University of Stuttgart
Institute for Modelling Hydraulic and Environmental Systems

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Multidimensional flood analysis challenges and similarities utilizing linear and non-linear approaches

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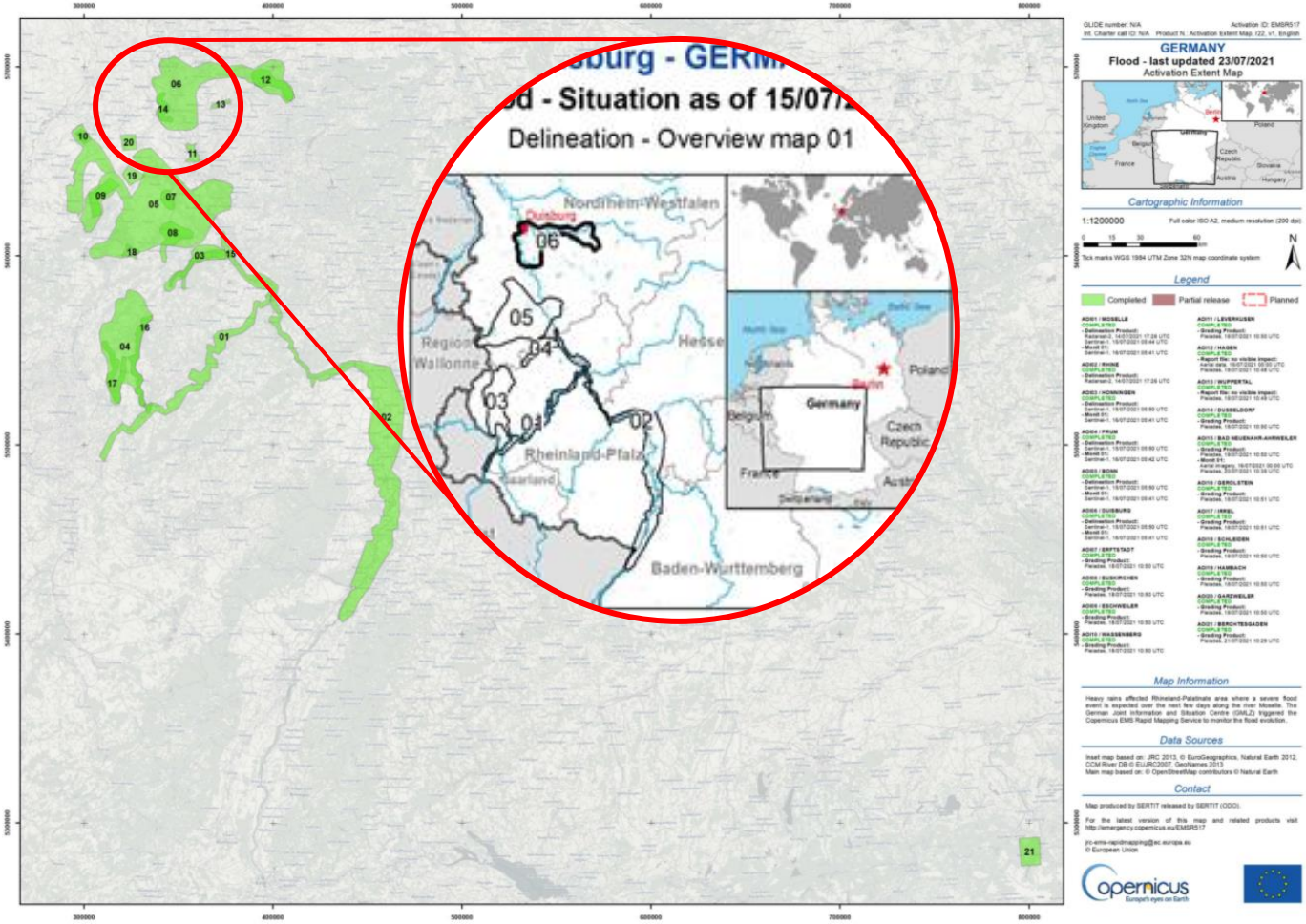
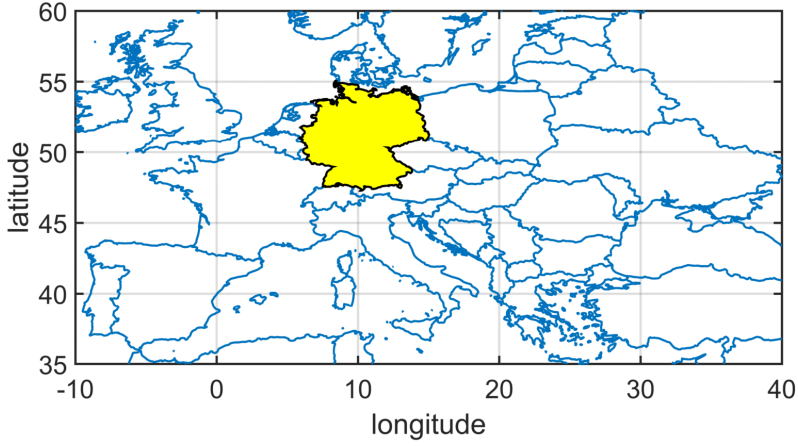
Floods

