



## **Meanie3D - a mean-shift based, multivariate, multi-scale clustering and tracking algorithm**

Jürgen-Lorenz Simon, Diederich Malte, and Troemel Silke

Hans-Ertel-Centre for Weather Research, Atmospheric Dynamics and Predictability Branch, University Bonn, Germany

Project OASE is the one of 5 work groups at the HERZ (Hans Ertel Centre for Weather Research), an ongoing effort by the German weather service (DWD) to further research at Universities concerning weather prediction. The goal of project OASE is to gain an object-based perspective on convective events by identifying them early in the onset of convective initiation and follow then through the entire lifecycle.

The ability to follow objects in this fashion requires new ways of object definition and tracking, which incorporate all the available data sets of interest, such as Satellite imagery, weather Radar or lightning counts. The Meanie3D algorithm provides the necessary tool for this purpose.

Core features of this new approach to clustering (object identification) and tracking are the ability to identify objects using the mean-shift algorithm applied to a multitude of variables (multivariate), as well as the ability to detect objects on various scales (multi-scale) using elements of Scale-Space theory.

The algorithm works in 2D as well as 3D without modifications. It is an extension of a method well known from the field of computer vision and image processing, which has been tailored to serve the needs of the meteorological community. In spite of the special application to be demonstrated here (like convective initiation), the algorithm is easily tailored to provide clustering and tracking for a wide class of data sets and problems.

In this talk, the demonstration is carried out on two of the OASE group's own composite sets. One is a 2D nationwide composite of Germany including C-Band Radar (2D) and Satellite information, the other a 3D local composite of the Bonn/Jülich area containing a high-resolution 3D X-Band Radar composite.