Special section

GPR data imaging and interpretation - Introduction

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Ground Penetrating Radar (GPR) is a well-established geophysical method that has found applications in a wide range of applied geophysics problems, from investigations at the earth's polar regions to infrastructure sensing at the hearts of our modern metropolises. Notwithstanding many advances in GPR practice, GPR data continue to pose challenges to interpreters. Due to the continuous improvement in data acquisition technologies the community reaps the benefits of fast, multi-frequency and multi-channel recordings. At the same time, imaging and interpretation algorithms are called upon to handle a rapidly growing amount of data, which often require adaptive and efficient batch processing. For both conventional and more advanced techniques, dedicated processing of the highly non-stationary GPR signal is required to overcome the difficulties in transitioning from data to imaging and interpretation. Interpretation may also require new techniques and tools for the visualization and quantification of subsurface structure.

In this special section of GEOPHYSICS, a collection of 7 (9??) articles provides the GPR community with examples from the latest trends in this inherently challenging task, and proposes some of the future directions for research in this area. We briefly present below the summaries of the published articles.

Liu and Shi propose to utilize diffraction imaging of GPR data to assess water pipeline leakage. The laboratory and field experiments substantiate its viability and illustrate the potential of using GPR to such applications.

Ercoli and Fergusondemonstratethe performance of Gabor Deconvolution on data with mixed-phase dominant wavelets, such as the GPR data,to compensate for attenuation and improve the temporal resolution.They test this technique on synthetic profiles and apply it on a 3D real GPR dataset, improving the imaging of an important active fault in Central Italy as well as suggesting clear benefits in other applications.

Angelis et. al present a workflow for processing multi-offset GPR data from systems with multi-concurrent receivers. These novel systems' data require an innovative anddedicated data procesing workflow combined with methods adapted from seismic data processing, to produce stacking velocity fields and zero-offset sections with increased singnal to noise ratio.

Highlightingthe growing popularity of drones in geophysical surveying, **Booth and Koylass** undertake a critical analysis of adrone-GPR platform for velocity analysis. The authors use synthetic and field data to show that refraction effects across the air-ground interface significantly distort the moveout of diffraction hyperbolae, introducing significant errors to GPR velocities estimation.

Allroggen et al. present an attribute classification-based interpretation approach of 3D GPR data collected across a breccia pipe on Svalbard. After comparing their results with a manual interpretation, the authors obtain insight into the pipe architecture and its internal structures.

Diamanti et al. explore the issue of "unusual" responses sometimes encountered in GPR sections whichcould cause mis-interpretation of survey results. After developing a conceptual explanation, both numerical modelling and field data are employed to demonstrate the concepts described and the results lead to recommendations on key factors to consider in GPR field operations and in data interpretation.

In their study, **Alemdağ et al.** combined GPR data obtained with different dominantfrequency antennas on the same profile with simple and time-shifted balanced summation techniques. In addition, they demonstrate the usage of FDLMNF (needs all the words), f-x and AGCfilters for the improvement of these GPR sections'imaging quality.

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