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The use of infrared remote sensing to prospect ore deposits on Mars. Preliminary results from a planetary field analog in the Rio Tinto mining area in Spain

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Data from martian rovers and martian meteorites suggest the presence of ore minerals on Mars (eg. pyrite, chalcopyrite, pentlandite). Three spectrometers: CRISM (The Compact Reconnaissance Imaging Spectrometer for Mars; spectral range 0.4-3.9 μm) onboard Mars Reconnaissance Orbiter (MRO), OMEGA (Observatoire pour la Mineralogie, l'Eau, les Glaces et l; Activité, 0.4 - 5.1 μm) and PFS (Planetary Fourier Spectrometer, 1.3-45.0 μm) onboard Mars Express (MEX) operate in near infrared (NIR) spectrum and provide information on the mineral composition of Mars but none of them is yet capable to efficiently identify sulfides. Detecting sulfide ore deposits is difficult in NIR due to spectral interferences with silicates. Due to the limited *in-situ* measurements by the Opportunity, Spirit, Curiosity, and Perseverance rovers, Mars mineralogical studies must be supported by studies of terrestrial analogs. One example is the Rio Tinto area in Andalusia, Spain, which hosts the largest known volcanogenic massive sulfide deposits on Earth. In this area, we analyzed satellite images in the infrared spectrum (ASTER, Landsat 8). We will compare these results to mineralogical data we will retrieve in the field during envisaged geological mapping in Spring 2022. By establishing our test field for remote sensing of sulfide deposits in a PFA site on Earth, we will be able to determine abundance thresholds for the detection of major sulfide phases on Mars and identify their key spectral features. Our results will help in 1) more efficient use of the current NIR Martian spectrometers to detect ore minerals, 2) designing new space instruments optimized for ore detection to include in future missions to Mars such as one developed at the Institute of Geological Sciences and the Space Research Centre of the Polish Academy of Sciences called MIRORES (Martian far-IR ORE Spectrometer).

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