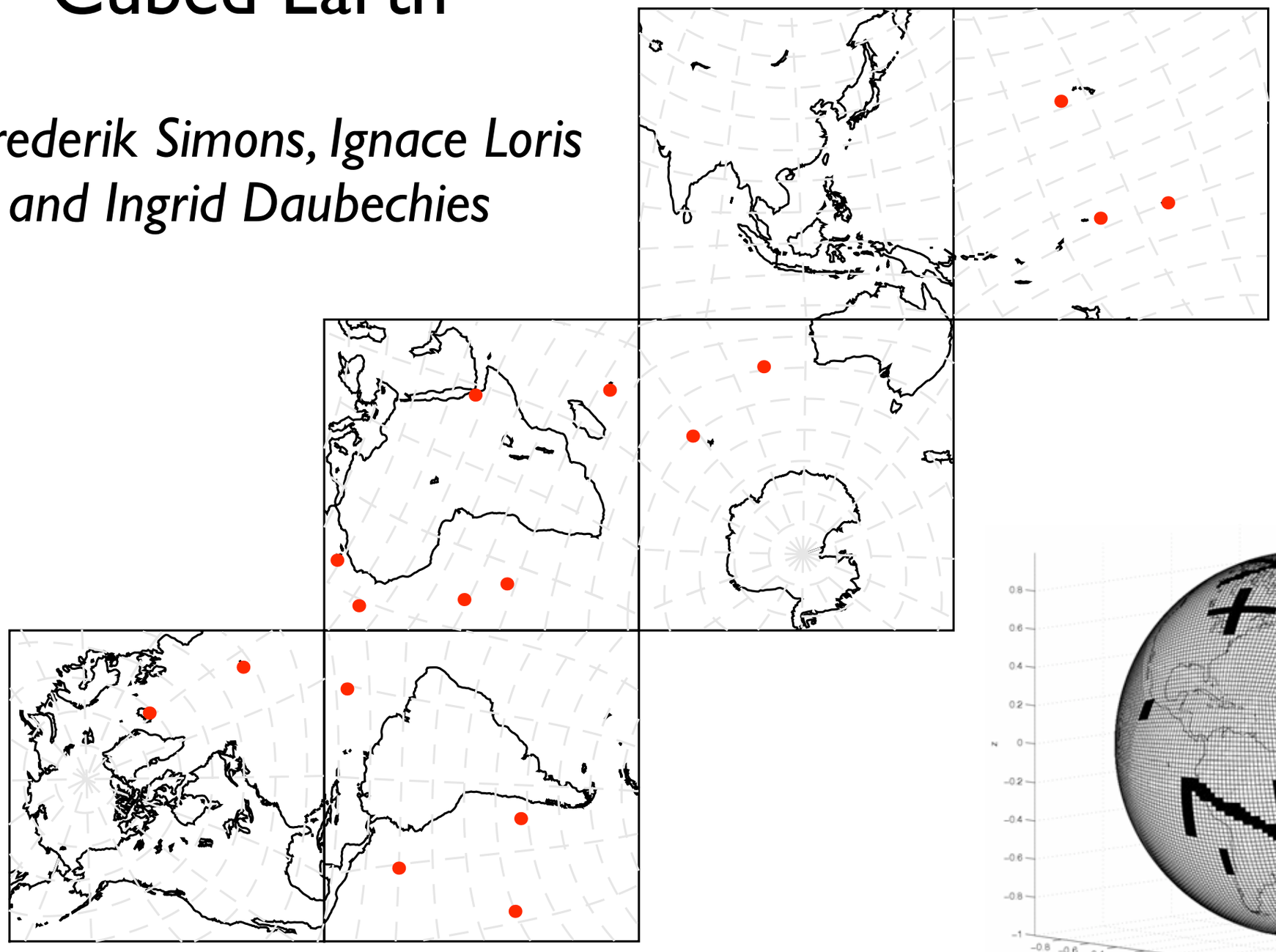
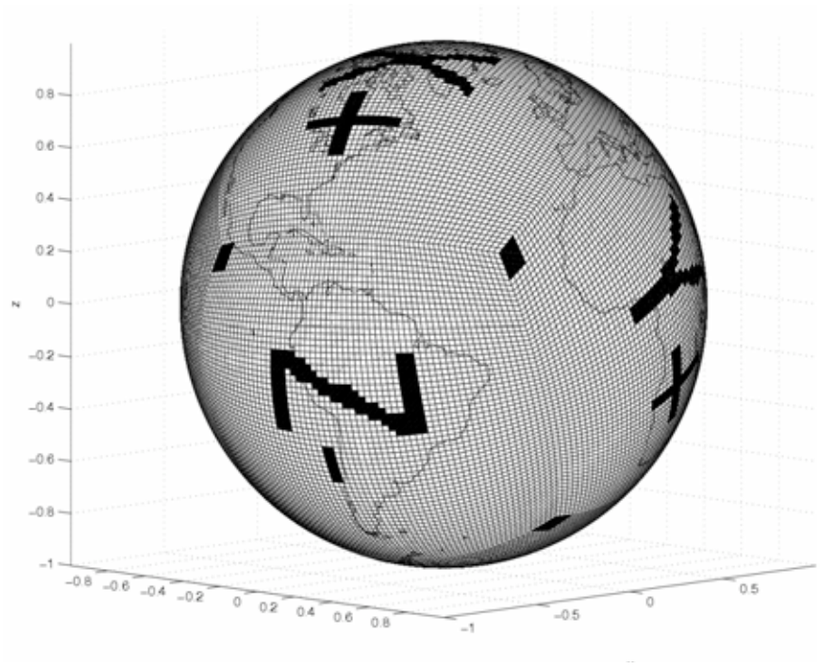
Current Globalseis efforts

