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Preface to the special issue "Developments in GPR and near-surface seismics — New applications and strategies for data integration, inversion, and modelling"

Research in the fields of near-surface seismic and ground penetrating radar (GPR) has seen strong and sustained growth as evidenced by the development of novel methods and applications. This special issue consists of 14 articles, which are based on pertinent presentations given at the European Geoscience Union's General Assembly in 2010 covering a wide range of topics and reflecting current developments and trends in these research fields.

First, Yedlin et al. present a new and improved transfer function for transforming a three-dimensional (3D) data set to the equivalent 2D data set. Next, Belina et al. (a) investigate the performance of a full-waveform cross-hole GPR data inversion scheme in cases where dispersion affects the data to various degrees. Belina et al. (b) also explore the performance of full-waveform cross-hole GPR data inversion, but in this case the focus is directed towards improving source wavelet estimation. Meles et al. describe an improved algorithm for the full-waveform inversion of GPR data acquired in media containing strong contrasts. Please note that this paper has accidentally been published in a regular issue of this journal (v. 73, p. 174-186) and is reprinted here for completeness. Böniger and Tronicke present a spectral decomposition approach for improving high-resolution GPR imaging of thin-bed layering. The following article by Bouchedda et al. presents and tests a new algorithm proposed for joint inversion of cross-hole GPR data and electrical resistivity tomography (ERT) data. Doetsch et al. focus on joint interpretation of GPR and ERT data collected along the ground surface and use GPR reflection data to constrain ERT data inversion. Lo et al. present a solution to the seismic stimulation problem and test the performance of their scheme by comparing calculated results to laboratory data. Perozzi et al. use geostatistical approaches for jointly interpreting seismic travel times and log data from boreholes in order to improve Ni-grade estimates with implications for a specific Canadian mining site. Gloaguen et al. suggest a geostatistical approach for improved GPR velocity characterisation of the subsurface, which relies on integrated analysis of radar reflection data collected at the surface and log data. McGlashan et al. use time-lapse cross-hole GPR investigations in order to track changes in GPR wave velocity and amplitude characteristics possibly related to growth of biomass and degradation of hydrocarbons in an area, where different hydrocarbons have been injected into the subsurface. André et al. provide a detailed soil stratigraphy that is based on interpretations of GPR, electromagnetic induction and ERT data, which provide useful constraints for wine production. Dorn et al. collect and interpret different types of borehole GPR data in order to map highly permeable fracture zones and improve knowledge of flow path geometry in a granitic aquifer in France. The final article of the special issue is written by Krawczyk et al., who present and interpret shear-wave seismic data of high resolution collected in a region of the city of Hamburg influenced by a salt diaper with the purpose of imaging hazardous fault and sinkhole structures in this densely populated area.

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