Mineral deposits on Mars revealed with the OMEGA visible-infrared imaging spectrometer and their implications for astrobiology

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OMEGA, a visible and Near-Infrared imaging spectrometer onboard Mars Express, has been observing Mars since January 2004 covering over 50% of the planet. These data reveal a new face of Mars in terms of surface mineralogy with significant astrobiological implications. The data have allowed the mapping of the CO2 and H2O ices over the southern and northern polar cap as well as the determination of global and regional maps of high and low calcium pyroxenes, which are sometimes in very high concentrations and small areas extremely enriched in olivine. Most relevant to astrobiology, the instrument allowed the identification of hydrated minerals (sulfates and silicates) Hydrated sulfates are commonly observed in association with high concentrations of ferric minerals, probably oxides. Hydrated silicates are commonly observed in completely distinct deposits. These minerals are associated with layered deposits and the identification of sulfates favors a formation through the deposition in a standing body of water or through groundwater or hydrothermal processes. These environments could have favored the apparition of life on Mars and are thus important targets for future investigation. We

started a comparison of the mineralogy identified on Mars through the OMEGA dataset with a terrestrial analogue, the Rio Tinto in Spain. The mineralogy associated with this very acidic river (pH~2) is dominated by oxides and sulfates. This analysis will lead us to a better understanding of the processes at stake on Mars in the formation of the sulfate and hydrated silicate deposits, and their consequences for astrobiology.