Characterizing Abundances of Volatiles in Comets Through Multiwavelength Observations

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Abstract:

Recently, there have been complimentary observations from multiple facilities to try to unravel the chemical complexity of comets. Incorporating results from various techniques, including: single-dish millimeter wavelength observations, interferometers, and/or IR spectroscopy, one can gain further insight into the abundances, production rates, distributions, and formation mechanisms of molecules in these objects [1]. Such studies have provided great detail towards molecules with a-typical chemistries, such as H_2CO [2]. We report spectral observations of C/2007 N3 (Lulin), C/2009 R1 (McNaught), 103P/Hartley 2, and C/2009 P1 (Garradd) with the Arizona Radio Observatory's SMT and 12-m telescopes, as well as the NRAO Greenbank telescope and IRTF-CSHELL. Multiple parent volatiles (HCN, CH_3OH, CO, CH_4, C_2H_6, and H_2O) as well as a number of daughter products (CS and OH) have been detected in these objects. We will present a comparison of molecular abundances in these comets to those observed in others, supporting a long-term effort of building a comet taxonomy based on composition. Previous work has revealed a range of abundances of parent species (from "organics-poor" to "organics-rich") with respect to water among comets [3,4,5], however the statistics are still poorly constrained and interpretations of the observed compositional diversity are uncertain. We gratefully acknowledge support from the NSF Astronomy and Astrophyics Program, the NASA Planetary Astronomy Program, NASA Planetary Atmospheres Program, and the NASA Astrobiology Program.

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