Contribution ID: **41** Type: **Poster presentation**

Comparing airborne sub-millimetre observations of ice clouds with model simulations

The next generation of European polar-orbiting weather satellites (EPS-SG), due to be launched in the 2020s, will carry the novel Ice Cloud Imager (ICI) which has 13 channels measuring frequencies between 183 and 664GHz that are sensitive to scattering by ice crystals in clouds. As well as providing global estimates of bulk ice mass, these observations also have the potential to be assimilated directly into operational Numerical Weather Prediction (NWP) models using the "all-sky" approach. It is therefore of considerable interest to consider whether the representation of ice clouds within current NWP and radiative transfer models is sufficiently accurate to simulate realistic brightness temperatures at millimetre and sub-millimtere wavelengths.

The International Sub-Millimetre Airborne Radiometer (ISMAR) has been developed as an airborne demonstrator for ICI and flown on the UK Facility for Airborne Atmospheric Research (FAAM) BAe-146 aircraft since 2014. Together with the Microwave Airborne Radiometer Scanning System (MARSS) it provides observations between 89GHz and 874GHz covering the majority of ICI channels. Here we consider case studies from several flight campaigns that took place between 2015 and 2019. Atmospheric fields from high-resolution Met Office NWP models are used as input to the ARTS radiative transfer model, which is run using optical properties for realistic ice crystal habits from the state-of-the-art ARTS scattering database. Where possible, we aim to achieve a consistent representation of cloud microphysics between the NWP and radiative transfer models. Simulated brightness temperatures for cloudy scenes are compared to observations from MARSS and ISMAR. We show that the modelled brightness temperatures at these frequencies are strongly sensitive to the ice cloud optical properties, but by using particular ice crystal habits it is possible to produce realistic simulations across the range of frequencies observed by ICI.

Primary author: Dr FOX, Stuart (Met Office)

Presenter: Dr FOX, Stuart (Met Office)

Session Classification: Poster session with self-serve tea and coffee

Track Classification: 4th workshop on assimilating satellite cloud and precipitation observations for NWP