
EAPS Planetary Lunch Colloquium Series (PICS)

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Breaking the Ice: How Sublimative Torques Alter and Destroy Cometary Bodies

To quote David Levy: “comets are like cats: they have tails, and they do precisely what they want.” They have strange bilobate nuclei, undergo outbursts (rapid, unpredictable brightening events), and form long striated dust features in their tails that somehow align with the Sun rather than the nucleus. Additionally, their dynamics appear to require some mysterious mechanism for reactivating their sublimative activity. In this talk, I describe how all of these features are the result of ice sublimation, the process that defines these irregularly shaped bodies.

Asymmetric sublimative mass loss generates torques that change the rotation state of comet nuclei in a manner analogous to the YORP Effect. Such rotational spin-up can induce internal stresses that fission the nucleus, forming cometary striae and preserving the strange bilobate shape of 67P/Churyumov-Gerasimenko. Additionally, the concentration of activity at the small lobe of 103P/Hartley 2 (and the activation/reactivation of comet nuclei more generally) is likely the result of avalanches triggered by such changes in the rotation state of the comet nucleus. Such avalanches may also result in the highly collimated outburst plumes observed at 67P/Churyumov-Gerasimenko and in other comet comae.



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