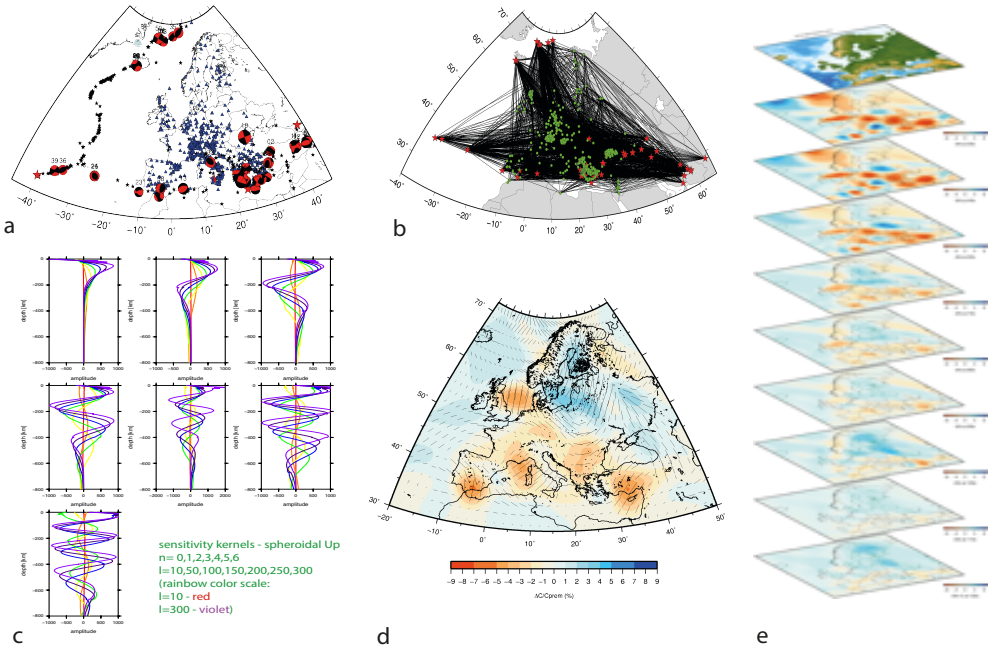
The main objective of the project was to work out a new shear velocity model of mantle structures beneath the European continent using complementary information from different types of waves. One of the main aspect of the project was to retrieve not only radial but also azimuthal anisotropy parameters while calculating tomographic images. The incorporation of surface wave data analyses has enhanced the methodology the fellow had been using in her previous studies (body wave treatment).
The punctillous work of constructing phase velocity dispersion curves for fundamental as well six first overtones of Rayleigh and Love waves has been accomplished in the first part of the project.
The collection of waveforms for the tomography studies was downloaded using the newly developed script-oriented efficient ObspyDMT tool (Scheingraber et al., 2013). The data concern the seismograms registered in the European observatories for the body wave magnitude higher than 6 natural events with epicentres correlated with the subduction zones in the Mediterranean region and in the Mid-Atlantic Ridge (fig. a). The traveltime distance range (fig. b) and the period range 35s-200s of the considered modes (fig. c) ensures sampling the mantle down to the mantle transition zone depths.
Fundamental and higher modes velocities both for the LOVE and RAYLEIGH waves were calculated using the roller-coaster algorithm (Beucler et al., 2003). The synthetic seismogram database required for calculating reference Fourier transforms information in frequency domain was obtained by normal mode summation method. In the modeling, the source information was taken from the CMT moment tensor solution database.

The highest ray density was obtained in Meso-Cenozoic part of the Mediterranean: the region of the Alps, the Apennines and the Anatolian part of the Mediterranean.
Regionalisation (Montagner et al., 1990) of all the 60 datasets for the whole European continent took into account velocities with the errors assigned to them, the amplitude of anisotropy and its direction (see example in fig. d). Azimuthal anisotropy was retrieved in the regions with the highest ray coverage. A lot of tests have been performed with the changing horizontal correlation length of the data and finally the length of 250 km was chosen as the one giving the better compromise between the data density, theoretical limitations, the length of the cell and the resolution in differentiating the premium tectonic provinces. The output are regionalised databases for 30 periods extracted for different modes of Rayleigh as well as Love waves (as in fig. e).



