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

Gregory Porter, Richard Delf, Albin Gasiewski, Michael Hurowitz, David Gallaher, Brian Sanders, William Hosack, David Kraft, Roger Carter, Kun Zhang, and Geoffrey Sasaki
Orbital Micro Systems Ltd, Edinburgh UK (greg.porter@orbitalmicro.com)

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 and 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.