A MULTIWAVELENGTH INVESTIGATION OF THE REMAINS OF SUNGRAZING COMET LOVEJOY (C/2011 W3). M.M. Knight[1,2], H.A. Weaver[2], Y.R. Fernández[3], S.R. Chesley[4], M.S. Kelley[5], R. McNaught[6], D. Bodewits[5], C.M. Lisse[2], D.J. Osip[7], N. Dello Russo[2], and K. Battams[8]. [1]Lowell Observatory, Flagstaff, Arizona, USA (knight@lowell.edu), [2]JHU Applied Physics Laboratory, Laurel, Maryland, USA, [3]University of Central Florida, Orlando, Florida, USA, [4]California Institute of Technology, Jet Propulsion Laboratory, Pasadena, California, USA, [5]University of Maryland, College Park, Maryland, USA, [6]Siding Spring Observatory, Australian National University, Coonabarabran, NSW, Australia, [7]Las Campanas Observatory, La Serena, Chile, [8]Naval Research Laboratory, Washington, D.C., USA.

Overview: Comet Lovejoy (C/2011 W3) was the first Kreutz sungrazing comet in the modern telescopic era (since 1970) to survive perihelion, although the extent to which the nucleus survived is unclear. We used observations by *SOHO* and *STEREO* obtained near perihelion as well as observations we acquired with a number of ground- and space-based telescopes in the days and weeks after perihelion (2011 December 16) to constrain the size of any remaining nucleus and study the effects of the intense solar radiation near perihelion (q~1.2 solar radii) on the comet.

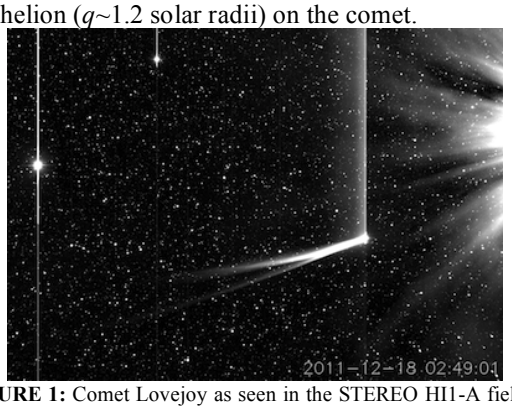

FIGURE 1: Comet Lovejoy as seen in the STEREO HI1-A field of view ~2 days after perihelion. Vertical lines are due to saturation. Jupiter (the larger bright point) and Mercury (the smaller bright point) are also visible. The Sun is off the image to the right. The field of view is ~20° wide. Image courtesy NASA/NRL.

Background: The Kreutz family is the best studied group of sungrazing comets. Its members include some of the most spectacular comets in history, e.g., the Great Comet of 1882 (1882 II) and Ikeya-Seki (1965f) [1]. Kreutz comets are thought to have fragmented from a single parent and can be recognized today by their similar orbits. Nearly 2000 Kreutz comets have been observed in *SOHO* and *STEREO* images since 1996. These comets are estimated to be ~100 m or smaller [2,3], and none had survived perihelion [4] until Comet Lovejoy. These small fragments can be described by a power-law size distibution, but the size distribution does not predict any fragments large enough to survive perihelion (yet eight such comets have been seen in the last ~200 years) [5].

A primary goal of our observations was to estimate the size of Lovejoy's nucleus in order to understand where it belongs in the Kreutz family hierarchy – the largest small fragment yet observed, or one of the few large fragments (from which the small fragments are apparently derived) [6]. The wealth of multiwavelength data will provide unprecedented insight into the processes acting on a comet in the harsh near-Sun environment. In particular, we are interested in characterizing the dust for comparison with comets at more traditional heliocentric distances.

Observations: Lovejoy was discovered just two weeks prior to perihelion, when its solar elongation angle was too small for observations by most non-coronagraphic telescopes. Furthermore, it had an extreme southern declination making ground-based detections challenging from the southern hemisphere and impossible from the northern hemisphere until many weeks after perihelion. We studied Lovejoy's development in various telescopes on board the *SOHO* and *STEREO* spacecraft around perihelion and obtained target of opportunity and director's discretionary time on numerous additional telescopes to study the comet when it re-emerged from the Sun after perihelion. These included *Hubble Space Telecope, Spitzer Space Telescope, Swift,* Siding Spring Observatory, Las Campanas Observatory, and Lowell Observatory.

Results: Preliminary analysis suggests that no substantial nucleus survived for more than a few days after perihelion. However, significant quantities of dust were produced and were still visible in *Spitzer* data acquired in early 2012 February. Analysis of the data are ongoing and new results will be reported.

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Acknowledgements: Support for *SOHO* and *STEREO* data analysis was provided by NASA Planetary Mission Data Analysis Program grant NNX10AP75G. Telescope time was granted under *HST* program DD 12792, *Spitzer* program 80237, and *Swift* target ID 32251.