

# **1 Ground-based retrieval of atmospheric temperature, moisture, cloud properties, and aerosols using the Atmospheric Emitted Radiance Interferometer (AERI)**

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The Atmospheric Emitted Radiance Interferometer (AERI) system measures infrared downwelling radiances at one wavenumber resolution from 3-20  $\mu\text{m}$  with better than 10-minute temporal resolution. The robust, and fully automated AERI instruments are monitored in the field via the Internet in near real-time. The AERI absolute radiometric accuracy is better than 1% of ambient radiance. The calibrated AERI radiances are used to validate high spectral resolution line-by-line model calculations, retrieve profiles of atmospheric constituents, derive cloud/aerosol properties, and surface/oceanic skin properties. The University of Wisconsin – Madison Space Science and Engineering Center (SSEC) developed the AERI for use within the United States Department of Energy (DOE) Atmospheric Radiation Measurement (ARM) research program. DOE ARM has funded the development and installation of eight ground-based AERI systems based in several international locations including Darwin, Australia; Niger, Africa; Barrow, Alaska; and Nauru Island in the South Pacific. The AERI systems have shown high reliability including over ten years of continuous operation at Lamont, Oklahoma, USA.

The AERI technology has been licensed to ABB Bomem of Quebec City, Canada and plans are underway to provide commercial versions of a variety of atmospheric measurement capabilities. The most mature and demonstrated capability allows direct retrieval of meteorological information about the vertical structure of temperature and water vapor in the planetary boundary layer (PBL; 0-3 km). New cloud and aerosol property retrieval applications are in development and show promise to provide operational utility for meteorological forecast offices, airport terminal weather nowcasting, and direct numerical weather prediction model assimilation of downwelling radiances to complement new current and upcoming infrared high spectral resolution satellite-based radiance measurements from Atmospheric Infrared Sounder

(AIRS), Infrared Atmospheric Sounding Interferometer (IASI), and Cross-track Infrared Sounder (CrIS) sensors. This paper will present an overview of latest AERI atmospheric science operational and research applications.