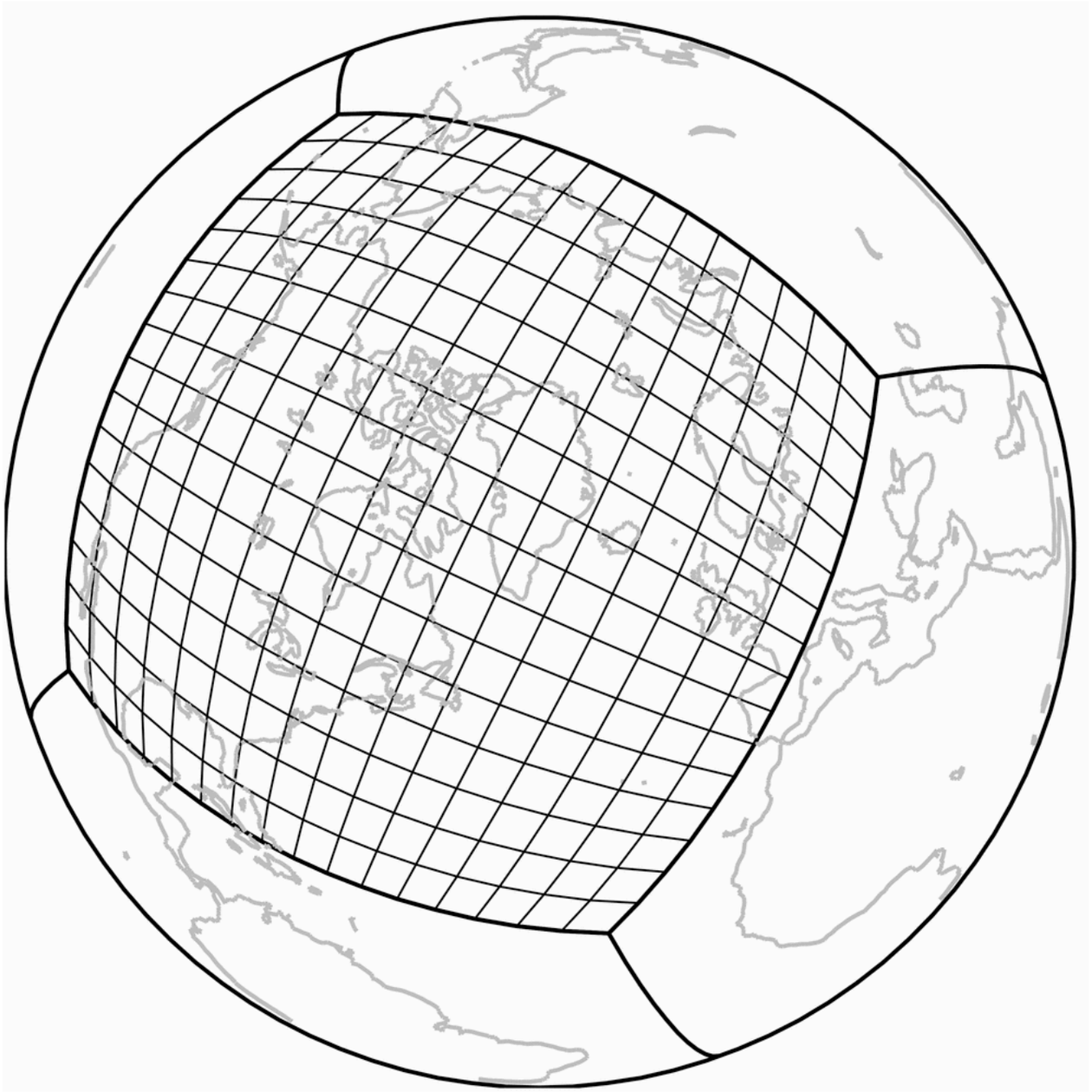
Cubed Earth

+ *Frederik Simons, Ignace Loris and Ingrid Daubechies*





Dense parameterization in a cubed Earth



Goal:
6x512x512x128=
2×10^8 for mantle
(20 km resolution)

Currently:
6x128x128x37=
3.6×10^6 (80 km)

4. New inversion techniques

