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Magnetism of Minor Bodies in the Solar System: From 433 Eros, passing Braille, Steins, and Lutetia towards Churyumov-Gerasimenko and 1999 JU3.

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Minor bodies in the solar system, such as asteroids and comets, are important sources of information for our knowledge of the solar system formation. Besides other aspects, estimation of a magnetization state of such bodies might prove important in understanding the early aggregation phases of the protoplanetary disk, showing the level of importance of the magnetic forces in the processes involved. Meteorites' magnetization measurements suggest that primitive bodies consist of magnetized material. However, space observations from various flybys give to date diverse results for a global magnetization estimation. The flybys at Braille and Gaspra indicate possible higher magnetization ($\sim 10^{-3}$ Am^2/kg), while flybys at Steins and Lutetia show no significant values in the global field change illustrating low global magnetization. Furthermore, the interpretation of remote (during flybys) measurements is very difficult. For correct estimates on the local magnetization one needs (in the best case) multi-point surface measurements. Single point observation has been done by NEAR-Shoemaker on 433 Eros asteroid, revealing no signature in magnetic field that could have origin in asteroid magnetization. Similar results, no magnetization observed, have been provided by evaluation of recent data from ROMAP (Philae lander) and RPC-MAG (Rosetta orbiter) instruments from comet 67P/Churyumov-Gerasimenko. The ROMAP instrument provided measurements from multiple points of the cometary surface as well as data along ballistic path between multiple touchdowns, which support the conclusion of no global magnetization. However, even in case of the in-situ on surface observations the magnetization estimate has a limiting spatial resolution that is dependent on the distance from the surface (~ 50 cm in case of ROMAP). To get information about possible smaller magnetized grains distribution and magnetization strength, the sensor shall be placed as close as possible to the surface. For such observations the next ideal candidate mission is Hayabusa-II with its Mascot lander equipped with fluxgate magnetometer. The small-sized lander shall deliver the magnetometer within centimeters from the surface, providing measurements on multiple points thanks to a hopping ability. The mission has been recently launched (December 2014) and is aiming to a C-type asteroid 1999 JU3 to reach it in 2018. The results will hopefully add some piece of information to the still unclear question of minor solar system bodies magnetization.