Latent heat release in extratropical cyclones in a high resolution climate model, reanalysis and remote sensing data

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Climate models must be capable of properly simulating the processes that drive extratropical cyclones if they are to realistically represent their intensities, evolution and propagation. One such process which models need to capture is the magnitude and location of latent heat release within cyclones. Both the magnitude and the location of the latent heat release can influence the evolution of extratropical cyclones.

Here, an evaluation of latent heat release in a high-resolution climate model (HiGEM) is presented by applying an innovative storm compositing technique which allows the magnitude and location of fields associated with latent heat release to be determined in composite extratropical cyclones. Case studies are also presented.

In addition to comparing the model to reanalysis, remote sensing data that measures fields associated with latent heat release is employed to extend this work beyond many previous studies. First, the GPCP (Global Precipitation Climatology Project) dataset is used to assess precipitation within storms, which can be thought of as a first order estimate of the integrated latent heat release in a storm. Forward modelled radiances from the model and reanalysis are then created using an offline simulator (COSP: CFMIP Offline Simulator Package) to provide fields that can be directly compared to remote sensing data. The ISCCP (International Satellite Cloud Climatology Project) dataset is used to assess the two dimensional structure of storms in the model and reanalysis, before the three-dimensional structure is analysed using the CloudSat dataset.