Geophysical Research Abstracts
Vol. 16, EGU2014-2832, 2014
EGU General Assembly 2014

S receiver function observations of flat Laramide subduction in the western US and lithospheric delamination in the Yellowstone volcanic region

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We used more than 40.000 visually picked S receiver functions recorded by the USArray to visualize the upper mantle structure below the north-western part of the United States from the Moho down to the 410 km discontinuity. We observed a continuous negative discontinuity reaching from the Pacific coast to the Midcontinental Rift System (MCRS). Its depth is near 100km at the coast and near 200km at the MCRS. We interpret this structure as LAB of the flat subducting Laramide slab. The Laramide slab is disrupted in the greater region of the Yellowstone volcanisms by a west dipping negative structure reaching also down to about 200km. We suggest that this structure could be caused by confined delamination of parts of the Laramide slab. To the east of the Laramide slab we observe two negative discontinuities at 100 and 200km depth with locally varying strength. We need to wait for data from the eastern end of the USArray project to study possible connections to the Grenville or Appalachian Orogens. We conclude that fossil subduction is a significant part of the structure of the cratonic lithosphere. Near the depth of 300km we observed a more scattered positive discontinuity which we interpret as base of the asthenosphere or Lehmann discontinuity. The 410km discontinuity is also well observed. About 50km above the 410 we see a large scale negative discontinuity which is probably caused by partial melt and it is also known from other regions around the globe. There is no large scale distortion of the discontinuities below the LAB in the greater Yellowstone region, which could speak for a relatively shallow volcanic source.