Mars, accessing the third dimension: a software tool to exploit Mars ground penetrating radars data.

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The Mars Advanced Radar for Subsurface and Ionosphere Sounding (MARSIS), on board the ESA's Mars Express and the SHAllow RADar (SHARAD), on board the NASA's Mars Reconnaissance Orbiter are two ground penetrating radars (GPRs) aimed to probe the crust of Mars to explore the subsurface structure of the planet. By now they are collecting data since about 10 years covering a large fraction of the Mars surface.
On the Earth GPRs collect data by sending electromagnetic (EM) pulses toward the surface and listening to the return echoes occurring at the dielectric discontinuities on the planet's surface and subsurface. The wavelengths used allow MARSIS EM pulses to penetrate the crust for several kilometers.

The data products (Radargrams) are matrices where the x-axis spans different sampling points on the planet surface and the y-axis is the power of the echoes over time in the listening window.
No standard way to manage this kind of data is established in the planetary science community and data analysis and interpretation require very often some knowledge of radar signal processing.

Our software tool is aimed to ease the access to this data in particular to scientists without a specific background in signal processing. MARSIS and SHARAD geometrical data such as probing point latitude and longitude and spacecraft altitude, are stored, together with relevant acquisition metadata, in a geo-enabled relational database implemented using PostgreSQL and PostGIS. Data are extracted from official ESA and NASA released data using self-developed python classes and scripts and inserted in the database using OGR utilities. This software is also aimed to be the core of a collection of classes and script to implement more complex GPR data analysis.
Geometrical data and metadata are exposed as WFS layers using a QGIS server, which can be further integrated with other data, such as imaging, spectroscopy and topography. Radar geometry data will be available as a part of the iMars WebGIS framework and images will be available via PDS and PSA archives.
QGIS is a freely available analysis tool available for PC, Mac and Linux platforms. A dedicated QGIS plug-in allows, once the data of interest have been selected in the main QGIS window, to visualize the corresponding radargrams. The plug-in can show the radargrams individually or aligned by latitude. Different lookup table can be selected. When available, surface clutter simulations can be visualized, alone or superposed to the actual radargrams, to help data intepretation.
This tool is aimed to be distributed to the scientific community using Mars GPRs.