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High Water Content Areas Identified In Equatorial Band of Mars by FREND Neutron Telescope Onboard ExoMars TGO

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FREND is a neutron telescope installed onboard Russian-European ExoMars mission Trace Gas Orbiter. Neutron measurements from orbit are a good characteristic of water content in the subsurface of Mars down to 1 meter in depth. The instrument's major characteristic is its neutron collimator that narrows significantly the field of view allowing for mapping with high spatial resolution of 60-200 km.

Previous missions (e.g. HEND experiment on NASA's Mars Odyssey) showed that water content is enhanced mainly in Martian polar regions and at Arabia area, however spatial resolution of these instruments only allowed to map the surface with a resolution of several hundreds of kilometers. A study performed on FREND data accumulated during its science mission between May 2018 and January 2021 was targeted on equatorial band of $\pm 40^\circ$ latitude. We identified several local areas with enhanced mass fraction of water and performed a thorough analysis of each of them to identify the water content and estimate statistical significance of such wet spots.

The locations found are associated with major Martian relief formations, e.g. Olympus Mons, Ascraeus Mons, Xanthe Terra, Valles Marineris and others, each showing water content of tens of weight percent (wt%), with good statistical certainty above 3σ relative to the immediate dry surroundings.

In this talk we will present the areas identified as well as explain the search algorithm and water content estimation techniques.