EPSC Abstracts
Vol. 13, EPSC-DPS2019-1977-1, 2019
EPSC-DPS Joint Meeting 2019

EPSC
EPSC-DPS Joint Meeting 2019
15–20 September 2019 | Geneva, Switzerland

Fine Resolution Neutron Detector: global and local near-surface water abundance on Mars

Igor Mitrofanov, **Alexey Malakhov**, Maxim Litvak, Anton Sanin and Dmitry Golovin

Space Research Institute, Moscow, Russia (malakhov@np.cosmos.ru)

Abstract

In this work we present latest results obtained by the Fine Resolution Epithermal Neutron Detector (FREND) instrument, which provides near-surface water content on Mars, both global maps and local features analysis.

1. Introduction

FREND is a neutron telescope instrument installed onboard Roscosmos/ESA ExoMars 2016 mission, Trace Gas Orbiter (TGO) spacecraft.

The instrument's main objective is to estimate hydrogen (water equivalent) content in the Martian soil shallow subsurface up to 1 m deep. It does so by measuring epithermal and fast neutron fluxes on orbit, which are highly dependent of water content in the soil below the spacecraft.

Characteristic feature of FREND is its collimator module which shields detectors from neutrons from outside the narrow field of view, allowing for maps of unprecedented spatial resolution, 60-200 km per pixel [1].

2. Global and local water abundance

In this talk we will present FREND's latest findings. The main scientific phase of TGO began in May 2018, so the instrument accumulated more than one year of measurements that are enough to compile statistically valid global map of water distribution, but also to look at some local features in more detail. The latter are of most interest since no neutron detector flown to Mars before could provide such a good spatial resolution, where one can start associating water content in the soil with local geomorphological features. These are of course extremely important for understanding climate conditions in regions of interest and, e.g., future landing sites.

References

[1] I. Mitrofanov et al.: Fine Resolution Epithermal Neutron Detector (FREND) Onboard the ExoMars Trace Gas Orbiter, Space Sci Rev (2018), https://doi.org/10.1007/s11214-018-0522-5