

## Recent Progress in Airborne Microwave Atmospheric Sounding<sup>1</sup>

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Airborne passive microwave measurements of the Earth's atmosphere have proven useful for technology demonstration, calibration and validation of spaceborne observations, and algorithm development and evaluation. In this talk we present recent observations taken by the S-NPP Airborne Sounder Testbed-Microwave (NAST-M) and describe a new airborne instrument currently in development – the Hyperspectral Microwave Atmospheric Sounder (HyMAS). NAST-M includes spectrometers operating near oxygen absorption lines at 50-57 GHz, 118.75 GHz, and 424.76 GHz, and a spectrometer centered on the water vapor absorption line at 183.31 GHz. The four antenna horns are directed at a single scanning flat-plate reflector so that the beams are collocated. The beams (7.5° full-width at half-maximum) are scanned across the flight track to achieve a ~100 km swath at 20 km altitude. HyMAS leverages the existing Conical Scanning Microwave Imaging Radiometer (CoSMIR) to provide a cross-track scan in a very compact mechanical package. HyMAS measures 52 channels in two bands – 36 channels near 118.75 GHz and 16 channels near 183.31 GHz. A key-enabling technology for HyMAS is the ultra-compact Intermediate Frequency Processor (IFP). The IFP, measuring  $10 \times 10 \times 1 \text{ cm}^3$ , amplifies, power divides, filters, detects, and digitizes the six IF passbands into 52 channels. The IFP is fabricated with materials made of Low-Temperature Co-fired Ceramic (LTCC) technology integrated with detectors, amplifiers, A/D conversion, and data aggregation. This talk will focus on three areas, as follows. 1) NAST-M recently observed an EF5 tornado in Moore, OK, and a 3-D radiometric image in three bands (60, 118, and 183 GHz) was collected as part of a campaign to underfly the Suomi NPP (S-NPP) satellite to validate its performance. 2) The NAST-M radiometer was recently upgraded to include channels at 23.8 and 31.4 GHz to permit complete comparisons with the S-NPP Advanced Technology Microwave Sounder (ATMS). 3) The Hyperspectral Microwave Airborne Sounder (HyMAS) is being developed by MIT-LL and NASA GSFC to support potential flights in 2014. This instrument will measure 52 channels in 118 and 183 GHz bands using an ultracompact, low-power IF spectrometer. These three elements will be described in detail.

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