Global Mapping of Internal Lunar Magnetic Field

Mohamed-Cherif BERGUIG (1), Mohamed HAMOUDI (), Jean-Louis LEMOUEL (), Mioara MANDEA (), and Yves COHEN ()

(1) Universite des Sciences et de la Technologie Houari BOUMEDIENE, BP32 USTHB, 16123 Bab-Ezzouar, Alger, Algerie, berguig@ipgp.fr, (2) GFZ German research Centre For Geosciences, Section 2.3, Telegrafenberg, 14473 Potsdam, Germany, hamoudi@gfz-potsdam.de, (3) Geomagnetisme, Institut de Physique du Globe de Paris, IPGP, 4 Place Jussieu, 75252 Paris Cedex 05, lemouel@ipgp.fr, (4) Geophysique Spatiale et Planetaire, Institut de Physique du Globe, 4, Avenue Neptune, 94107 Saint Maur des Fosses, Paris, France, mioara@ipgp.fr

We present a new study of the lunar magnetic fields using advanced methods and algorithms to select and process Lunar Prospector Magnetometer data (LP-MAG). These methods and algorithms have allowed us to derive a global model of the internal lunar magnetic field from the LP-MAG data acquired at low altitude, over 1999. To validate the results, we have developed a method based on properties of the potential fields, where the horizontal North and East components are derived from the vertical component, only. The global model estimated at spacecraft altitude is then downward continued at the Moon's surface using an inverse method approach. The obtained results confirm the crustal origin of the sources and show that the strongest anomalies are associated with formations of high albedo and/or are antipodal to large young basins (Orientale, Serenitatis, Imbrium, and Crisium) of age about 3.9 Ga. These basins are characterized by very weak anomalies. The modeling of some of the strongest anomalies shows clustered paleomagnetic pole positions within a radius of 35 degrees centered at (30S, 225E). These results support the hypothesis of a currently extincted paleo-lunar dynamo, which magnetized the lunar crust.