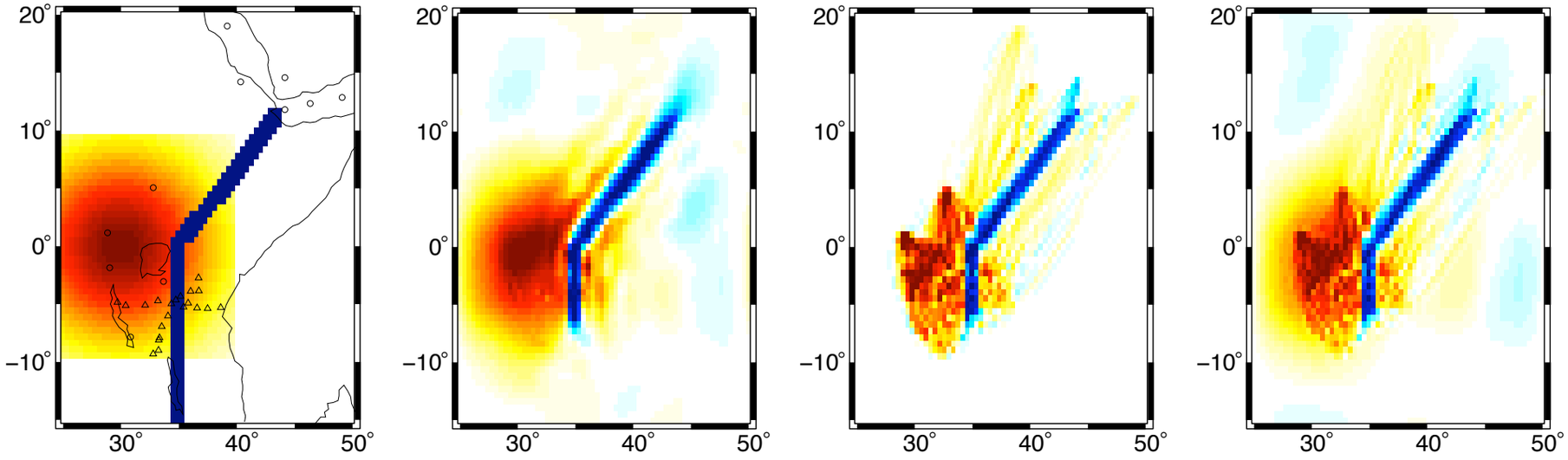


Figure 4: From left to right: A toy model for the East-African rift, with stations (triangles) and events (circles); reconstruction with ℓ_1-method; reconstruction with ℓ_2-method; reconstruction with wavelet ℓ_2-method.

