Smog Check for Comets: CO2, CO, and particulate emissions

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We measured the CO2, CO, and dust emission from a sample of comets using the Spitzer space telescope. This study is in the spirit of the A'Hearn et al. compilation of the OH, C2, and dust production rates for 85 comets, wherein the only widely accepted, physically−based taxonomic types of comets were identified. Spitzer/IRAC observations are unique in their sensitivity to CO2 and CO gas. CO and CO2 have prominent spectral bands that fall within IRAC channel 2 (centered at 4.5 microns), while dust strongly dominates IRAC channel 1 (centered at 3.6 microns). Despite being the second and third most abundant compositions of cometary ice, their high abundance in the Earth's atmosphere makes ground−based observations exceptionally difficult. Recent results from the EPOXI encounter with comet Hartley 2 indicate that CO2 is in fact a dominant driver for much of cometary activity, at least for some comets and for active regions. Our new observations allow an assessment of CO2 production for the sample comets, as well as providing unique imaging capabilities to determine the extend of CO and CO2 emission. Significant extended CO+CO2 was detected for several comets in the sample, including rings and arcs with structure distinct from that of the dust emission. We will present a summary of the ongoing observations and preliminary results.