

THE GLOBAL MAPPING OF THE LUNAR CRUSTAL MAGNETIC FIELD USING NEW EXTERNAL INTERNAL SEPARATION FIELD TECHNIQUES

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In this work we report a global mapping of vector lunar magnetic field based on new method of separation of internal and external fields. The magnetic measurements collected during the lifetime of Lunar Prospector (LP) extended mission during 1999 were strongly disturbed by the solar wind, a period which coincided with a maximum of the 23 cycle activity. The multi scale wavelength external fields were analyzed using spherical harmonic transform. The external field determined by inversion was then removed from each magnetic field component for each half orbit. To map the vector magnetic crustal anomalies, all LP magnetometer data collected at low altitudes in the three different lunar environments: (1) geomagnetic tail (2) solar wind (3) geomagnetic sheath, were processed using this new approach. The results obtained using this method allow us to derive at, variable spacecraft altitudes, a high spatial resolution crustal magnetic anomalies fields. This global mapping clearly shows that the strongest anomalies are located antipodal to large young basins. Moreover, high albedo features, such as Reiner Gamma or Descartes Formations, are associated with similar magnitude anomalies. The modeling of some of these strongest anomalies shows a clustered paleomagnetic pole positions within a radius of 35 degrees centered at (30S, 225E). This result strengthens the hypothesis of a now extincted paleo lunar dynamo that may have probably magnetized rocks of lunar crust.

Lunar Magnetic Field

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