Figures: a: events – stations database; b: ray-coverage geometry; c: the example of changes with depth- resolution for the period range 10-300 s of the spherical mode kernels, d: the example of phase velocity map for Rayleigh fundamental mode of the period 70 s, e: phase velocity changes for different periods of Rayleigh waves.

The fellow is now accomplishing the point-by-point inversion for depth of the massive surface wave phase velocity datasets for spheroidal and toroidal modes with the use of the kernels calculated for both fundamental and higher modes. The aim is to publish this year a new the European mantle S-velocity model which fits all the modeled parameters among which azimuthal anisotropy is considered.

The spectral element method implemented in RegSEM (Cupillard et al., 2012) will be used for checking the correlation between the synthetics calculated in the obtained model and the real data waveforms.

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The training, which was complementary to the researcher's previous experience, played an important role in the project. The training actions are listed below:

- autumn – winter 2012 – lectures on **surface waves properties and global tomography studies** by Prof. Jean-Paul Montagner;
- autumn 2012 – 10 courses on **Practical Aspects of Digital Signal Processing** by James Martin;
- **GEOSCOPE network functioning and data acquisition –** training in the GEOSCOPE observatory, IPGP;
- February – April 2013 - advanced informatics course – **Programming in Fortran90***;*
- May 2013 – two-day training in **Spectral Element Method** application (Paul Cupillard – the lecturer) organised by the fellow;
- March 2013 – 2-day workshop in **programming in Python**, using **obspy** and **obspyDMT** tools for handling seismological data;
- acquiring skills in **working on computer cluster** in the IPGP – IT specialists .
- September 2013 – **Waves and inversion problems in geophysics** – one-day workshop in the Institute of Henri Poincare organized by SMAI (Society of Applied Mathematics);
- September 2013 - the workshop dedicated to Albert Tarantola - the author of **probabilistic formulation of inverse problems**;
- October - November 2013 – six lectures in the College de France on the **Physics of the Earth's interior** by prof. Barbara Romanowicz;
- 2013 – 2-day workshop in the College de France on the **Structure and Dynamics of the Lithosphere/Asthenosphere System** organized by prof. Barbara Romanowicz;
- March – May 2014 – participating in a suite of eight lectures on **normal mode and first order perturbation theory** by prof. Barbara Romanowicz;
- January 2014 – one-day training in the IPGP concerning **efficient use a new cluster of parallel supercomputers**;
- Meetings with the scientist in charge concerning the details of the subsequent steps of data processing and the methods having been applied.
  participation in monthly meetings of the seismological team headed by the scientist in charge;
- participation in weekly seminars in seismology in the IPGP;
- 2013 -2014 – participation in weekly videoconferences IPGP – University of Berkeley animated by by Prof. Barbara Romanowicz.

Outreach activities were addressed to different age categories of public: children, high school students and scientists from non-geophysical fields, they were as follows:

- Presenting a daily life of seismologist to the groups of children visiting the IPGP during a "holiday of science" (FETE DE LA SCIENCE) organised in October 2012;
- Participation in the annual international week-long meeting of PhD students (CONGRES DES DOCTORANTS – April 2013) in the IPGP, promoting Marie Curie Actions among young scientists and giving detailed advice in preparing Marie Skłodowska-Curie grants to two candidates applying for the projects;
- Giving presentation about seismological risks in the Cite Universitaire for the public outside the geophysical society;
- July 2014 – 2-week training and responsibility for a student from a high school in Paris having an internship in geophysics in the IPGP – presenting experiments (in high-pressure physics, paleomagnetism, tectonics, spectrometry) in a variety of geophysical laboratories.

In order to disseminate the seismology to the public in good-level French, the fellow improved her French speaking skills by participating in a French course for non-francophone scientists.