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Revealing the crust of western Romania using CCP tehniques

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The western part of Romania was poorly investigated until now in terms of crust and lithosphere structure. The South Carpathian Project (SCP) is a joint project in Romania aimed at determining the lithospheric structure and geodynamical evolution of the South Carpathian Orogen using a dense, temporary network of broad-band seismographs. Alongside existing permanent broad band stations in the study region (12), 33 broadband seismic stations were installed in September 2009 to operate autonomously for two years.
We analyze teleseismic P-to-S receiver functions to image crustal structure and uppermost lithosphere. The receiver functions (RF) are calculated in time domain by iterative deconvolution. The further data processing and analysis was performed using FuncLab, a GUI-based MATLAB receiver function processing toolkit (Eagar and Fouch, submitted 2011). We apply a common conversion point (CCP) stacking of receiver functions - a method used to image smooth regional topography on subhorizontal interfaces (Eagar et al. 2010). It is a back-projection method in which the receiver function amplitudes are placed in the appropriate position along the raypath based on a time-to-depth conversion. These amplitudes are then binned at each depth based on the position of the ray piercing point and then stacked to enhance the signal originating from that approximate position. We first perform 1-D ray tracing, then accommodate for large lateral variations in seismic velocities across the region by applying linear timing corrections based on a high resolution regional S wave tomography model (Young et al., in preparation) and then compute the time-to-depth conversion of the receiver functions. The final step in the workflow is CCP stacking. We also apply a Gaussian-weighted common conversion point stacking (GCCP) by weighting the receiver functions within the stacks by the distance of the piercing point from the image point, which is the same as the center point of the CCP bin. The weight is determined from a 2-D Gaussian function whose one standard deviation width is chosen appropriately by the array aperture and/or Fresnel zone at the imaging target (Eagar et al., 2011).
Our results reveal an average crustal thickness of 28-30 km beneath the Romanian sector of the Panonian Basin and a thicker crust for stations within the Southern Carpathian Orogen ($\sim$35km). For two stations located in the Apuseni Mountains the Moho discontinuity is replaced by a transition zone extended between 36 and 40 km depth. The H$-$k stacking solutions reveal significant variations in crustal thickness across the study region. Both H-k and GCCP stacking show general agreement in the pattern of Moho topography. Discrepancies between the two results are mostly linear shifts and both exhibit the same broad-scale patterns. Poisson's ratios across the region vary strongly and regional patterns do not directly correlate with variations in Moho depth.