



The use of Far InfraRed high spectral resolution data for cloud identification and classification

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An innovative methodology for Cloud Identification and Classification (CIC) is presented. The CIC algorithm is a machine-learning technique, based on Principal Component Analysis, performing binary classification for clear/cloudy scene detection and classification (i.e. liquid/ice cloud phase).

Firstly, CIC is tested on a wide synthetic dataset of high spectral resolution radiances in the far and mid infrared (FIR and MIR) part of the spectrum simulating measurements from the ESA Earth Explorer Fast Track 9 competing mission FORUM (Far Infrared Outgoing Radiation Understanding and Monitoring) that is currently (2018/19) undergoing the industrial and scientific Phase-A studies. Simulated spectra represent observations covering many diverse climatic areas, ranging from the tropical to polar regions.

Secondly, CIC is applied to a small dataset of high spectral resolution radiance observations taken from aircraft on the 13th March 2015 off the north-east coast of Scotland, UK, during the Cirrus Coupled Cloud-Radiation Experiment (CIRCCREX). Measurements in the FIR are made by the Tropospheric Airborne Fourier Transform Spectrometer, TAFTS, (Canas et al. 1997) and in the MIR by the Airborne Research Interferometer Evaluation System, ARIES, (Wilson et al. 1999).

The main result demonstrates the high information content of spectral radiance in the FIR region of the electromagnetic spectrum which is exploited here to improve the detection performance in identifying cloudy scenes, specifically thin cirrus clouds.