Lunar magnetism – the understanding so far!

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It has been known that the Moon does not have an active global magnetic field. But past missions to the Moon (e.g. Apollo missions, Lunar Prospector) have detected magnetic anomalies in many regions of the lunar surface. They carry rich information about geophysical processes on and within the Moon, thus central for understanding the structure and dynamics in the interior and the surface, e.g. the core and the suggested magma "ocean". The origin of lunar magnetization remains largely speculative. There are several mechanisms suggested in the past to explain the lunar magnetization, e.g. ejecta materials of the basins, impact shock reduction of preexisting ferromagnesian silicates, dike-like magmatic bodies in the crust, cometary impact generated transient fields and impact-related antipodal magnetization. But these mechanisms, either individually or combined, could not explain all observed anomalies. Among the other proposed mechanisms is the paleo lunar dynamo, i.e. the lunar-wide magnetization was acquired in an internal magnetic field generated by a dynamo once operated in the lunar core. A key for this to work is that the generated field strength should explain observations. Our estimation with a strong-field lunar dynamo suggests that the field strengths are between 155 and 700 nT, depending on the lunar core size. This estimation is consistent with more recent results from paleomagnetic analysis of Apollo sample (76535) which provides paleointensity of the Moon to be at least 300 to 1000 nT. Can we find a simple geophysical mechanism to model some of the observed magnetic anomalies and thus better utilize measurements of Chandryaan-2 for studies of lunar surface, its interior and evolution history?

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