Loris et al., GJI 2007

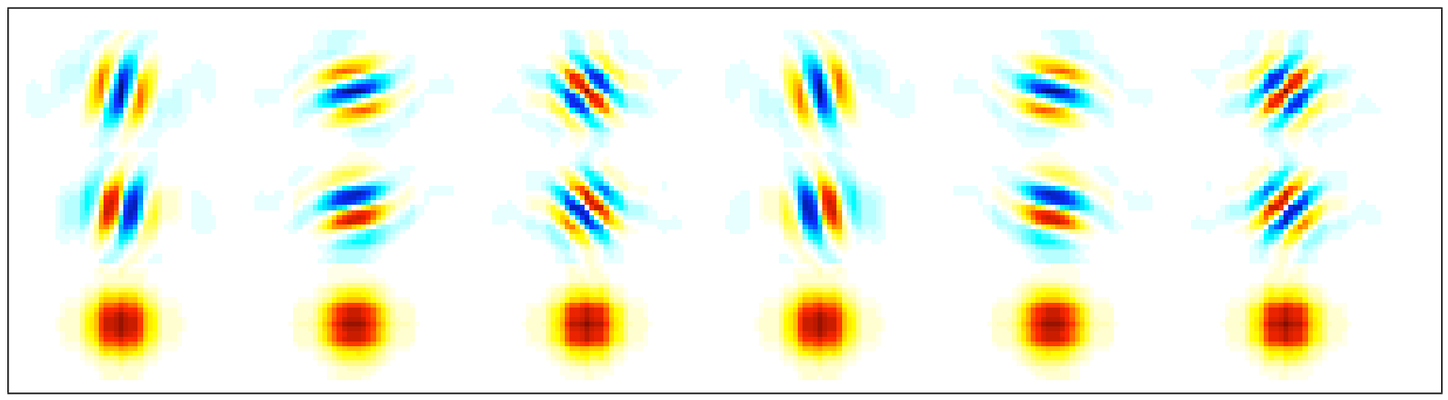
