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Compilation of initial 3-D crustal model northern Fennoscandian shied

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POLENET/LAPNET project is a passive seismic array experiment in northern Finland with some stations also in northern Sweden, Norway and Russia. The experiment was a part of International Polar Year (IPY) 2007-2009. One of the main targets of the project is to obtain a seismic model of the upper mantle using tomographic inversion of teleseismic travel times. In order to correct teleseismic travel times for crustal effect a seismic crustal 3-D model of the POLENET/LAPNET research area is needed. The aim of this study is to compile a 3-D crustal model of northern Fennoscandian shield centred in northern Finland and extending to surrounding areas in Sweden, Norway, and Russia. The modelled area is located between 64° – 70° N and 18° – 34° E. The new crustal model may be regarded as a northward extension of the 3-D crustal model of previous SVEKALAPKO crustal model and it is based mainly on published models of previous 2-D controlled source seismic (CSS) experiments. There are four major seismic profiles in our research area: wide-angle reflection and refraction profiles FENNOLORA in Sweden, POLAR in Finland, and Kostomuksha-Pechenga in Russia, and near-vertical reflection transect FIRE4 in Finland. In addition to these main profiles there are smaller profiles, most of them with only one shot-point, but there are also quite large areas with no previous information at all. These regions of data gaps may partly be filled by receiver function information on Moho depth based on published receiver functions studies on SVEKALAPKO data in Finland and SNSN data in Sweden and initial analysis of receiver functions obtained from POLENET/LAPNET data. CRUST3D program is used for compiling a 3-D crustal model of all these different types of data. The program is designed to take advantage of the different methodological strengths and to compile a 3-D crustal model that fits all available data within its appropriate individual and methodological uncertainty limits. The original data leading to the published models were carefully analysed to ascertain only information is used from locations where Moho reflectors/refractors were actually observed. During the compilation of 3-D crustal model, Moho reflector/refractor elements are off-line migrated in space based on a preliminary interpolation and mainly relying on information on nearby profiles. After 3-D migration of all derived Moho elements, final Moho surface is derived by a second interpolation round. With the Moho interface defined, all available CSS velocity information can be locally appointed to the corresponding grid. The Moho interface is obtained by application of the principle of simplicity: the aim is to find a smoothest Moho interface that satisfies all reflector data within their a priori estimated error bars. It is important to note that we do not suggest our such derived 3D crustal model to be "correct" or the even geologically most likely model. Rather, our a priori model denotes the seismic model of least complexity fitting all presently available seismic information as this is the best initial reference model for further updates with new and additional data.