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Activity and composition of comet Lulin

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Abstract

The abundance of native ices in comet nuclei is a fundamental observational constraint in cosmogony. An important unresolved question is the extent to which the composition of pre-cometary ices varied with distance from the young sun. Our fundamental objective is to build a taxonomy based on cometary volatile composition instead of orbital dynamics [1].

The Swift space telescope [2] is unique in combining gamma ray, UV and X-ray instruments. Swift's UV-optical grisms (175-520 nm), which have not been extensively used before this campaign, encompass known cometary fluorescence bands (e.g., CO_2^+, OH, CO, NH, CS, CN, etc.) that can quantify and track the water and organic ice chemistry in the coma (see Figure 1). Until the scheduled repairs of HST's STIS, Swift is the sole space-borne observatory that can characterize the molecular composition of a comet at UV-optical wavelengths. Through its rapid cadence, Swift is perfectly suited to characterize changes in the temporal development and composition of released gas.

Swift/UVOT observed comet Lulin 16 times on January 28, February 16, and March 4 2009 for a total of 18.8 ksec, providing a unique dataset that reveals variations in the comet's gas production rate on scales of hours to months. We will discuss this variability in the context of the rotation of the nucleus and the comet's orbital motion around the Sun.

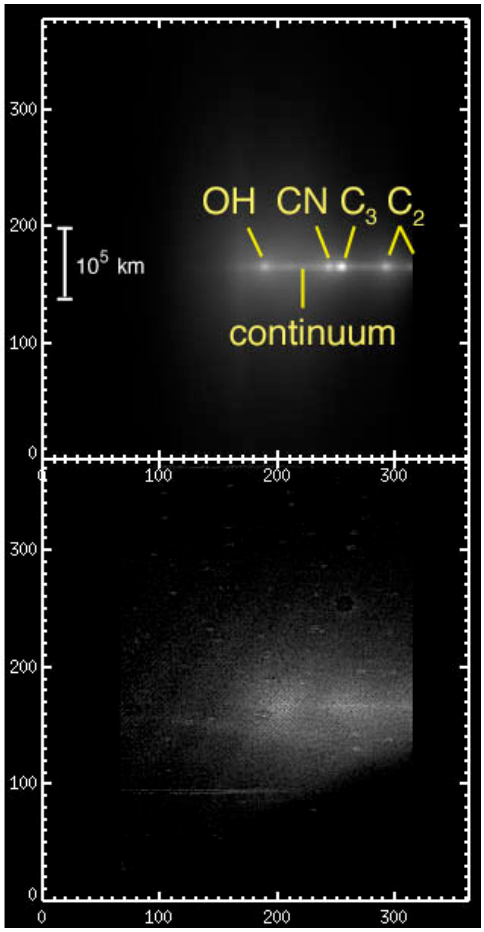

Figure 1 – Swift/UVOT grism observations of comet Lulin. **Top**: Model grism image. The different molecular spectral features are indicated. The continuum can be seen as a thin bar. **Bottom**: Observed grism image. All panels have the same scale, grey scale and alignment. Dimensions are 353 x 378 pixels (or (6.2 x 6.7) x 10^5 km).

References

[1] Mumma M.J. et al (1993) in *Protoplanets and Planets III, Univ. Ariz. Press*, 1177

[2] Gehrels N. (2004) *Ap.J.611*, 1005