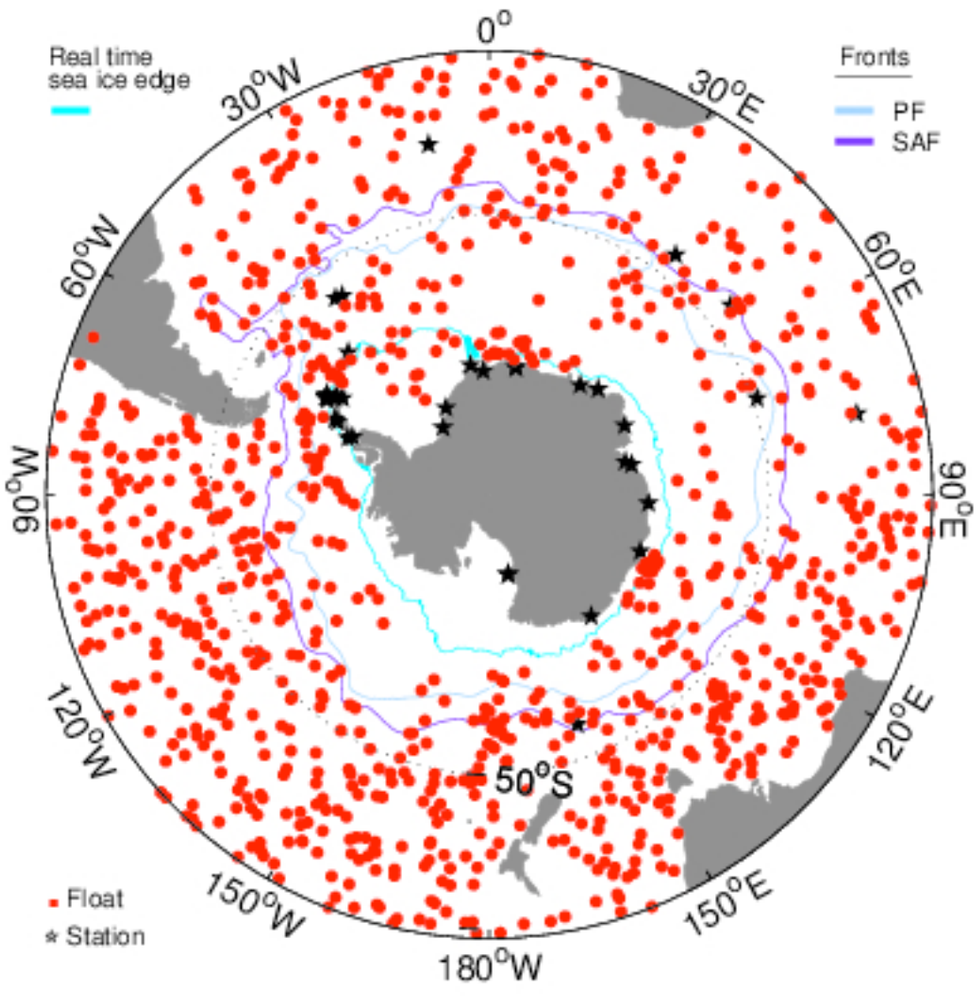
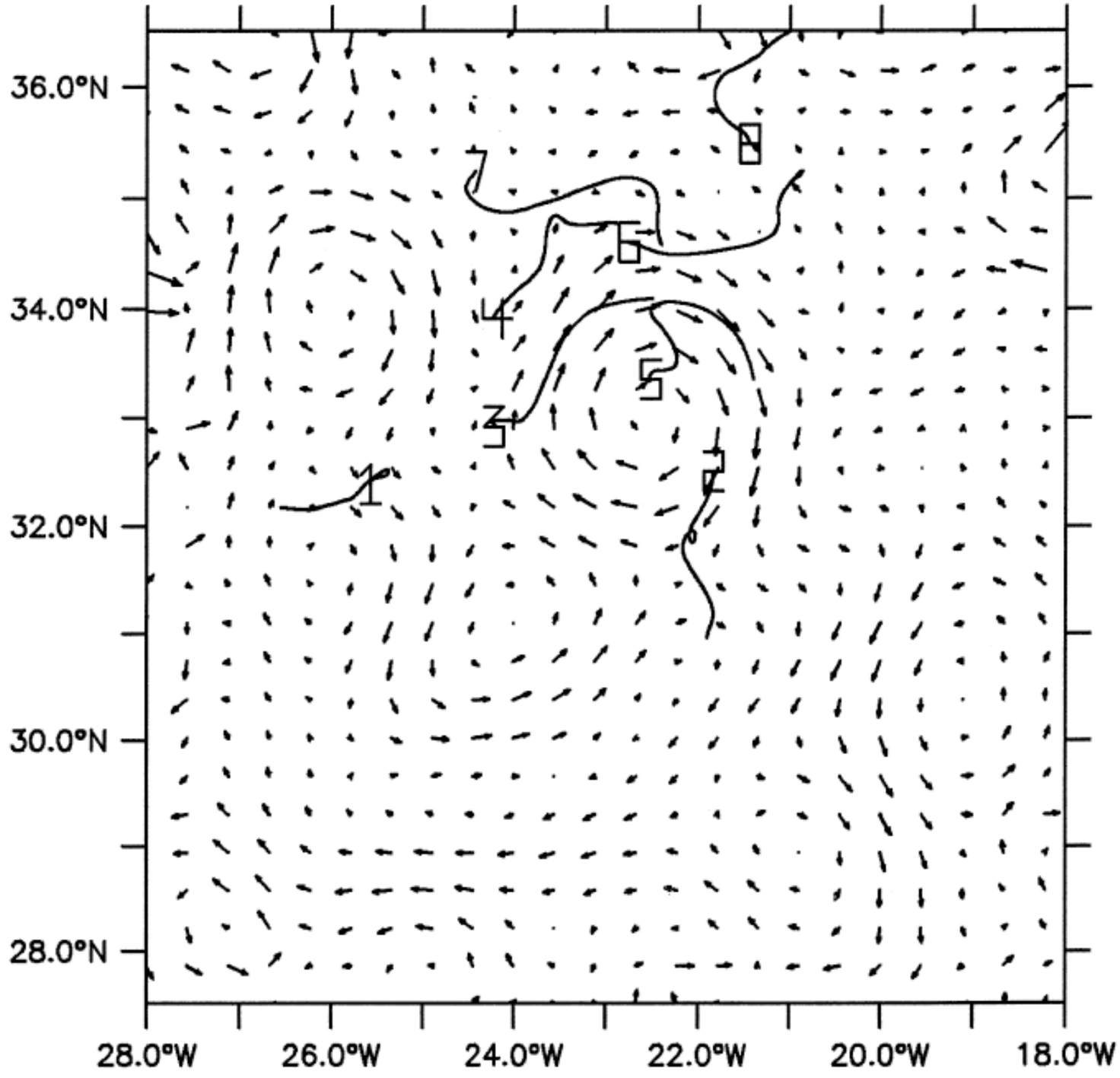


