Title: High-resolution model evaluation with self-supervised neural network approach targeted on severe storms over the Alps

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Abstract:
As climate change advances, the Alps are expected to experience increasingly intense thunderstorms, which are likely to cause more damage due to floods and landslides. This study aims at evaluating extreme precipitation in weather models over complex terrains where orography causes the hardest challenges to precipitation prediction.

Our preliminary analysis assessed which infrared and visible satellite channels are most effective in predicting precipitation, by examining the MSG satellite channels and radar-derived rain products. This assessment considered the influence of terrain by comparing data from flatlands and more complex topographies.

We will then use a combination of the selected channels to train a self-supervised machine learning (ML) algorithm for both observations and model outputs. We will exploit the space where cloud classes are identified, known as feature space, in two distinct ways to evaluate the ICON-GLORI model. Firstly, we pinpoint significant cases of extreme precipitation and simulate them using the ICON-GLORI model. This data is then input into the observation-trained ML algorithm to determine the cluster within the feature space where the simulated cases will be categorized. Secondly, we construct a feature space using the ensemble ICON-GLORI model. A showcase of the ML algorithm trained using the cloud optical thickness from 2015 imagery over Germany will demonstrate the potential of this approach.