A DEDICATED CONSTELLATION FOR GLOBAL GPS LIMB SOUNDING

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Long-term averaging of GPS occultation (limb-sounding) data promises to yield atmospheric measurements of unprecedented precision, vertical resolution, and absolute accuracy. A constellation of six orbiting occultation receivers can achieve a refractivity precision equivalent to 0.1 K in temperature within a climate region corresponding to 1/30 the earth’s surface, with just a few weeks of data. Vertical resolution can be better than 1 km. This offers perhaps the most promising approach yet to detecting and discriminating among subtle forced climatic signals, which may amount to only a few tenths of a Kelvin average temperature change per decade. To avoid confounding true climate signals with aliased diurnal, seasonal, and other effects, global sampling must be rigorously controlled, implying a constellation with a strictly defined and maintained configuration. GPS-CLIM (for “climatology”) is a proposed constellation of six microsatellites now under review for NASA’s Earth System Science Pathfinder Program. The principal science objective is to acquire a comprehensive global occultation data set to test and refine global climate models and help trace the origins of observed climate signals. Designed by Spectrum Astro Inc, the 10-kg, notebook-size “CLIMsats” can be packed into the secondary payload space on such launch vehicles as the Delta II, Taurus, and Pegasus. To achieve the required uniform global coverage, the mission will distribute the six satellites about two high-inclination orbit planes, by means of two separate launches three months apart. The satellites will be made largely with commercial grade parts to minimize cost. Future CLIMsats can be built and launched for less than $1M each. This opens up the possibility of low-cost expansion of the constellation to dozens of satellites within just a few years.

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