Gravity, internal structure and nucleus composition of 67P/Churyumov-Gerasimenko as measured by the Rosetta Radio Science Experiment RSI

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When Rosetta arrived at its target comet 67P/Churyumov-Gerasimenko it first performed a series of distant flybys (100-30 km). During this mission phase the mass of the comets nucleus could be determined by analyzing the RSI radio tracking data. In combination with the volume from images of the OSIRIS camera this resulted in a precise bulk density determination. That already gave first insights into the comets interior structure. The nucleus appears to be a low-density, highly porous dusty body.

From bound orbits with distances below 30 km the low degree and order gravity field coefficients could be derived. The gravity field coefficients strongly depend on the nucleus irregular shape and on the interior mass distribution. The shape is very well reconstructed from of the OSIRIS camera images. Various models of the interior nucleus structure and density distributions are used to compute simulated values of the gravity field coefficients. A comparison with the observed coefficients yields the feasibility of the theoretical interior structure. Thus, the gravity field helps constraining models of the internal structure, the composition and also of the origin and formation of the comets nucleus.