Mid-IR Spectroscopy of Comets & Dusty Disks : Mineralogical and Elemental Clues to the Formation and Evolution of Solar Systems

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With observations made by the *Spitzer* Space Telescope, we are beginning to understand the details of how the composition and formation of our own Solar System compares to those of other stars in our Galaxy. This is a major question in astronomy, and recent, detailed observations by *Spitzer* of comets (remnants of the solar systems proto-planetary disk), proto-planetary disks around Young Stellar Objects, debris disks around moderate-age stars, and dust rich DZ white dwarfs have given us a collection of detailed spectra containing clues about our Galactic context. In this talk I will discuss Spitzer and related ISO mid-infrared (5 to 40 micron) spectroscopy of 6 comets [1,2,3], the young dusty systems SST-LUP3-1, HD100546 [1], HD163296, HD113766 [4], HD172555 [5], EF Cha, the Gyr-old systems Eta Corv and HD69830 [6], and the end of life DZ white dwarf systems G29-38 [7] and GD362.

Using the results from the recent Deep Impact and STARDUST space missions as ground truth [1], we can now constrain the relative abundances of silicates, carbonates, water ice/gas, amorphous carbon, sulfides, and polycyclic aromatic hydrocarbons (PAHs) in dusty disks, and directly relate the temperature of the circumstellar dust to its location with respect to the system primary. I will discuss the similarities and differences in the spectra, the amount, kind, and location of the dust and gas species detected, the primitive or advanced state of processing of the dust, compositional solar system analogues for the inferred source parent bodies, and their implications for our Solar System's origin and evolution.

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References

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