

# Abstract

Analyzing depressions plays an important role in meteorology, especially in the study of cyclones. In particular, the study of the temporal evolution of cyclones requires a robust depression tracking framework. To cope with this demand we propose a pipeline for the exploration of cyclones and their temporal evolution. This entails a generic framework for their identification and tracking. The fact that depressions and cyclones are not well-defined objects and their shape and size characteristics change over time makes this task especially challenging. Our method combines the robustness of topological approaches and the detailed tracking information from optical flow analysis. At first cyclones are identified within each time step based on well-established topological concepts. Then candidate tracks are computed from an optical flow field. These tracks are clustered within a moving time window to distill dominant coherent cyclone movements, which are then forwarded to a final tracking step. In contrast to previous methods our method requires only a few intuitive parameters. An integration into an exploratory framework helps in the study of cyclone movement by identifying smooth, representative tracks. Multiple case studies demonstrate the effectiveness of the method in tracking cyclones, both in the northern and southern hemisphere.