

Mars Exploration (3)
Mars Exploration (2) (2)

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FRIEND NEUTRON TELESCOPE ONBOARD EXOMARS TGO: MAPPING OF SHALLOW
SUBSURFACE WATER AT MARS MODERATE LATITUDES

Abstract

Fine Resolution Epithermal Neutron Detector, FRENDO, is an instrument onboard ExoMars' Trace Gas Orbiter (TGO). It uses neutron measurements to detect hydrogen (and thus water) variations in the shallow subsurface of the Martian soil. Similar experiments have been performed in the past on Mars, but FRENDO's main characteristic is its neutron collimator that significantly narrows down the field of view (FOV) to 28 full cone which corresponds to a 60-200 km diameter spot on the surface. This is considerably smaller than the spatial resolution of previous experiments and thus allows us to peek inside local features of hydrogen variations.

The instrument has been measuring for almost one full Martian year currently so what we present is a result of continuous observations of shallow subsurface water between May 2018 and present. A technique to locate the most prominent local spots, either very "dry" or very "wet", was developed to analyze the planetary surface from 70 degree North down to 70 degree South. It yielded several such local spots of interest that are presented, characterized and associated with particular geomorphological features or/and with the selected candidates of landing sites.

It is known that water or water ice is not stable at the surface of Mars, especially closer to equator, thus locating areas with enhanced subsurface hydrogen or water is of much interest both scientifically and in terms of future exploration. FRENDO is most sensitive to water in the shallow subsurface of about 1 m deep, which makes such deposits easily accessible and valuable.