UNRAVELING THE MYSTERIES OF COMPLEX INTERSTELLAR ORGANIC CHEMISTRY USING HIFI LINE SURVEYS

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We are undertaking a Herschel Space Observatory OT1 program to conduct HIFI spectral line surveys of interstellar clouds to probe the influence of physical environment on molecular complexity. We will observe a large sample of sources, cover a range of physical environments, and target selected frequency windows containing transitions from several known complex organic molecules. We have an ongoing complementary program in ground-based astronomy using the Caltech Submillimeter Observatory to collect spectral line surveys at lower frequencies, and plan to undertake additional interferometric observations using the CARMA and ALMA arrays to further examine the spatial distributions of the molecules detected toward our target sources. The goal of these observations is to correlate the relative abundances of organic molecules with the physical properties of the source (i.e. temperature, density, age, dynamics, etc.). Our broader research goal is to improve astrochemical models to the point where accurate predictions of complex molecular inventory can be based on the physical and chemical environment of a given source. The information gained from these observations will serve as a benchmark for these astrochemical models and holds the promise of significantly advancing our understanding of interstellar chemical processes. In this talk, we will overview the major goals of this observational program, and report on any preliminary results from these ongoing observations.