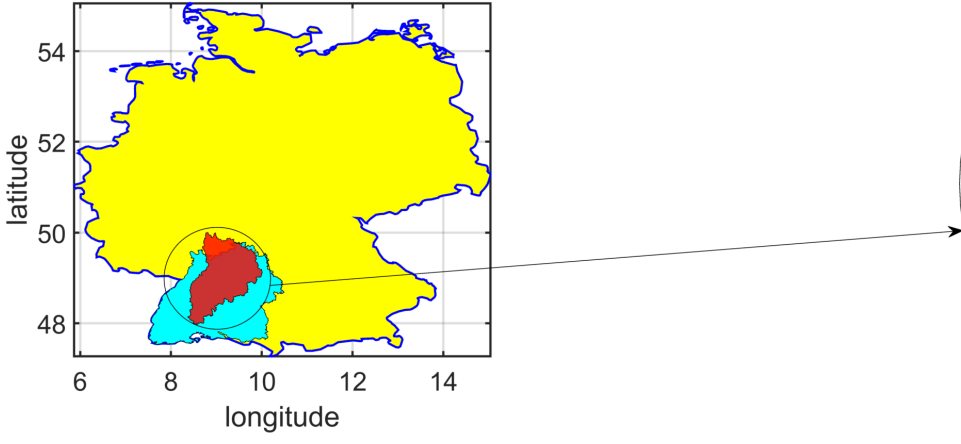
Simultaneous floods



Study area

Neckar catchment & discharge time series

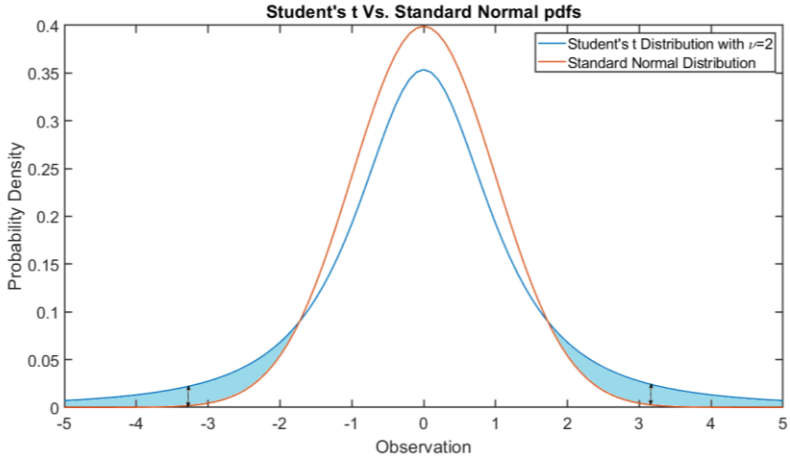




Multidimensional scaling & tSNE

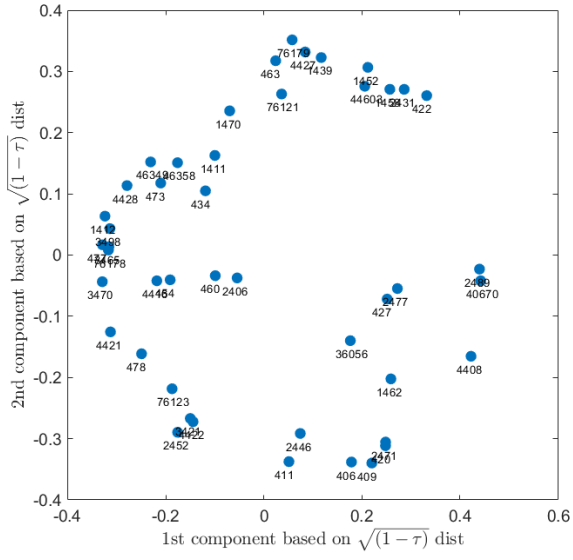
Normal distribution & Student's t distribution

- Multidimensional scaling (MDS) is based on Principal Component Analysis (PCA), which is a linear technique.
- t-distributed Stochastic Neighbor Embedding (tSNE) is a non-linear dimensionality reduction method. In theory, tSNE can handle outliers and perplexity and preserve the local structure of data.
- t-student distributions have a greater chance for extreme values than normal distributions.
- The fatter and heavier tails

