MICROWAVE ATMOSPHERIC SOUNDER ON CUBESAT (MASC) PROTOTYPE

Sharmila Padmanabhan, Shannon Brown, Pekka Kangaslahti, Robert Stachnik, Damon Russell, Richard Cofield, and Boon Lim

Jet Propulsion Laboratory, California Institute of Technology,
4800 Grove Drive, Pasadena, CA 91109

To accurately predict how the distribution of extreme events may change in the future we need to understand the mechanisms that influence such events in our current climate. Our current observing system is not well-suited for observing extreme events globally due to the sparse sampling and in-homogeneity of ground-based in-situ observations and the infrequent revisit time of satellite observations. Observations of weather extremes, such as extreme precipitation events, temperature extremes, tropical and extra-tropical cyclones among others, with temporal resolution on the order of minutes and spatial resolution on the order of few kms (<10 kms), are required for improved forecasting of extreme weather events. We envision a suite of low-cost passive microwave sounding and imaging sensors on CubeSats that would work in concert with traditional flagship observational systems, such as those manifested on large environmental satellites (i.e. JPSS,WSF,GCOM-W), to monitor weather extremes.

A 118/183 GHz sensor would enable observations of temperature and precipitation extremes over land and ocean as well as tropical and extra-tropical cyclones. This project has enable low cost, compact radiometer instrumentation at 118 and 183 GHz that fits in a 3U volume with the objective of mass-producing this design to enable a suite of small satellites to image the key geophysical parameters, humidity and temperature, needed to improve prediction of extreme weather events. We have taken advantage of past and current technology developments at JPL viz. HAMSR (High Altitude Microwave Scanning Radiometer), Advanced Component Technology (ACT'08) to enable the low-mass, low-power high frequency airborne radiometers.

In this paper, we will describe the design and implementation of the 118 GHz temperature sounder and 183 GHz humidity sounder on the 6U CubeSat. In addition, we will describe the airborne deployments of MASC during the Plain Elevated Convection at Night (PECAN) experiment during July, 2015 and the OLYMPEX campaign in Nov, 2015.