INFLUENCE OF STATION ARRAY DESIGN ON RESOLUTION OF RECONSTRUCTED MODELS IN 3-D LOCAL EARTHQUAKE TOMOGRAPHY

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In local earthquake tomography, resolution of results depends on several important factors such as quality and quantity of data, earthquake distribution, station spacing and density, model parameterization, initial velocity model, damping parameters etc. It is impossible to change the earthquake locations, to increase the data or to redesign the velocity structure. However, only one thing affecting the resolution of tomographic inversion is in our hands. This factor is related to the station parameters (e.g. number of station, station spacing, and array design). A well-designed station array on the basis of the earthquake distribution is able to increase the resolution. In this study, to demonstrate the influence of the station distribution on the inversion, different station arrays are designed for three type event scattering model (sparsely model, fault model, and cluster model) that can be observed in the nature. For each earthquake distribution type, a forward modeling is performed by using two synthetic models (checkerboard and characteristic structures) and different station arrays (irregular, gridded, circular, nested circular and crosswise). Before the inversion, Gaussian distributed noise with a standard deviation of 0.1 s and zero mean is added to the synthetic P-wave travel times. For each station array, same inversion parameters are used during the inversion procedures to prevent differentiation between computations. To assess the solution quality, some standard resolution tests are applied on the inverted synthetic data. All inversion results show us that there are some particular resolution differences in usage of different station arrays for same travel time data set and velocity model.