Geophysical Research Abstracts
Vol. 17, EGU2015-4928, 2015
EGU General Assembly 2015

The mantle transition zone beneath Antarctica: Evidence for thermal upwellings and hydration

Andrew Nyblade (1), Erica Emry (2), Samantha Hansen (3), Jordi Julia (4), Sridhar Anandakrishnan (5), Richard Aster (6), Douglas Wiens (7), Audrey Huerta (8), and Terry Wilson (9)

(1) Penn State University, Dept. of Geosciences, University Park, Pennsylvania, United States (aan2@psu.edu), (2) Penn State University, Dept. of Geosciences, University Park, Pennsylvania, United States (ele11@psu.edu), (3) University of Alabama, Dept. of Geological Sciences, Tuscaloosa, Alabama, United States (shansen@ua.edu), (4) Universidade Federal do Rio Grande do Norte, Departmento de Geofísica & Programa de Pós-Graduação em Geodinâmica e Geofísica, Natal, Brazil (jordi@geofisica.ufrn.br), (5) Penn State University, Dept. of Geosciences, University Park, Pennsylvania, United States (sxa17@psu.edu), (6) Colorado State University
, Department of Geosciences, Fort Collins, Colorado, United States (Rick.Aster@colostate.edu), (7) Washington University in St. Louis, Earth and Planetary Sciences, St. Louis, Missouri, United States (doug@seismo.wustl.edu), (8) Central Washington University, Department of Geosciences, Ellensburg, Washington, United States (huertaa@Geology.cwu.EDU), (9) Ohio State University, School of Earth Sciences, Columbus, Ohio, United States (wilson.43@osu.edu)

West Antarctica has experienced abundant Cenozoic volcanism, and it is suspected that the region is influenced by upwelling thermal plumes from the lower mantle; however this has not yet been verified, because seismic tomography results are not well resolved at mantle transition zone (MTZ) depths. We use P-wave receiver functions (PRFs) from temporary and permanent arrays throughout Antarctica, including the Antarctic POLENET, TAMNET, TAMSEIS, and GAMSEIS arrays, to explore the characteristics of the MTZ beneath the continent. We obtained PRFs for earthquakes occurring at 30-90° with Mb>5.5 using a time-domain iterative deconvolution method filtered with a Gaussian-width of 0.5 and 1.0, corresponding to frequencies less than ∼0.24 Hz and ∼0.48 Hz, respectively. We combine P receiver functions as single-station and as common conversion point stacks and migrate them to depth using the ak135 1-d velocity model. Results from West Antarctica suggest that the thickness of the MTZ varies throughout the region with thinning beneath the Ruppert Coast of Marie Byrd Land and beneath the Bentley Subglacial Trench and Whitmore Mountains. Also, prominent negative peaks are detected above the transition zone beneath much of West Antarctica and may be evidence for water-induced partial melt above the MTZ. Preliminary results from single-station stacks for the mantle transition zone beneath East Antarctica suggests that one section of East Antarctica, off of the South Pole may have slightly thinned transition zone. Results are forthcoming from the mantle transition zone beneath Victoria Land and the Northern Transantarctics. We propose that the MTZ beneath parts of West Antarctica and possibly also beneath one region of East Antarctica, is hotter than average, possibly due to material upwelling from the lower mantle. Furthermore, we propose that the transition zone beneath much of West Antarctica is water-rich and that upward migration of hydrated material results in formation of a partial melt layer above the MTZ.