HYPERSPECTRAL ANALYSIS OF TERRESTRIAL PLANETARY-ANALOG SITES: PRELIMINARY RESULTS FROM ANCIENT FLUVIAL ENVIRONMENTS IN THE GOBI AREA. Manzari P. 1, Camplone V. 2, 3, 4, Zinzi A.1,4, Ammannito E.1, Sindoni G.1, Zucca F. 3, Polenta G.1,4- 1 Agenzia Spaziale Italiana, 2 INAF-OAR, 3 Università di Pavia, 4 Space Science Data Center.

Introduction: In a study aimed at utilizing data acquired by the ASI PRISMA satellite on Earth [1] to compare spectral properties of rocks and minerals in terrestrial geological environments analogous to Mars observed by NASA MRO CRISM, we are focusing our attention on water-related environments to enhance the characterization of Martian sites [2]. This investigation aims to improve our understanding and characterization of Martian sites by examining spectral features in contexts involving water. By doing so, we leverage similarities between the two planets to better interpret data collected on Mars, providing a more comprehensive and detailed picture of the geological and mineralogical conditions on the Martian surface.

Methods and selected areas: Here we used PRISMA L2C/L2D (i.e., at-surface reflectance) products, adequately processed as described by [2], related to analogue sites for which field campaigns and sample mineralogical analyses were available.
In this view, we have analyzed different sites on the basis of the work by [3], [4]. The sites are located in the valley of Gobi Lakes, Mongolia (yellow circle in Fig.1). Due to the climatic conditions and fluvial morphologies present in this area, it is reasonable to consider it a promising terrestrial analogue for understanding paleolacustrine systems on early Mars [3]. To highlight spectral characteristics and correct for possible residual atmospheric features, we normalized the PRISMA data based on the average spectrum of the considered image [4].

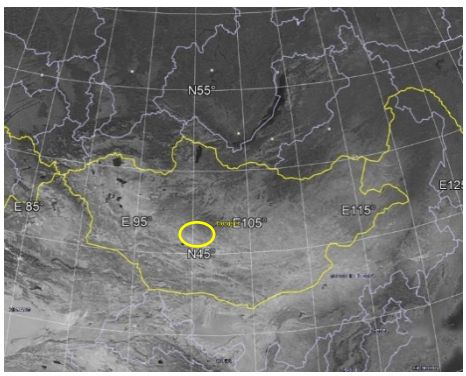

Figure 2. Valley of Gobi Lakes in Mongolia (yellow circle), basemap Google Earth.

Results and Discussion: As highlighted in Figure 2, the Gobi Lakes area features a variety of rocks, including granitoids, mafic and intermediate rocks, and sediments.

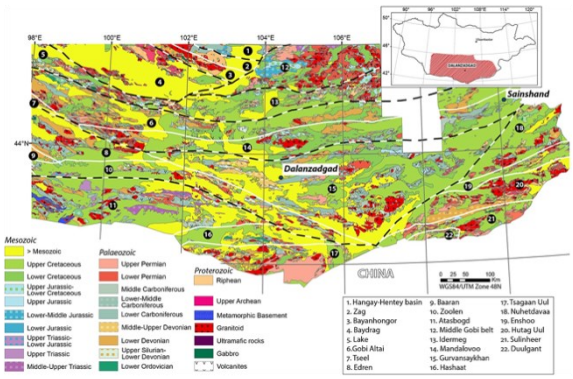

Figure 1. from Guy et al., 2014

This implies that within a few kilometers, different rock types with diverse origins are present. Regions of Interest (ROI) studied by [3] are located in the area indicated by the pink arrow.
Specifically, mineralogical analyses of sediments in ROI 3 revealed the presence of quartz, albite, and calcite.

PRISMA data analysed and corresponding to the ROIs investigated by [3], allowed to identify all min-

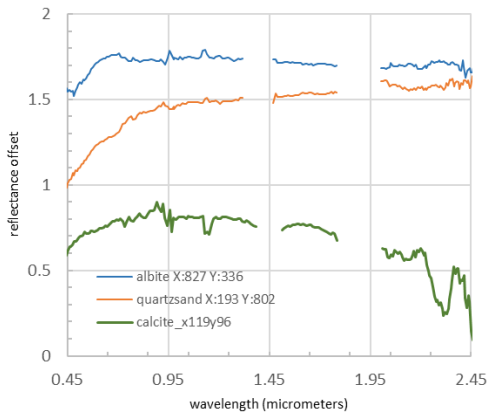

Figure 3. PRISMA spectra of minerals found in ROI3

erals present in the different scenes. For example, as shown in Figure 3, the spectral signatures of the three minerals in ROI 3 (albite, quartz sand and calcite) are clearly distinguishable in PRISMA spectra.

The presence of quartz and albite in the sediments of ROI 3 is correlated with the occurrence of granitoids in the region. The presence of calcite might be associated with groundwater activities.

Conclusions and future works: The results obtained from this investigation underscore the robustness and applicability of PRISMA data in interpreting spectra from diverse planetary surfaces. The potential

utility of this approach extends beyond Earth and can be extremely valuable in characterizing distant planetary environments by comparing the terrestrial spectra with the wealth of hyperspectral data acquired on other planets, such as Mars.

This study has also highlighted the crucial importance of field data collection to establish the fundamental foundations necessary for accurate interpretation of remote sensing spectra. The need for ground-truth data collected directly in the field is evident, as geological maps, while valuable resources, may not be available with the spatial resolution required for precise validation of spectral data. This emphasizes the importance of a multifaceted approach, combining satellite data with information obtained through on-site missions for a more in-depth and accurate understanding of the geological and mineralogical characteristics of a specific area.

In the future we aim at selecting a series of regions of Earth to be observed and analysed by PRISMA and subsequently to be compared with CRISM hyperspectral observations of sites of potential interest.

References: [1] Caporusso et al., 2020. IEEE IGARSS 2020 Proceedings, 3282. [2] Zinzi et al., 2023. Abstract XVIII Congresso Scienze Planetarie, Perugia, [3] Sekine et al., 2020. Minerals, 10(9):792. [4] Manzari et al., 2023, Proceedings Whispers 2023, paper n.146.

[5] Guy et al., (2014), J. Geophys. Res. Solid Earth, 119, 7966–7991, doi:10.1002/2014JB011026.