ÉCOLE DOCTORALE SCIENCES DE LA TERRE

Subject offered for a contract starting in October 2014

**SUBJECT TITLE:** ***Regularized Migration Velocity Analysis***

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Second Advisor/ Supervisor:
Host lab/ Team : **GPX, Centre de Géosciences, MINES ParisTech, Fontainebleau**

Financing: GPX/IPGP/Industry

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Migration Velocity Analysis (MVA) is a general method to determine the optimal background velocity model such that migrated sections become consistent. For example, common offset sections are independently migrated. If the correct background model is used, then all these sections should be similar. Inconsistencies are linked to an inaccurate velocity model. MVA does not have a unique solution, especially in the zones with poor illumination. It is thus important to introduce *a priori* information that may come from well data.

In classical tomography, regularizations are commonly applied. This is far less the case in MVA. This is maybe the reasons why MVA is rarely applicable on real data sets. The first objective of the project is to properly study how to introduce a priori information and in particular dynamic a priori information. By dynamic, we mean a penalty factor varying during the minimization process. In a recent paper, A. Anashaari et al. have proposed to dynamically guide the inversion in the context of Full Waveform Inversion (FWI), with successful applications on synthetic and real data sets. It is important to better understand if their approach can be transposed in the MVA context.

New MVA techniques are based on a non-physical model. It means until converge, artificial subsurface offsets are created. These images show artifacts that may limit the converge towards the global minimum. The second objective is to better understand how a priori information may help to converge.

MINES ParisTech has developed a long experience on different MVA techniques.

The candidate must have interest in seismic modelling and seismic imaging. The candidate should also have experience in programming.

**References**:

[1] Asnaashari, A., R. Brossier, S. Garambois, F. Audebert, P. Thore, and J. Virieux, 2013, Regularized seismic full waveform inversion with prior model information: *Geophysics*, 78(2), R25–R36