The Global Environmental Monitoring Systems (GEMS) Constellation of Passive Microwave Satellite

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The recent successful launch of the Orbital Micro Systems GEMS-1 IOD (Global Environmental Monitoring System In-orbit Demonstrator) satellite carrying the University of Colorado's MiniRad 118-GHz imager/sounder instrument provides the basis for a new means of observing atmospheric precipitation, temperature, and related state variables. GEMS-1 supports an 8-channel passive microwave radiometer operating at the 118.7503 GHz oxygen resonance with cross-track scanning imaging system providing cross- and along track Nyquist sampling at 17 km 3dB spatial resolution. It is precisely calibrated using cold space views along with an on board reference, yielding the first low-cost commercial weather satellite imagery. GEMS is the first of a constellation of approximately 50 such satellites of progressively improving resolution and spectral coverage that will collectively provide Nyquist time-sampling of precipitation and related weather variables on a global basis, and using microwave frequencies will provide such information probing through most cloud cover. Presented will be first light imagery and on-orbit performance data from the GEMS-1 mission, including validation data on the satellite brightness temperatures. Products will include calibrated multispectral imagery, temperature profiles, retrieved rain rate, and precipitation cell top altitude. The expansion of the GEMS-1 mission to the full GEMS constellation will be outlined.