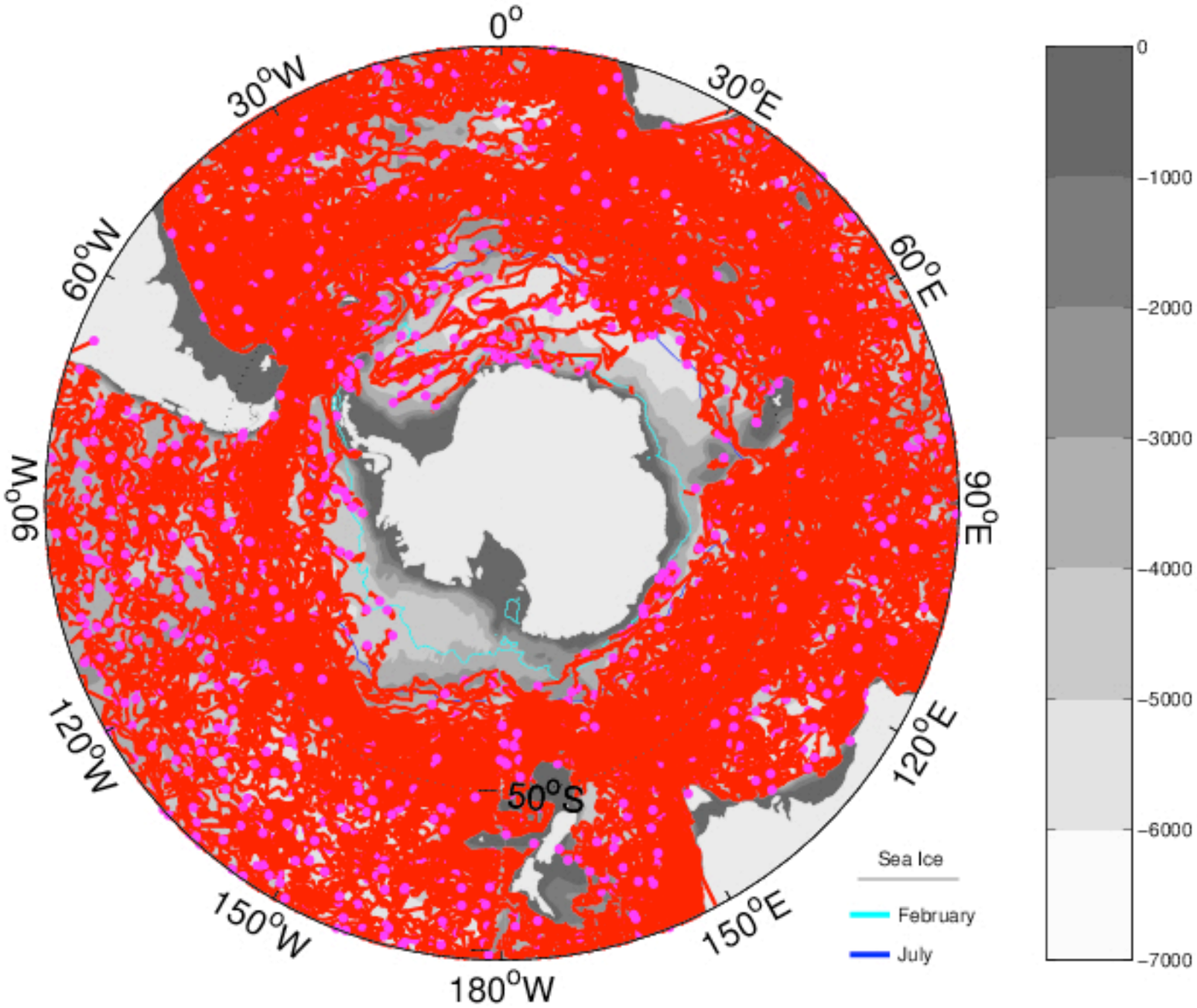
Figure 6: A graph of the 2D dual-tree complex wavelets used in the reconstruction. First row: real part, second row: imaginary part, third row: norm squared (figure taken/adapted from [24]). The directional character of each of the six wavelet functions is clear.

