Detection of Massive Water Ice Emission from the Nucleus of Comet C/1999 S4 (LINEAR)

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1-12 micron images were obtained of comet LINEAR S4 in June 2000 using NSFCAM and MIRLIN. Spectrophotometry derived from these images showed strong ice absorption from the nucleus of comet LINEAR S4 before its breakup in July 2000. **The ice absorption shown by these observations is most probably due to the rapid release of interior icy material from the comet as it fragmented before breakup.** Little carbonaceous material was found in the emitted dust, consistent with the findings of Mumma et al. The rotation rate of the comet was also measured for the first time. LINEAR S4 was a daytime object, making it hard to get optical lightcurves. The rotation rate was found to be too slow for the breakup to be due to rotational instabilities.

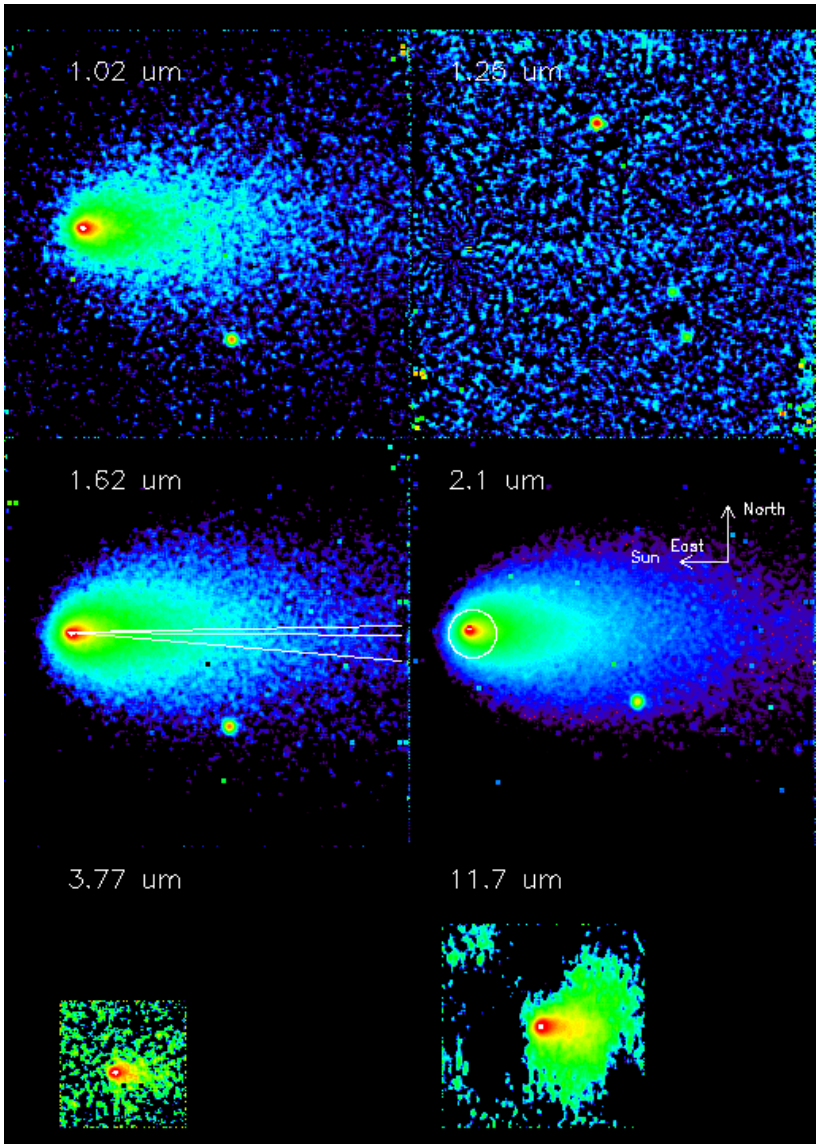

Figure 1 – 1.02 to 11.7 micron images of comet LINEAR C/1999 S4 obtained on 17 June 2000 UT. The field of view for the top 3 images is 77" x 77"; for the next image, 12" x12"; and for the last image, 60" x 60". The sun direction is to the left. This is part of the data set used to obtain the photometry shown in Fig. 2.

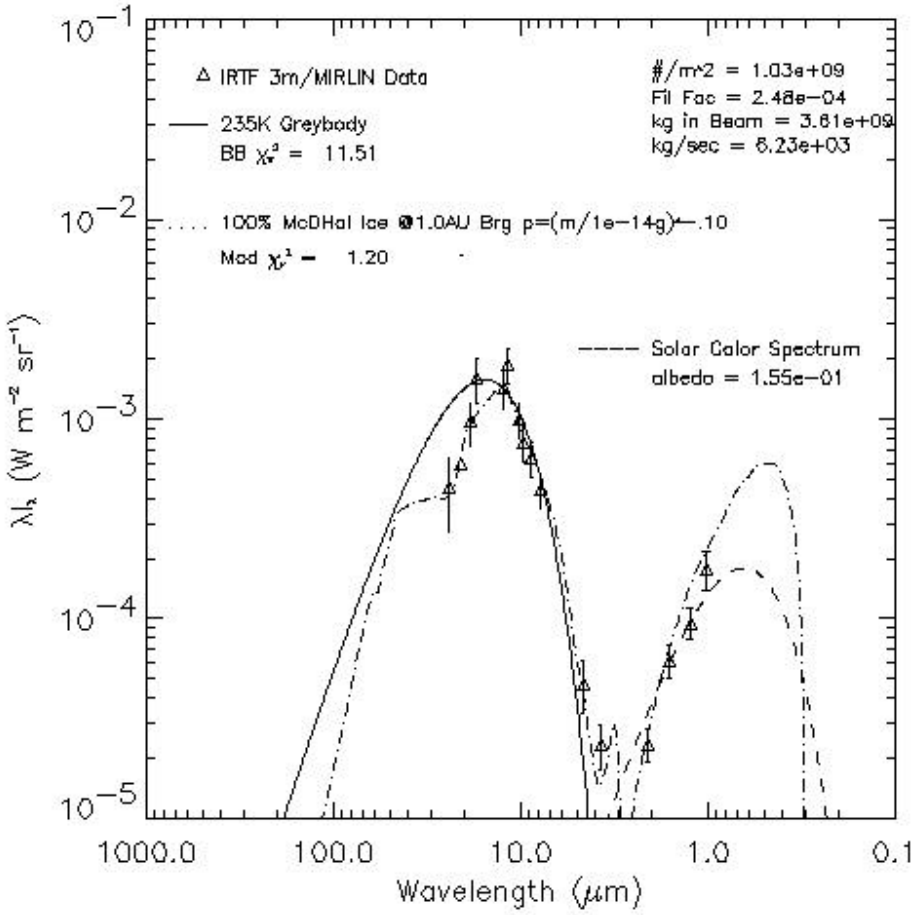

Figure 2. Spectral energy distributions of comet C/1999 S4 (LINEAR) (triangles) as observed on 17 June 2000 using a 7" radius aperture. Dashed curve - solar spectrum normalized to LS4 observation at 1.25 μm. Solid curve - modified greybody fit to the mid-IR data. The best-fit greybody temperature is 38 K cooler than the local equilibrium temperature. **From 12 to 25 μm, there is a strong absorption feature present due to water ice.** Dash-dash-dotted Curve - best-fit fractal particle model with 100% water ice and a comet Halley particle size distribution.