

Abstract Submitted
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Ice Dusty Plasma Experiment Upgrade to use Cryocoolers¹ PAUL BELLAN, Caltech — Tiny ice grains immersed in plasma occur in noctilucent clouds, Saturn’s rings, comet tails, and accretion disks. Experiments at the Max Planck Institut [1] and at Caltech [2,3] showed that ice grains spontaneously form from water vapor in a weakly ionized plasma if the background gas is made extremely cold via contact with refrigerated electrodes. Photos show [2,3] that the ice grains are long and spindly in contrast to the spherical shape commonly assumed in theoretical models; the grain length can exceed half a millimeter and the inter-grain spacing is a fraction of millimeter. The Caltech experiment is being upgraded to have the electrode cooling provided by liquid helium refrigerated cryocoolers; these will replace the liquid nitrogen Dewars now in use. The cryocoolers will provide both a temperature scanning capability and a much lower attainable temperature. These new features open up a new operational dimension and will allow determining the temperature dependence of plasma-instigated ice dust formation, growth, and composition. The design and construction status will be presented. [1] S. Shimizu et al. (2010), JGR 115, D18205. [2] K. B. Chai and P. M. Bellan (2015) ApJ 802, 112. [3] R. S. Marshall, K. B. Chai, and P. M. Bellan (2017) ApJ 837, 56.

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