

Abstract:

The Aerosol Ice Interface Transition Spectrometer – A new particle phase detector for UTLS investigation.

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As part of the UK NERC commitment to future UTLS Science Missions using the NASA Global Hawk the CAST project (Coordinated Airborne Studies in the Tropics) has initiated two instrument developments for adaptation to the Global Hawk. We describe one of these, the Aerosol Ice Interface Transition Spectrometer (AIITS). AIITS will be used to investigate the combined scattering and ice nucleation properties of aerosol and sub-visible cirrus to investigate cirrus formation rates and lifetimes. It is designed to probe aerosol-ice nuclei and small ice particles and to detect their transition across the aerosol-ice phase.

The wing-mounted component of AIITS has a 70mm diameter inlet that carries the sample airflow through the optical measurement assembly. Individual particles of approximate size 1 – 100 μm carried in this airflow are detected at the AIITS optically-defined sensing zone and trigger the acquisition of high-resolution 2D polarisation forward scattering patterns (at rates up to 300 s^{-1}) and backscatter polarization ratio measurements (at rates up to 5000 s^{-1}). These data provide a means of determining both particle size and particle shape, with the 2D patterns additionally allowing the possibility of assessing properties such as ice crystal habit or surface roughness. All data are carried via optical fiber links to an inboard host PC for storage, pre-processing and onward transmission of real-time basic metrics relating to particle size, shape, and concentration.

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