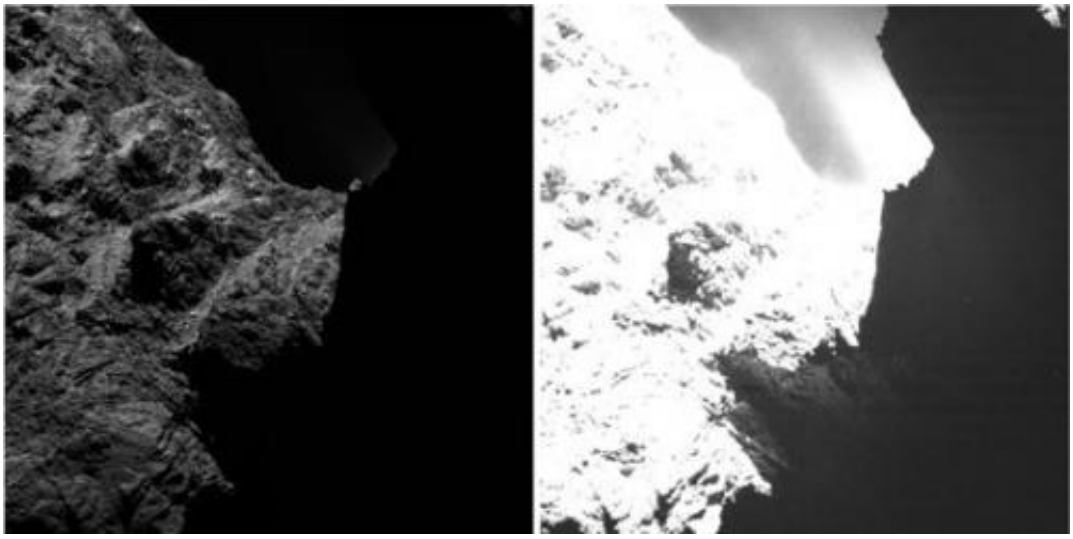
Rosetta: The dark side of the comet

November 6 2014



An image of comet 67P/Churyumov-Gerasimenko obtained on October 30th, 2014 by the OSIRIS scientific imaging system from a distance of approximately 30 kilometers and displayed with two different saturation levels. While in the left image the right half is obscured by darkness, in the right image surface structures become visible. Credit: ESA/Rosetta/MPS for OSIRIS Team MPS/UPD/LAM/IAA/SSO/INTA/UPM/DASP/IDA

(Phys.org) —Rosetta's scientific imaging system OSIRIS has caught a glimpse of the southern side of comet 67P/Churyumov-Gerasimenko. During the past months, this side has continuously faced away from the Sun making it impossible to determine shape and surface structures. Only the light scattered from dust particles in the comet's coma very slightly illuminates this uncharted territory.

