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INCREASING CUBESAT FORM FACTOR TO 6U: THE LOWER ATMOSPHERE/IONOSPHERE COUPLING EXPERIMENT

Abstract

The Lower Atmosphere/Ionosphere Coupling Experiment (LAICE) is the first 6U CubeSat to be publicly funded and manifested for launch in the United States. This satellite is currently under development by the University of Illinois and Virginia Polytechnic Institute and State University under funding from the National Science Foundation and manifested for launch through the NASA Educational Launch of Nanosatellites program. LAICE is a science mission planned for a low altitude orbit (¡ 350 km), with two fundamental science objectives: To observe and correlate gravity wave-induced airglow perturbations in the upper mesosphere with in-situ measurements at the satellite, and to produce global maps of active gravity wave regions in the mid- and low-latitude ionosphere such that climatological variations can be quantitatively compared to terrestrial weather patterns. This will be accomplished through remote sensing of airglow emission bands in the 90-100 km region during the local night time and in-situ sensors measuring the ion and neutral density fluctuations. LAICE is based on the standard Illinisat-2 CubeSat bus - a scalable, generic CubeSat bus system originally designed to handle satellites in the 1.5U to 3U form factors. For the LAICE mission, this bus design needed to undergo logical extensions up to the 6U form factor, involving adaption to increased power generation and larger launch pod volume. The bus provides power management, command and data handling, communication, attitude determination and control, environmental survivability and thermal management, while maximizing payload volume and simplifying the generic payload interface. This paper will outline the full mission, including the science objectives and expected results. Further, changes for each of the satellite bus systems which required minor updates to take advantage of the 6U form factor will be discussed.