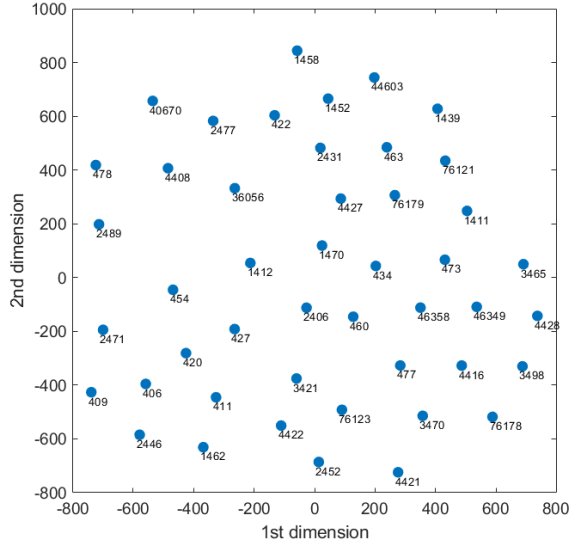


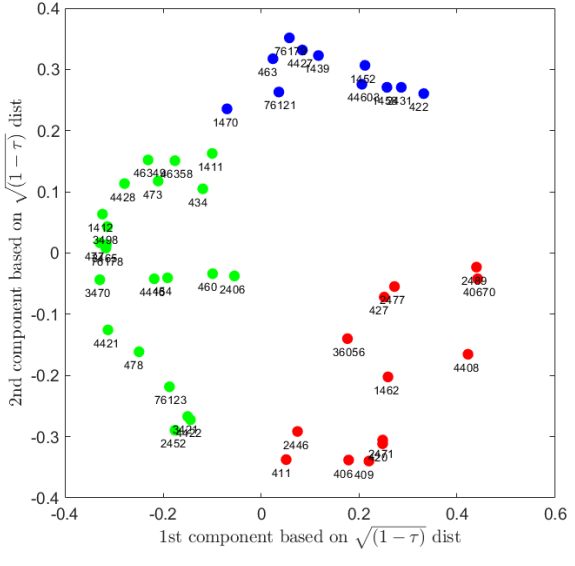
MDS Vs. tSNE

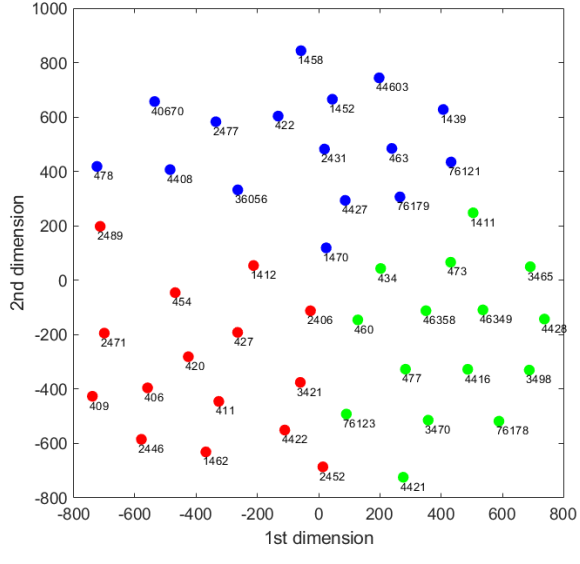
2D MDS



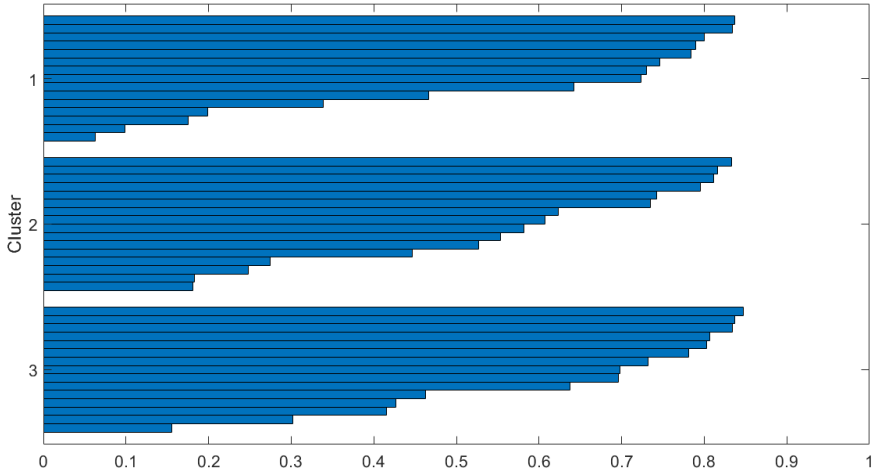
2D tSNE



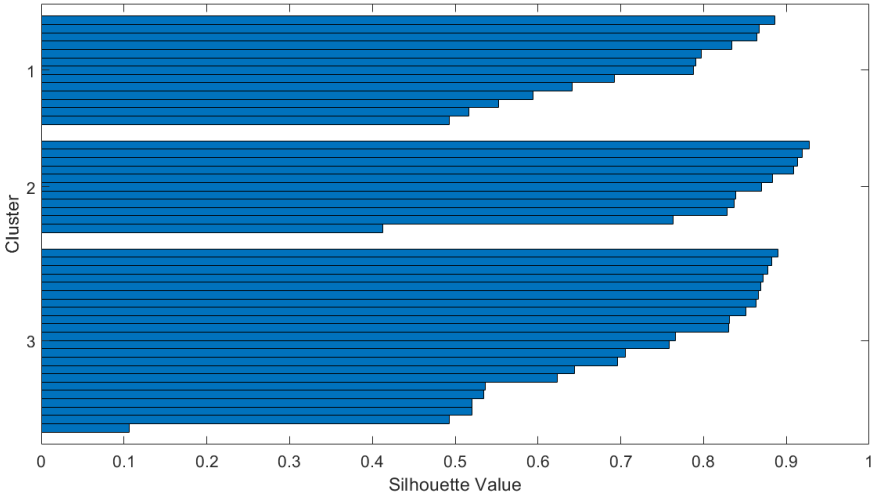




Cluster evaluation



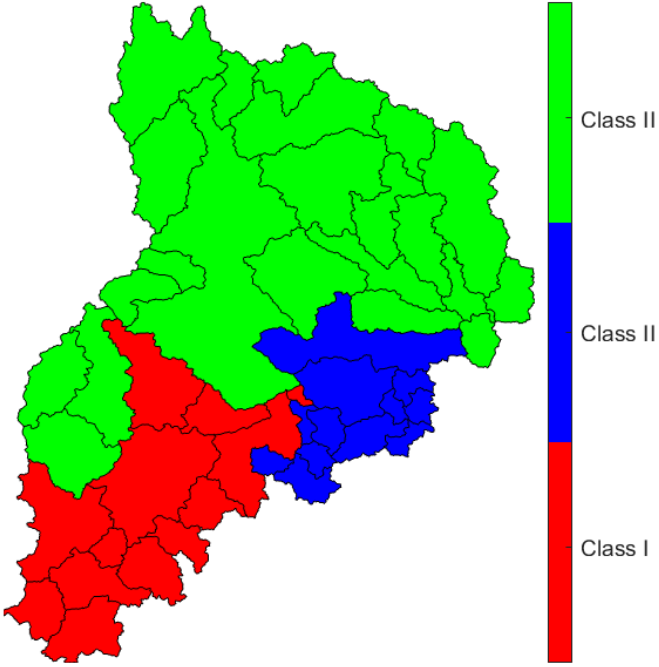