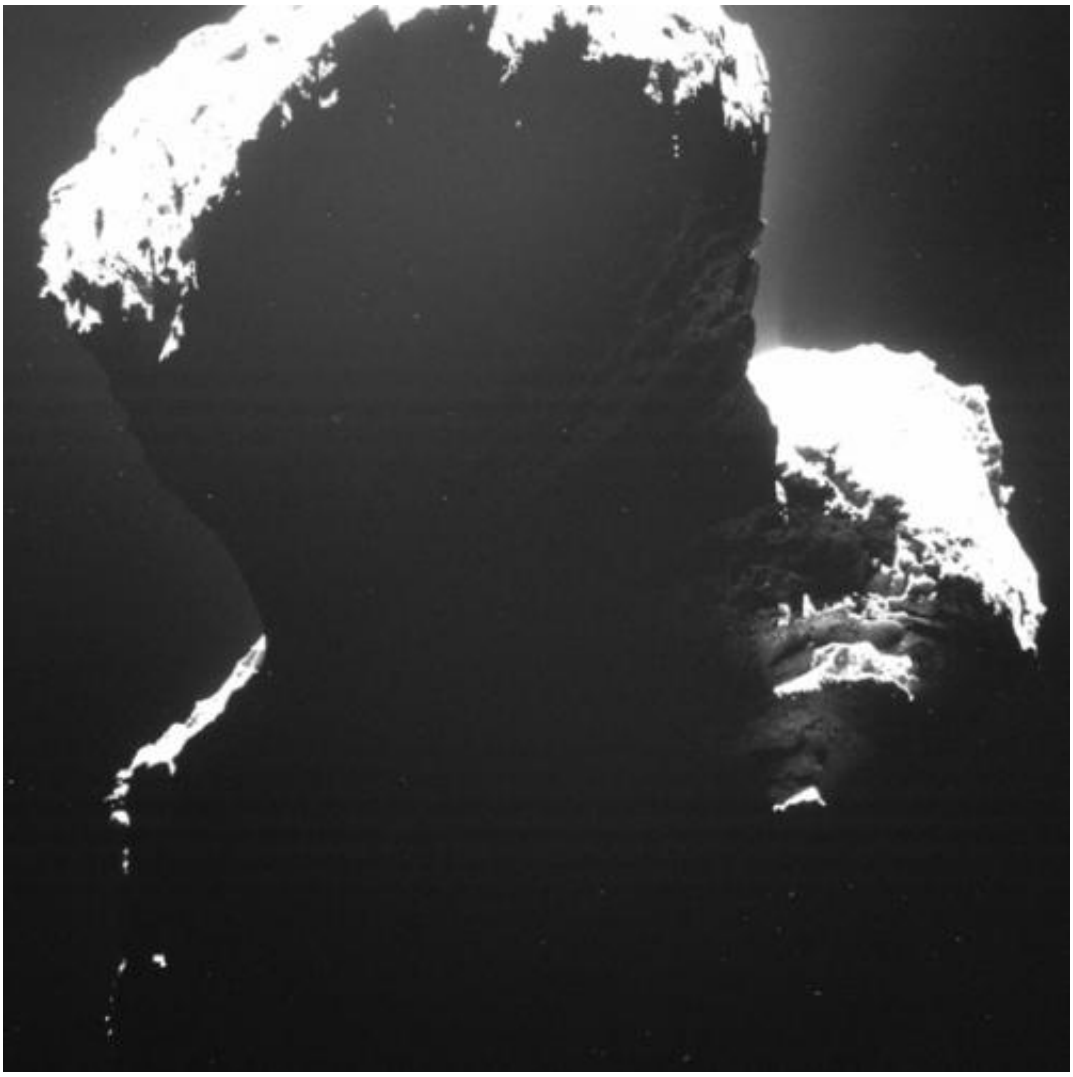
Since ESA's space probe Rosetta arrived at comet 67P/Churyumov-Gerasimenko in August, the scientific camera system OSIRIS has mapped most of its surface revealing stunning structures such as steep ravines, sharp cliffs and numerous boulders. 67P's southern side, however, is still a mystery. As the comet's rotation axis is not perpendicular to its orbital plane, but is tilted, parts of its surface can at times remain in total darkness. During the past months, 67P's southern side has seen such a polar night, comparable to the weeks of complete darkness in Earth's polar regions.

At the same time, 67P's dark side promises to hold the key to a better understanding of the comet's activity. "During perihelion, when 67P comes within approximately 186 million kilometers of the Sun, the comet's southern side is illuminated and thus subjected to especially high temperatures and radiation", says OSIRIS Principal Investigator Holger Sierks from the Max Planck Institute for Solar System Research (MPS) in Germany. Scientists therefore believe this side to be shaped most strongly by cometary activity. "We can hardly wait until May 2015, when the polar night ends and we can finally take a good look", says Sierks.

Until then, a recent image offers a first taste of what will come. In this image sunlight backscattered from dust particles in the comet's coma illuminates the comet's dark side revealing a hint of surface structures.

"For a normal camera, this tiny bit of scattered light would not help very much", says OSIRIS team member Maurizio Pajola from the Center of Studies and Activities for Space at the University of Padua in Italy who first spotted the amazing image. Unlike standard cameras that encode information in 8 bits per pixel and can thus distinguish between 256 shades of grey, OSIRIS is a 16-bit-camera. This means that one image can comprise a range of more than 65000 shades of grey – much more than a standard computer monitor can display. "In this way, OSIRIS can

see black surfaces darker than coal together with white spots as bright as snow in the same image", says Pajola.



A rare glance at the dark side of comet 67P/Churyumov-Gerasimenko. Light backscattered from dust particles in the comet's coma reveals a hint of surface structures. This image was taken by OSIRIS, Rosetta's scientific imaging system, on September 29th, 2014 from a distance of approximately 19 kilometers. Credit: ESA/Rosetta/MPS for OSIRIS Team MPS/UPD/LAM/IAA/SSO/INTA/UPM/DASP/IDA

Scientists from the OSIRIS team exploit this high dynamic range not only to peer into the total darkness of 67P's polar night, but also to gather information from regions that are only temporarily shaded in certain images.

Rosetta is an ESA mission with contributions from its member states and NASA. Rosetta's Philae lander is provided by a consortium led by DLR, MPS, CNES and ASI. Rosetta will be the first mission in history to rendezvous with a comet, escort it as it orbits the Sun, and deploy a lander to its surface.

Provided by Max Planck Society