



## **COST733CLASS - a software package for circulation and weather type classification**

Andreas Philipp, Christoph Beck, and Florian Streicher

University of Augsburg, Geography, Physical Geography and Quantitative Methods, Augsburg, Germany  
(andreas.philipp@geo.uni-augsburg.de)

Within the COST action 733 "Harmonisation and Applications of Weather Type Classifications for European regions" a FORTRAN software package has been developed at the University of Augsburg (Germany) to produce and evaluate classification catalogs using any kind of input data.

The software runs originally on UNIX/LINUX systems and can be controlled by command line arguments. This refers to the input data (ASCII or NETCDF), the data preprocessing (grid/date selection, high-/low-pass-filtering, PCA, normalization, weighting) as well as to the selection of the classification or evaluation algorithm. More than 20 different classification algorithms can be selected including: interval classification, prototype classification GWT, the Litynski method, the Jenkinson Collison scheme, the WLK-(Wetterlagenklassifikation) scheme of the German Metservice DWD, T-Mode PCA with/without oblique/orthogonal rotation, S-Mode PCA applying Esteban's extreme-scores-method, Kruizinga's P27, Lund, Kirchhofer, Erpicum, hierarchical cluster analysis, non-hierarchical algorithms like: k-means in several variants, k-medoids, simulated annealing clustering, self organizing maps, Gaussian mixture models and random classification schemes. Where possible the number of types can also be chosen by a command line switch. Several further switches allow fine-tuning of the methods, while the command line interface allows to run the software by shell-scripts for testing several variants. Several evaluation methods are available for analyzing catalog quality or statistics in subsequent runs.

The code is partly parallelized using OMP and can be run by scripts which makes it suitable for productive use. e.g. on compute clusters. On the other hand if compiled using the implemented OpenGL directives, the package can visualize the classification process in a PCA-reduced 3D-phase space. Single frames can be saved in order to create animations.

The code is released as open source software under the GNU public license (GPL) and comes with an user guide document describing the methods and including instructions how to add further methods. Even though the software is still under development it is already used by several institutions. Some selected features of the software are demonstrated, especially the 3D-visualization of different methods.