

## GeoMEx: Geographic Information System (GIS) Prototype for Mars Express Data

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## Abstract

As of today almost a decade of observational data have been returned by the multidisciplinary instruments on-board the ESA's Mars Express spacecraft. All data are archived into the ESA's Planetary Science Archive (PSA), which is the central repository for all ESA's Solar System missions [1]. Data users can perform advanced queries and retrieve data from the PSA using graphical and map-based search interfaces, or via direct FTP download [2]. However the PSA still offers limited geometrical search and visualisation capabilities that are essential for scientists to identify their data of interest.

A former study has shown [3] that this limitation is mostly due to the fact that (1) only a subset of the instruments observations geometry information has been modeled and ingested into the PSA, and (2) that the access to that information from GIS software is impossible without going through a cumbersome and undocumented process.

With the increasing number of Mars GIS data sets available to the community [4], GIS software have become invaluable tools for researchers to capture, manage, visualise, and analyse data from various sources. Although Mars Express surface imaging data are natural candidates for use in a GIS environment, other non-imaging instruments data (subsurface, atmosphere, plasma) integration is being investigated [5].

The objective of this work is to develop a GIS prototype that will integrate all the Mars Express instruments observations geometry information into a spatial database that can be accessed from external GIS software using standard WMS and WFS protocols. We will firstly focus on the integration of surface and subsurface instruments data (HRSC,

OMEGA, MARSIS). In addition to the geometry information, base and context maps of Mars derived from surface mapping instruments data will also be ingested into the system. The system back-end architecture will be implemented using open-source GIS frameworks: PostgreSQL/PostGIS for the database, and MapServer for the web publishing module. Interfaces with existing GIS front-end software (such as QGIS, GRASS, ArcView, or OpenLayers) will be investigated and tested in a second phase.

This prototype is primarily intended to be used by the Mars Express instruments teams in support to their scientific investigations. It will also be used by the mission Archive Scientist in support to the data validation and PSA interface requirements definition tasks. Depending on its success, this prototype might be used in the future to demonstrate the benefit of a GIS component integration to ESA's planetary science operations planning systems.

## References

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[5] A.B. Ivanov, A. Frigeri, *Geographic Information System (GIS) database for MARSIS data*, 44th Lunar and Planetary Science Conference (2013)