HEAT GENERATING PROCESSES AND THEIR AFFECTS ON ICE AND ICE MIXTURES: ON THE POTENTIAL ORIGINS OF CRYOVOLCANISM IN THE SOLAR SYSTEM. C. McCarthy[1], [1]Lamont-Doherty Earth Observatory (Palisades, NY mccarthy@ldeo.columbia.edu)

Introduction: Icy bodies of the solar system display a variety of surface morphologies, a great number of which have been attributed to cryovolcanism. Examples of ancient and/or active resurfacing posited to be due to eruption of partially molten water ice are present on icy bodies of various sizes and orbital histories (e.g., [1], [2], [3]). Cryovolcanism would be particularly important as a transport mechanism between liquid oceans or lenses and frigid surfaces (that can be sampled and accessed). But there are many unknowns about how various landforms are created and how the plumbing systems work. I will revisit the state of knowledge about cryovolcanism in the solar system, including potential source mechanisms. I will provide an overview of the compositional variations of different bodies as determined from near-infrared spectroscopy, and review how these chemical species affect the rheological and microstructural properties of ice [e.g. [4], [5]]. I will share data from laboratory experiments (from my lab and others) that document heat-generating mechanisms in both the brittle and ductile portions of icy shells. These mechanisms are related to tidally-forced frictional sliding on pre-existing faults (in the brittle shallow portion) and tidal dissipation, or attenuation, (in the ductile portion). Improved knowledge about how partial melts as formed, and once present how they influence the bulk material properties is important to next generation modeling of cryovolcanic features and dynamics.

References:

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