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Transdimensional Bayesian approach to seismic traveltime tomography applied on field data from the Salzach Valley.

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One of the major issues of linearized inverse modeling of non-linear seismic data is the need to quantify the uncertainty that affects every solution model. We are developing a transdimensional Monte Carlo Markov Chain algorithm that provides a quantitative estimation of uncertainty in traveltime tomography through a probabilistic approach. Our transdimentional Bayesian algorithm samples the parameters space and provides not a single-model solution but an ensemble of model. The probability distribution for the inverse parameters in this ensemble contains much more information than a single deterministic solution model and allows a quantitative assessment of model parameters uncertainty. The inverse model parametrization density and geometry are not user-defined but data-driven.
A synthetic example will be used to present some preliminary results: the use of multiple parallel Markov Chains is shown to be a valuable method to speed up the sampling of the model space. Further improvements both in computational efficiency and quality of the solutions are obtained through the use of "staggered grids". Finally the method is applied to a field dataset from the Salzach valley (Austria), the results are compared with a previous reflection-refraction study on the same data by F. Bleibinhaus (2012). Future directions in the development of our code will be presented.