"Messengers from the Early Solar System - The Similarity & Diversity of Comets"

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Viewed from a cosmic perspective, Earth is a dry planet yet its oceans are enriched in deuterium by a large factor relative to nebular hydrogen. Can comets have delivered Earth's water? The question of exogenous delivery of water and organics to Earth and other young planets is of critical importance for understanding the origin of Earth's water, and for assessing the possible existence of exo-planets similar to Earth.

Strong gradients in temperature and chemistry in the proto-planetary disk, coupled with dynamical models, imply that comets from the Oort Cloud and Kuiper Disk reservoirs should have diverse composition. The primary volatiles in comets (ices native to the nucleus) provide the preferred metric, and taxonomies based on them are now beginning to emerge [1, 2, 3]. The measurement of cosmic parameters such as the nuclear spin temperatures for H_2O, NH_3, and CH_4, and of enrichment factors for isotopologues (D/H in water and hydrogen cyanide, $^{14}N/^{15}N$ in CN and HCN) provide additional important tests for the origin of cometary material.

I will provide an overview of these aspects, and their implications for the origin of Earth's water and prebiotic organics.

[1] Mumma & Charnley (2011), *Ann. Rev. Astron. Astrophys.* 49: 471-524.
[2] DiSanti & Mumma (2008), *Space Sci. Rev.* 138, 127-145.
[3] Crovisier et al. (2009) *Earth, Moon, Planets* 105, 267-272.