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3D MODEL OF A PLANET'S ATMOSPHERE USING A MEGA CLUSTER OF 10-GRAM CHIPSATS.

Abstract

Comprehensive information about a Planet (celestial body) surroundings (Earth, Moon, Mars, etc.) is critical for our understanding of the way it evolves in time, and for our ability to assess and predict implications on certain space-related applications such as communication. This mission layout a concept for creating a comprehensive 3D model a Planet's global surroundings, by using a very large number of ChipSats - a new type of miniature (10 grams) and extremely low-cost circuit-board satellites equipped with a power source, short-range communication and a sensor. The mission concept is to release simultaneously a very large number of ChipSats (x0,000) from carrying satellites that will orbit the researched celestial body at low altitude. Each ChipSat will measure a parameter of the body's surroundings, providing all together with a comprehensive and synchronized information that can be accumulated into a full 3D model. Once released, the ChipSats will gain an initial vector that will guide them to dive into the celestial body's center of gravity. During the dive, each ChipSat will sample data from a large number of heights and transmit it, either to the carrying satellite or to a ground station. The data will include identiers, such as ChipSat, Height, Location and Time. Possible 3D model results of this mission may be gravity field, radiation, magnetic field, or atmospheric gases, all subject to an available sensor. The accumulated data will be sent to a central computer, which will use dedicated software to combine it into a unifed 3D model. Future missions may create the same model at different times (periodically or annually, on the same date), providing insights about the 3D model dynamics changes in time. Another mission concept can be to release only some ChipSats for more local/regional research, e.g. sample surroundings of a hurricane storm. End of mission planning is to have the ChipSats burned at the lower layer of the atmosphere. During this session, we will [1] review the scientifc needs of such a 3D model, [2] present the mission concept life cycle, [3] assess ChipSats technologies and their TRL levels, [4] discuss the unique advantages of ChipSats that make them ideal for such a mission.