DYNAMICS AND TRANSPORT OF NANOMETER-SIZED DUST PARTICLES GENERATED IN THE INNER SOLAR SYSTEM. L. O'Brien[1], A. Juhasz[2,1], M. Horanyi[1], Z. Sternovsky[1]. [1]Laboratory for Atmospheric and Space Sciences, University of Colorado, 1234 Innovation Drive, Boulder, CO, 80303, [2]Institute for Particle and Nuclear Physics, Wigner, RCP, 1121 Budapest, Hungary, XII.

Introduction: Interplanetary dust particles (IDPs) make up a fraction of matter in the heliosphere. IDPs are mostly generated through collisions of larger asteroid and cometary material. IDPs slowly spiral toward the Sun due to the Poynting Robertson drag, where the dust density and collision rate is expected to increase with distance toward the Sun. Solar wind-dust interactions represent a missing piece in our understanding of the interaction and flow of matter in the heliosphere. Inner solar system dust populations and their interaction with/influence on the solar wind (e.g., potential link to inner source pickup ions and solar wind transient structures) is a largely unexplored question.

The WAVES instruments on the two STEREO spacecraft reported the detection, strong temporal variation, and potentially high flux of nanometer-size dust particles transported to 1 AU through interaction with the solar wind [1]. Simulations of nano-dust dynamics are performed to gain an understanding of their transport in the inner heliosphere and distribution near 1 AU where they can potentially be detected. Simulations show that the temporal variation in nano-dust detection, as suggested by the STEREO observations, can be described by the dust's interaction with the complex structure of the interplanetary magnetic field (IMF) [2]. Furthermore, Le Chat, 2015 [3] reported on the correlation between high nano-dust fluxes observed by STEREO and the observation Interplanetary Coronal Mass Ejections (ICMEs).

Here we report on our investigation in the formation, dynamics, and transport of dust in the inner heliosphere through solar influence and interaction with the solar wind and transient structures such as ICMEs. Charged nanometer-size dust particles are expected to be generated close to the Sun. Those generated outside of ~0.15 AU are picked up and transported away from the Sun due to the electromagnetic forces exerted by the solar wind. We model the dynamics of nano-dust through their interaction with the solar wind and explore the potential for their detection and the ultimate investigation of solar wind-dust influence. Dust flux and composition measurements, combined with solar wind magnetic field and particle measurements can be paired with dust-solar wind interaction modeling to improve our understanding of the dust environment near the Sun and its interaction with the solar wind.

References:

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