tSNE silhouette score



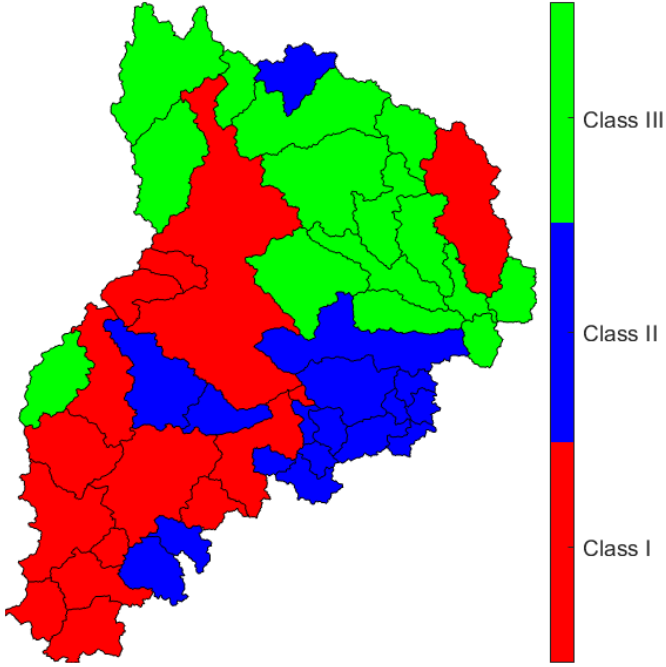
MDS silhouette score

Mapping clusters

Clustering simultaneous extreme floods



MDS-kmeans mapping



tSNE-kmeans mapping

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Thank you!

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