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An automated cirrus classification

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Cirrus clouds play an important role in determining the radiation budget of the earth, but our understanding of the lifecycle and controls on cirrus clouds remains incomplete. Cirrus clouds can have very different properties and development depending on their environment, particularly during their formation. However, the relevant factors often cannot be distinguished using commonly retrieved satellite data products (such as cloud optical depth). In particular, the initial cloud phase has been identified as an important factor in cloud development, but although back-trajectory based methods can provide information on the initial cloud phase, they are computationally expensive and depend on the cloud parametrisations used in re-analysis products.

In this work, a classification system (Identification and Classification of Cirrus, IC-CIR) is introduced. Using re-analysis and satellite data, cirrus clouds are separated in four main types: frontal, convective, orographic and in-situ. The properties of these classes show that this classification is able to provide useful information on the properties and initial phase of cirrus clouds, information that could not be provided by instantaneous satellite retrieved cloud properties alone. This classification is designed to be easily implemented in global climate models, helping to improve future comparisons between observations and models and reducing the uncertainty in cirrus clouds properties, leading to improved cloud parametrisations.