Multiwavelength Observations of Volatiles in Comets

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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/2006 M4 (SWAN), C/2007 N3 (Lulin), and C/2009 R1 (McNaught) 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) plus two photo-dissociation 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.

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