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Thermophysical analysis of the Imhotep region

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Abstract

Using a thermophsical model and comparing the theoretical results with the data on the comet 67P/Churyumov-Gerasimenko (hereafter 67P) it is possible to determine the composition and properties of the surface and how they change with time.
In this talk the results will be shown of the analysis, performed on VIRTIS [2] and OSIRIS [4] data, of the surface thermophysical properties of the Imhotep region related to the presence/absence of ice.

1. Introduction

The huge amount of data on the comet 67P gave us the opportunity to test and improve in an unprecedented way the models describing the thermophysical properties of cometary nuclei and their evolution. Using this kind of models and comparing their results with the available observations, it is possible to determine the composition and properties of the surface and how they change with time. As far as regards the observations, we are using the temperature images, derived from the VIRTIS data, and the OSIRIS images, that with their better pixel resolution provide the context to interpret the results. The area on which this analysis has been performed is the Imhotep region [3], selected for its variety of different terrains and structures and the good and continuous coverage along the time of the mission from both instruments.

2. Method and results

The thermophysical model [1] is used in a feedback process, i.e. when the comparison of its results with the VIRTIS temperature data is satisfied we can assume that the description of the surface properties and composition given in the model through the input parameters is close to reality. In this way it is possible, for example, to interpret the temperatures derived from VIRTIS spectra in order to determine the amount of ice that is present in the surface layers and its variation along the orbit. The results are then checked on the OSIRIS images.
The first results are encouraging. We are finding that it is possible to determine the amount of ice on the surface necessary to match the theoretical temperatures with the observed ones, when available, and the composition information extracted from VIRTIS spectra, confirmed also by the OSIRIS images that clearly show the presence and evolution of various ice patches.

3. Summary and conclusions

With the help of a thermal evolution model we are trying to determine the thermophysical and compositional properties of the surface of the Imhotep region on the comet 67P. We are finding a good match between the results of this analysis and the composition information extracted from VIRTIS spectra, confirmed also by the OSIRIS images that clearly show the presence and evolution of the ice patches.

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OSIRIS was built by a consortium of the Max-Planck-Institut für Sonnensystemforschung, in Göttingen, Germany, CISAS-University of Padova, Italy, the Laboratoire d'Astrophysique de Marseille, France, the Instituto de Astrofisica de Andalucia, CSIC, Granada, Spain, the Reseach and Scientific Support Department of the European Space Agency, Noordwijk, The Netherlands, the Instituto Nacional de Tecnica Aeroespacial, Madrid, Spain, the Universidad Politechnica de Madrid, Spain, the Department of Physics and Astronomy of Uppsala University, Sweden, and the Institut für Datentechnik und Kommunikationsnetze der Technischen Universität Braunschweig, Germany. The support of the national funding agencies of Germany (DLR), Italy (ASI), France (CNES), Spain (MEC), Sweden (SNSB), and the ESA Technical Directorate is gratefully acknowledged. We thank the ESA teams at ESAC, ESOC and ESTEC for their work in support of the Rosetta mission.

References

[1] Capria, M. T. et al., MNRAS, 469, p.S685, 2017

[2] Coradini, A. et al., Space Sci. Rev., 128, 529, 2007

[3] El-Maarry, M.R. et al., A&A 583, A26, 2015

[4] Keller, H. U., Barbieri, C., Lamy, P., et al., Space Sci. Rev., 128, 433, 2007