MICROMETEORITIC NICKEL IN THE MARTIAN SOIL

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Model. *EMMA* is a model describing the effects of the accretion of micrometeorites on the early terrestrial planets during the period of late heavy bombardment (*LHBomb*), prior to ~3.9 Gyr. On the Earth and Moon there are well preserved remnants of this accretionary phase, including in particular the iridium and Ni content of the lunar crust and the Ir content of the upper mantle of the Earth, which are well predicted by *EMMA* (*see a companion abstract*). The extrapolation of *EMMA* to Mars represents a difficult undertaking because its early history is very poorly known. We just relied on the model developed successfully for 3 siderophile elements (Ni, Ir and Au) on the Moon. We further assumed that the micrometeorites flux is inversely proportional to the heliocentric distance, and that the end of the scavenging period of siderophile elements by core formation corresponds to that of the formation time interval of the planets, of about 100 Myr (i.e., a value both deduced for the Earth and predicted by dynamicists for the last stage of accretion involving planetary embryos). ***Predictions***. The micrometeoritic contribution can be estimated from the Ni content of about 1 % recently measured in new "unweathered" micrometeorites recovered from snow samples in central Antarctica (*see a companion paper*). It includes two components: (1) the dominant *LHBomb* component is due to the much enhanced flux of micrometeorites effective during the *LHBomb*, prior to ~4 Gyr. Assuming that it was mixed into a lunar type ~25 km thick mega-regolith, the Ni content expected from this component on Mars is bracketed between 0.1–0.3 wt% Ni, for a density of the Martian soil varying from 1 to 3 g/cm^3; (2) the second minor *normal* component was delivered by the contemporary flux of micrometeorites to a 5 m thick regolith (i.e., similar to the regolith that tops lunar Maria) over the last ~4 Gyr, after the end of the *LHBomb*. It yielded a Ni content about 5 times smaller than that of the *LHBomb* component. There is a good fit between the predicted *LHBomb* Ni content and the observed value of ~0.2 %, which can be inferred from the X-ray spectra available on the JPL Web site (it was acquired by the APXS instrument on board of SPIRIT). However, this value appears to be very high and could be due to some man-made contamination still to be appropriately assessed. If this is so, we expect that the revised value cannot be smaller than the *normal* micrometeoritic Ni contribution of about 0.02% to 0.06%.