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Mapping of Surface and Shallow Subsurface Signatures in the CONSERT Data during the Descent of Philae

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The primary scientific objective of the Comet Nucleus Sounding Experiment by Radiowave Transmission (CONSERT) aboard Rosetta is the characterization of comet 67P/Chuyurmov-Gerasimenko's deep interior dielectric properties.

This was done during the first science sequence (FSS) by means of bi-static radio propagation measurements between the the CONSERT instrument aboard lander Philae launched onto the comet's surface and its counterpart aboard the Rosetta orbiter.

In addition to the FSS measurements, CONSERT was operated during the separation and descent of Philae onto the 67P/C-G's surface. The received CONSERT signal during the SDL consists of the direct propagation between Rosetta and Philae and indirect reflections of 67P/C-G's surface.

Using the peak power measurements in the dominant direct path between Rosetta and Philae during the descent we were able to reconstruct the lander's attitude and estimate the spin rate of the lander along its descent trajectory. The deployment of the lander legs and CONSERT antennas as well as the orbiter change of attitude in order to orient the science towards the assumed lander position are visible in the measured CONSERT data as well.
The information gained on Philae's attitude is used in the estimation of 67P/C-G's surface and near subsurface dielectric properties.

Information on the surface of 67P/C-G are contained in the data during roughly the last third of the descent of Philae onto the comet's surface. The surface signatures in the measured data are mapped to the location of origin on 67P/C-G's surface. The results from the mapping process show good spatial diversity along the descent track of Philae necessary for the estimation of the dielectric properties of prominent features in the CONSERT SDL data.