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On the possibility to determine the electrical conductivity of 67P/CG from ROSETTA magnetic field observations

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Information about the electrical conductivity and its distribution inside the cometary nucleus can be derived by measuring the magnetic fields induced in the nucleus by variations of the interplanetary magnetic field. Due to the relatively small size of the nucleus, this task is not trivial and requires very precise magnetic field measurements.

For the nucleus we use a spherical model with either uniform conductivity or consisting of a core and an outer layer with different conductivities. The space outside of the nucleus is modeled either by highly conductive solar wind plasma or by zero conductivity void.

Various combinations of conductivities, radii of the nucleus and of the core, and properties of the space outside the nucleus result in different inductive responses. Several such combinations which could be encountered by ROSETTA are analyzed in order to estimate which conductivity ranges and core radii can be determined using the ROSETTA instruments.