Mineralogy at Meridiani Planum, Mars, from the MER Opportunity Mössbauer Spectrometer

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The Mars Exploration Rover (MER) Opportunity landed in Eagle crater, Meridiani Planum, on 24 January 2004 [1]. This landing site was chosen on an engineering basis, because the region seemed to be flat and smooth favoring a save landing and because hematite (α-Fe_2O_3) was detected from orbit by the MGO Thermal Emission Spectrometer (TES) in significant quantities. Hematite can form in different ways, including aqueous processes. After landing Opportunity with its Mössbauer (MB) spectrometer investigated soils and outcrop material present in Eagle crater, before exploring the plains and several other craters. In contrast to the Spirit landing site at Gusev crater, the surface within Eagle crater and the surrounding plains are not heavily covered with large rock fragments. The surface is very flat and smooth with some wind ripples on the top, and with several craters of different sizes (up to $\sim$200 m diameter) where exposed outcrop material similar to Eagle crater is found.

The scientific objective of the MB spectrometer MIMOS II on MER [3] is to identify the Fe-bearing minerals and phases, provide quantitative information about the amount of these minerals and phases present in soils and rocks, and the oxidation state and coordination state of Fe. In Meridiani Planum, MB could identify four main mineralogical components [1,2]: (i) a ferric sulfate, called jarosite, present in significant amounts in the hematite- and sulfate-rich outcrop rock unit covering the surface and craters of Meridiani Planum along Opportunity's traverse ($\sim$ 6.5 km at Sol 720); (ii) hematite rich soil (whole spherules and their fragmants as lag deposits); (iii) olivine bearing basaltic soil; (iv) and spherules with diameters of 3-5 mm whose primary Fe-bearing phase is hematite. The spherules are dispersed throughout the outcrop and on the surface. The sulfate-rich outcrop thus has two populations of hematite: the spherules and outcrop matrix.

We will discuss the Mössbauer mineralogical composition at Meridiani and it's implications on possible aqueous processes present in the past, as well as changes and variations in mineralogy along Opportunity's traverse to Victoria crater which is about 7 km away from the landing site.

[1] Squyres et al., *Science*, 306 (2004) 1698. [2] Klingelhöfer et al., *Science*, 306 (2004) 1740.

[3] Klingelhöfer et al., *J. Geophys. Res.* 108 (2003), doi 10.1029/2003JE002138.