Swirl Distribution on the Lunar Surface: Locations Antipodal to the Young Basins?

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The nature of diffuse albedo anomalies on the lunar surface that look like swirls is one of most interesting mystery in current lunar studies. There are two main classes of hypothesises of the swirl origin: formation of the swirls in the regions antipodal to large impact basins (1), and formation of the swirls in result of cometary impacts (2). The first hypothesise proposes that swirls represent regions whose higher albedo have been preserved due to deflection of the solar wind ion bombardment by strong crustal fields. The most likely magnetization mechanism was proposed by Hood, in which the ionized vapor cloud produced in a hypervelocity basin-forming impact expands around the Moon and concentrates the pre-existing ambient magnetic field at the basin antipode. The most recent data obtained by the Lunar Prospector show that swirl features are associated with magnetic anomalies and they lie on regions antipodal to the Imbrium, Serenitatis, and Crisium basins. The second hypothesis does not suggest correlation between the swirl locations and the regions antipodal to basins. Gold and Soter suggested a mechanism of a local magnetic field origin on the Moon in result of cometary impact. The local shock produced by collision of the main mass of a comet nucleus with the Moon will indeed occur just when the ambient solar wind fields have been strongly enhanced, as the large partially ionized cometary coma is compressed against the lunar surface. Schultz and Srnka , Bell and Hawke, Shevchenko considered that swirl patterns on the lunar surface could be related to the imprint of recent cometary impacts. In order to investigate the features of the swirl distribution along lunar surface there were identified and mapped swirl locations within regions where they were observed. The areas of all identified swirl fragments were measured and statistical analysis of the distribution was performed. The more strong correlation is observed for youngest large basins: Orientale and Imbrium. The swirls are absent in region antipodal to youngest (second age group, more younger than Imbrium basin) but small (320 km) Schrodinger basin. The swirl area is observed on region antipodal to Serenitatis basin, but any swirl markings are absent on regions antipodal to Humorum, Hertzprung, and Humboldtianum basins in spate of similar age and diameter of them. On the other hand, there are two cases of absence of correlation between swirl areas and regions antipodal to impact basins (for small swirl formations). The Reiner Gamma formation is most obvious example of that the correlation mentioned above is not statistically strong and do not exclude the swirl origin associated with external reason, such as cometary impact.