



Philae's triple play

20 November 2014

SESAME experiment CASSE records sound of first landing

A short but significant 'thud' was heard by the Cometary Acoustic Surface Sounding Experiment (CASSE) as Philae made its first touchdown on Comet 67P/Churyumov-Gerasimenko. The two-second recording from space is the very first of the contact between a man-made object with a comet upon landing. The CASSE sensors are located in the feet at the base of all three legs of the lander and were active on 12 November 2014 during the descent to the comet. "The contact with the surface was short, but we can evaluate the scientific data," says Martin Knapmeyer, a planetary scientist at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) and scientific leader of the CASSE Team.

https://w.soundcloud.com/player/?url=https%3A//api.soundcloud.com/tracks/177810225&color=ff5500&auto_play=false&hide_related=false&show_comments=true&show_user=true&show_reposts=false

The signals acquired by the three lander feet are more enlightening for the researchers than might seem for the lay man: "The Philae lander came into contact with a soft layer several centimetres thick. Then, just milliseconds later, the feet encountered a hard, perhaps icy layer on 67P/Churyumov-Gerasimenko," explains DLR researcher Klaus Seidensticker, who is responsible for the Surface Electric Sounding and Acoustic Monitoring Experiment (SESAME), which includes CASSE.

Listening to the touchdown

During the descent phase, CASSE initially detected vibrations from the flywheel that stabilised the flight. Upon its first contact with the comet's surface, Philae bounced because the harpoons intended to anchor it as it touched down failed to deploy. "From our data, we can determine that no second landing occurred immediately after the first bounce," explains Knapmeyer. Together with data from the ROMAP instrument, it has been determined that Philae did not immediately return to the comet surface after the first touchdown and bounce during the evening of 12 November.

Philae landed a total of three times, finally coming to rest on the surface at 18:32 CET and immediately starting to conduct the next measurements. CASSE transmitted and received vibrations from the lander's feet to determine the mechanical properties of the comet surface. CASSE also detected vibrations as the MUPUS instrument attempted to hammer a probe deep into the hard surface material.

Search for dust and water ice

The two other components of SESAME, the Dust Impact Monitor (DIM) and the Permittivity Probe (PP) experiments, performed measurements and sent data back to Earth during Philae's more than 60 hours of operation. Initial analyses of data from DIM suggest that the final landing site on 67P/Churyumov-Gerasimenko – at the edge of a crater – is not currently active. No particles were detected, which suggests that no dust is moving in the immediate vicinity of the lander. The PP experiment used a number of electrodes to transmit alternating current through the comet surface and was able to detect that there is a large quantity of water ice under Philae.

On 12 November 2014, shortly after the first touchdown, it became clear to the team at the DLR Lander Control Center that the harpoons had not fired and that the Philae lander had very likely

rebounded. DLR researcher Klaus Seidensticker initially feared an unfavourable outcome for the mission: "But now we have much more data than I had hoped for."

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Sound: Philae touches down on Comet 67P



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