# CRUST1.0: An Updated Global Model of Earth's Crust

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We present an updated global model of Earth's crustal structure. The new model, CRUST1.0, serves as starting model in a more comprehensive effort to compile a global model of Earth's crust and lithosphere, LITHO1.0. CRUST1.0 is defined on a 1-degree grid and is based on a new database of crustal thickness data from active source seismic studies as well as from receiver function studies. In areas where such constraints are still missing, for example in Antarctica, crustal thicknesses are estimated using gravity constraints.

The compilation of the new crustal model initially follows the philosophy of the widely used crustal model CRUST2.0 (Bassin et al., 2000; http://igppweb.ucsd.edu/~gabi/crust2.html). Crustal types representing properties in the crystalline crust are assigned according to basement age or tectonic setting. The classification of the latter loosely follows that of an updated map by Artemieva and Mooney (2001) (http://www.lithosphere.info). Statistical averages of crustal properties in each of these crustal types are extrapolated to areas with no local seismic or gravity constraint. In each 1-degree cell, boundary depth, compressional and shear velocity as well as density is given for 8 layers: water, ice, 3-layer sediment cover and upper, middle and lower crystalline crust.

Topography, bathymetry and ice cover are taken from ETOPO1. The sediment cover is essentially that of our sediment model (Laske and Masters, 1997; http://igppweb.ucsd.edu/~sediment.html), with several near-coastal updates. In the sediment cover and the crystalline crust, updated scaling relationships are used to assign compressional and shear velocity as well as density. In an initial step toward LITHO1.0, the model is then validated against our new global group velocity maps for Rayleigh and Love waves, particularly at frequencies between 30 and 40 mHz. CRUST1.0 is then adjusted in areas of extreme misfit where we suspect deficiencies in the crustal model. These currently include some near-coastal areas with thick sediment cover and several larger orogenic belts. Some remaining discrepancies, such as in backarc basins, may result from variations in the deeper uppermost mantle and remain unchanged in CRUST1.0 but will likely be modified in LITHO1.0. CRUST1.0 is available for download.

References:

Artemieva, I.M. and Mooney, W.D., Thermal thickness and evolution of Precambrian lithosphere: A global study, J. Geophys. Res., 106, 16,387-16,414, 2001.

Bassin, C., Laske, G. and Masters, G., The Current Limits of Resolution for Surface Wave Tomography in North America, EOS Trans AGU, 81, F897, 2000.

Laske, G. and Masters, G., A Global Digital Map of Sediment Thickness, EOS Trans. AGU, 78, F483, 1997.

URL: http://igppweb.ucsd.edu/~gabi/crust1.html