

ABSTRACT IWPG WORKSHOP

Title: Learning spatiotemporal evolution of storms for improving forecasting over complex terrain

In 2050, in Europe, damages from climate change and flooding are expected to reach €45 billion annually. Severe storms produce heavy rain, often causing landslides, and orography is crucial in triggering such events, especially in the foothills of the Alps. Due to difficulties conducting ground-based remote sensing observations over complex terrain, satellite observations are a valuable alternative for monitoring high-resolution natural hazards in the Alpine region.

The most recent approaches to detecting severe storms rely on integrating multiple datasets and machine learning to improve weather prediction and develop accurate nowcasting. Most of the time, the temporal dimension is used to make short-term predictions; for instance, this is done by applying atmospheric motion vectors to radar images or by using machine learning approaches. However, in the spatiotemporal evolution of clouds, substantial information about cloud systems remains largely unexplored.

In the past, deep learning self-supervised techniques have shown exciting developments in identifying spatial cloud patterns from satellite images and characterizing the conditions under which such organization occurs. In this contribution, we use recent deep-learning self-supervised algorithms developed to identify spatiotemporal motion in MSG/MTG and lightning data to study and classify the evolution of cloud patterns. We will characterize the evolution of convective systems and derive parameters that quantitatively describe this evolution. Finally, we will show, using case studies from the TEAMx campaign over the Alps, how this knowledge can be applied to better detect extreme precipitation within a nowcasting framework.