Geophysical Research Abstracts,
Vol. 10, EGU2008-A-12199, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-12199
EGU General Assembly 2008

Magnetic properties of lunar materials: comparison between meteorites and sample return

P. Rochette (1), J. Gattacceca (1), A. Ivanov (2), M. Nazarov (2) and N. Bezaeva (1,3)

(1) Department of Geophysics and Planetology, CEREGE, CNRS/Aix-Marseille University, Aix-en-Provence, France (gattacceca@cerege.fr), (2) Vernadsky Institute, Moscow, Federation of Russia, (3) Lomonosov State University, Moscow, Federation of Russia

Our natural satellite is the only body in the solar system from which samples are available through two completely different processes: sampling by man made spacecrafts, i.e. « sample return », and natural sampling by impact and transport to the Earth, i.e. meteorites.

While the samples returned by the Apollo 11 to 17 missions from 1969 to 1972 (380 kg of soils and rocks) and by the Luna 16, 20 and 24 missions from 1970 to 1976 (320 g of soils and minute rock fragments) has been the subject of considerable work in the years following missions, only two lunar meteorites have been studied previously for their magnetic properties: Yamato 791197 and ALH81005. We will present a comprehensive study of lunar meteorites (about 100 meteorites from 50 different falls), and compare it to published data on the Apollo and Luna missions, as well as new data from the Luna 16 and 20 surface soil samples, and from the Luna 24 two-meter long core.

We concentrate on magnetic susceptibility (χ in nm^3/kg) and saturation remanence (M_{rs} in mAm^2/kg) that reflects the amount and grain size of metallic iron. In Luna soils χ decreases with increasing depth and grain size, due to the predominance of Fe metal nanoparticles associated to regolithization processes (amount of metal up to a few %). Meteorites, Luna and Apollo samples share the same wide range of susceptibility ($1.9<\log\chi <4.6$) and saturation remanence ($-1<\log M_{rs} <2.5$), although meteorites have on average lower metal content due to a lower regolithic component. Most mare basalts appear nearly paramagnetic (metal content $<<0.1\%$) and more magnetic rocks are found within the highland or impact reprocessed materials. Meteorites provide a better sampling of the anorthosite highland lithology, very rare in sample return collection. This lithology provides the least magnetic material ever sampled in the solar system ($\log\chi < 2.5$).