NEAR-INFRARED SEARCHES FOR DEUTERATED SPECIES IN COMETS. B. P. Bonev[1,2], E. L. Gibb[1,3], G. L. Villanueva[1,2], M. A. DiSanti[1], L. Paganini[1,4], J. Keane[5], K. Meech[5], and M. J. Mumma[1], [1]NASA Goddard Center for Astrobiology, Greenbelt, MD, 20770 (USA), bonev@cua.edu; [2] Catholic University of America, Washington, DC, 20064 (USA); [3]University of Missouri – St. Louis (USA); [4]NASA Postdoctoral Program, Greenbelt, MD (USA); [5]Institute for Astronomy - University of Hawaii, Honolulu, HI (USA)

The emergence of the terrestrial biosphere may be linked to exogenous delivery of water and prebiotic organic matter from bodies like comets, asteroids, meteorites, and interplanetary dust roughly within the first billion years of Earth's history. A major challenge to astrobiology is to test this possibility and to evaluate the relative contributions from various classes of small bodies. A key element in this interdisciplinary effort is measuring the chemical composition and the deuterium abundances of cometary volatiles. The D/H ratios of molecules released from cometary nuclei are considered signatures of the chemical formation pathways of volatiles in planet-forming disks. Outstanding questions include: are cometary D/H ratios consistent with theories of the chemical evolution of volatile matter in the solar nebula? Does the HDO/H_2O ratio vary substantially among the comet population and what would be the implications for understanding the origins of Earth's water

In this poster, we will report progress on our sensitive searches for HDO (simultaneously with H_2O or its proxy OH prompt emission) and CH_3D (simultaneously with CH_4) in order to constrain the D/H ratio in cometary water and methane. We use near-infrared high-resolution spectroscopy with NIRSPEC at Keck 2 (atop Mauna Kea) and CRIRES at ESO's VLT. A perception exists that measuring cometary D/H (in any species) is very high risk, and thus feasible for exceptionally bright comets only. While this notion was valid for earlier IR searches, in the last three years we have improved the sensitivities of near-IR work permitting highly significant tests for a range of modern astrochemical models from observations of moderately bright comets. We will report our searches for CH_3D and HDO in comets C/2007 N3 Lulin and 103P/Hartley-2 with NIRSPEC at Keck 2, discuss both the significance and the limitations of the resulting upper limits, and provide quantitative predictions for improved sensitivities in future D/H studies.

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