Geophysical Research Abstracts
Vol. 15, EGU2013-4397, 2013
EGU General Assembly 2013

Scale-integrated spectral characterisation of mineralogical analogues to Mars at Rio Tinto

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Iron-sulfur assemblages within the Rio Tinto basin of Huelva province in Spain show mineralogical similarities to sites on the surface of Mars as determined by orbital and lander datasets. Exploration of Mars surface environments is intermittent and resolution-limited, and additional layers of information available for terrestrial analogue sites may extend incomplete planetary datasets. Characterising mineralogy in satellite, field and laboratory reflectance spectra of Rio Tinto sites can determine how accurately Mars-relevant mineralogies are represented in orbital data. Comparisons with Mars datasets, such as OMEGA and CRISM, can provide insights into planetary surface conditions. Interaction between materials in field mixtures can lead to potential interferences between endmembers and/or offsets in spectral features, which can obscure or hinder the identification of certain minerals. Such interactions can be difficult to predict on the basis of library spectra collected using pure materials. Determination of which diagnostic spectral features can be identified in field mixtures is an advantage of collecting data in real world environments, and can be used to aid interpretation of planetary datasets. This study utilizes the dynamic sulfur and iron deposits of Rio Tinto as an analogue of Mars sites such as Meridiani Planum, using the many scales of observation available for the terrestrial sites as a means of extending our view of Mars surface conditions from the orbital view to which we are frequently limited.