Water activity on comet 67P: linking nucleus to inner coma

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The insolation-driven sublimation of water ice in the top layer of the nucleus of comet 67P produces gas and dust emissions that dominate the diurnal and seasonal variability of the comet's innermost coma. The complex morphology of both gas and dust fields, as revealed by various remote-sensing instruments on board Rosetta spacecraft, alludes to the ubiquitous existence of water ice over the entire nucleus as the main driver of dust activity.

In this study, we investigate the evolution of water activity on both diurnal and seasonal scales. In an effort to understand the connection between the nucleus activity and the complex structure of near-nucleus coma, we model the emission of water vapor as well as dust motion combining realistic thermo-physical model and state-of-the-art Direct Simulation Monte Carlo method. The modeled coma morphology is compared with the distributions of water vapor and dust close to the nucleus observed by both OSIRIS and VIRTIS onboard Rosetta.