New data



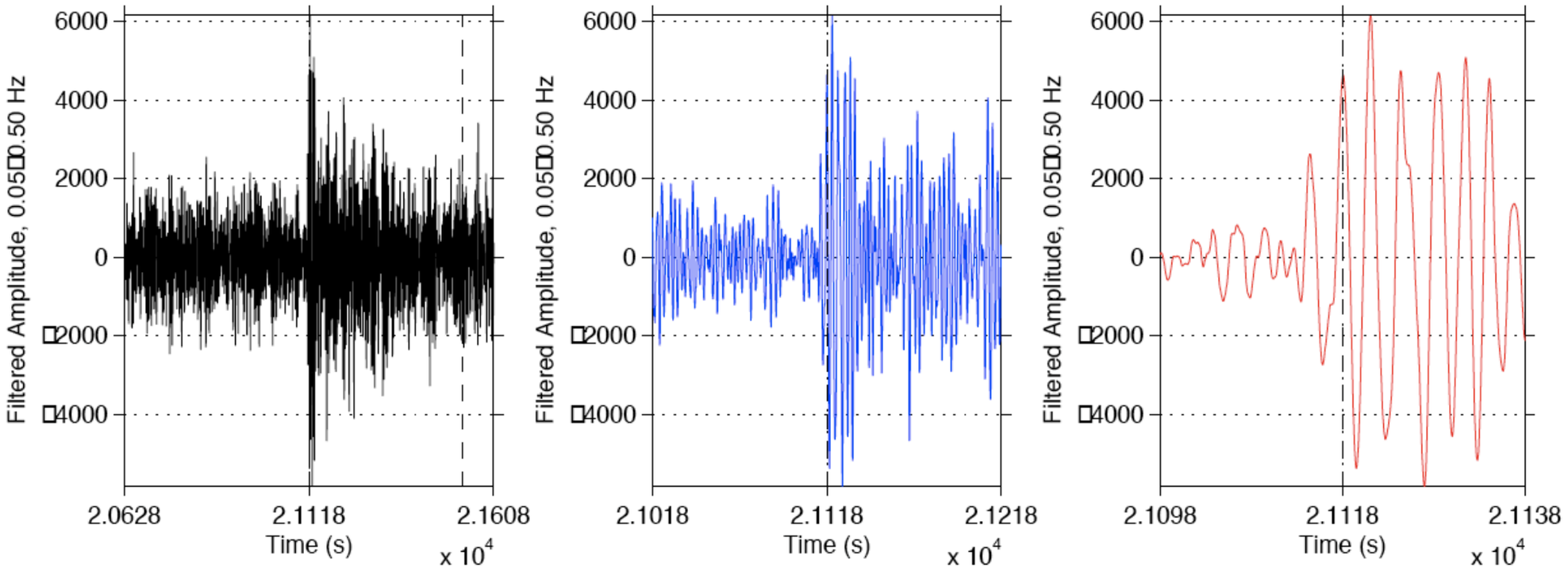
ARGOS: 3000 floats for oceanography


36.0°N
34.0°N
32.0°N
30.0°N
28.0°N
28.0°W
26.0°W
24.0°W
22.0°W
20.0°W
18.0°W



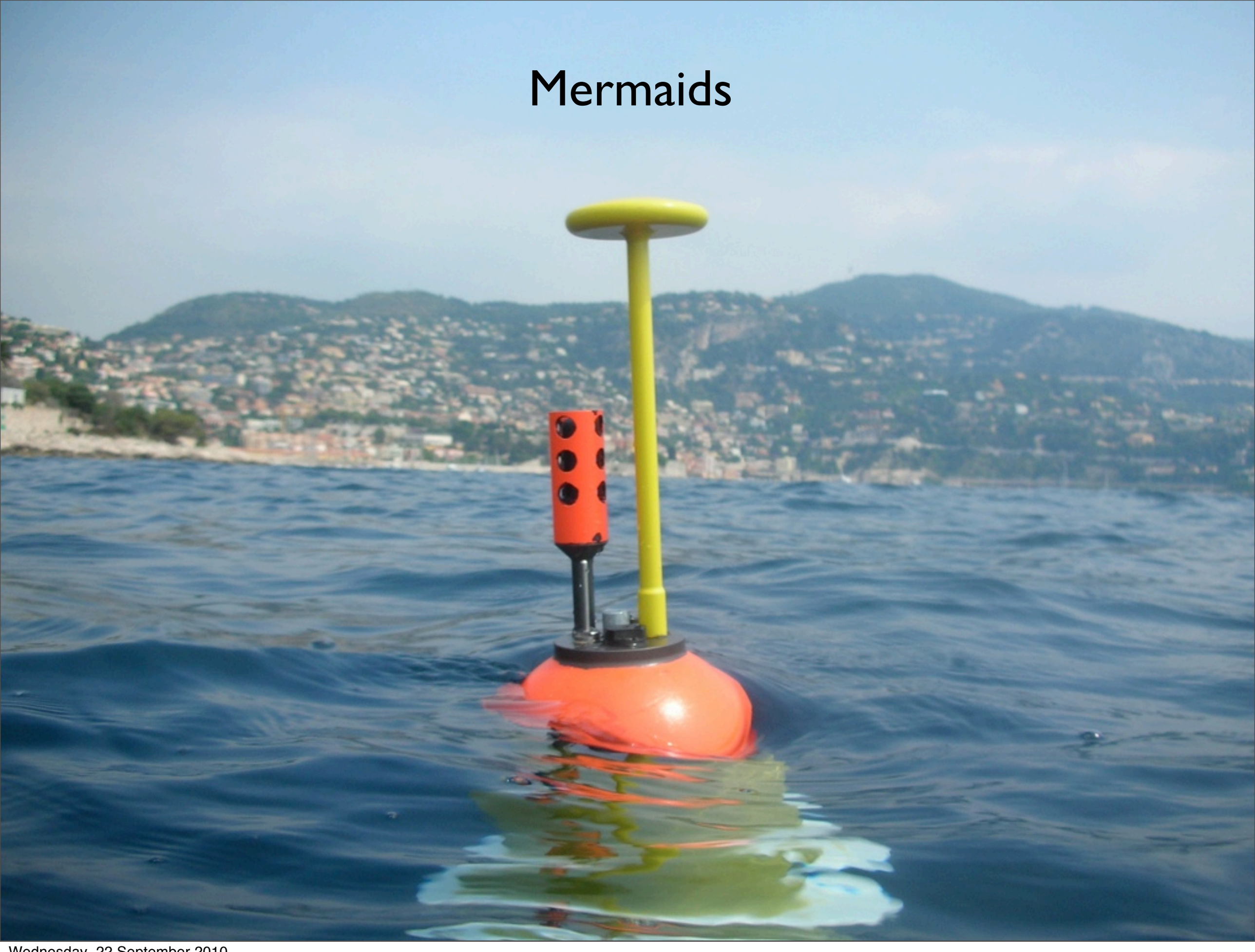
Float Positions: 02–Apr–2008

Zooming in on the onset



Courtesy Frederik Simons

Mermaids



Cruising depth to 2000 m

Lifetime about 3 years

Expected to get good signal for magnitudes 5.8 and higher (100 per year, about $60 per P wave)