

Working Group Proposal:

Imaging mantle structure beneath mid-ocean ridges

Proposal revised January 2008

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Background:

Imaging the mantle beneath spreading centers using both seismological and electromagnetic (EM) techniques, such as the MELT experiment on the EPR, presents important constraints toward understanding mantle dynamics beneath different ridge systems (e.g. mid-ocean ridge with different spreading rate and/or influenced by the presence of a hotspot in the vicinity, or back-arc spreading influenced by the kinetics of a subducting slab and melting processes which generate arc magma). Constraints on mantle dynamics from geophysical imaging can only be achieved by including results from laboratory experiments on mantle rocks and from numerical simulations. The results from different ridge system can be associated with thermal structure, melting systematics, and ridge segmentation. The variability of such features should be addressed through investigations of structural, geophysical, petrological and geochemical characteristics of the lithosphere. The connection between the different mantle images as the input and the various outputs will identify the parameters controlling the outputs and improve understanding of how ridges work. The key scientific questions to be addressed by imaging the mantle beneath spreading centers are (1) clarifying mantle dynamics associated with different ridge systems, and (2) identifying the parameters controlling various lithospheric features at different types of ridge systems.

Working Group Roles:

The proposed working group has two main roles, 1) promoting experiments to image the mantle structure at one or two ridge systems, and 2) encouraging scientists to link effectively for interpreting and using the high quality images. High quality images for the mantle structure can only be achieved through international collaboration, because large-scale seismic and EM experiments in the same area are required. Both of the experiments provide different type of images and information for mantle structure. The high resolution of the images largely depends on the number of instruments and on the duration of the observations. Thus, it is important to share limited resources internationally including ship time. The

proposed working group can play an active role in promoting large-scale experiments that can not be done alone by single nations. One or two ridge systems will be selected as the targets for high quality imaging of the mantle structure, and they can be regarded as integrated study sites where individual efforts should be encouraged to investigate structural, geophysical, petrological and geochemical characteristics of the crust and lithosphere that can be connected with the high quality images. Moreover, the proposed working group will organize a theoretical institute to exchange knowledge and effectively link investigations to interpret the images and use them as the input to be connected with the various outputs. Timely exchange of the latest data and cruise results should be promoted through the organization of special sessions at international meetings.