CubeSat Sensors and Constellation Missions for Advancing Space Science

Charles M. Swenson, Alan Marchant
Utah State University
4120 Old Main Hill, Logan, UT, 84322
(Charles.Swenson@usu.edu; Alan.Marchant@usu.edu)

Chad Fish, Erik Syrstad
Utah State University Space Dynamics Laboratory
1695 North Research Park Way, North Logan, UT 84341
(Chad.Fish@sdl.usu.edu; Erik.syrstad@sdl.usu.edu)

The most significant advances in solar and space physics, or Heliophysics, over the next decade are most likely to derive from new observational techniques. The connection between advances in scientific understanding and technology has historically been demonstrated across many disciplines and time. Progress on some of the most compelling scientific problems will most likely occur through multipoint observations within the space environment to understand the coupling between disparate regions: Heliosphere, magnetosphere, ionosphere, thermosphere and mesosphere. Multipoint measurements are also needed to develop understanding of the various scalars or vector field signatures (i.e gradients, divergence) that arise from coupling processes that occur across temporal and spatial scales or within localized regions. The resources that are available over the next decades for all areas of Heliophysics research have limits and it is therefore important that the community be innovative in developing new observational techniques to advance science.

One of the most promising new observational techniques becoming available are miniaturized sensors and satellite systems called CubeSats. These are enabled by the enormous investment of the commercial, medical, and defense industries in producing highly capable, portable and low-power battery-operated consumer electronics, in-situ composition probes, and novel reconnaissance sensors. The advancements represented by these technologies have direct application in developing pico- or nano-satellites and CubeSats system for Heliophysics research. In this talk we overview the current environment and technologies surrounding these novel small satellites and discuss the types and capabilities of the miniature sensors that are being developed. We discuss how pico- or nano-satellites and CubeSats can be used to address highest priority science identified in the most recent National Academies Decadal Survey for solar an space physics and the innovations and advancements that are required to make substantial progress.