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Scalable Feature Extraction and Tracking (SCAFET): A general framework for feature extraction from large climate datasets

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The study describes a generalized framework to extract and track features from large climate datasets. Unlike other feature extraction algorithms, Scalable Feature Extraction and Tracking (SCAFET) is independent of any physical thresholds making it more suitable for comparing features from different datasets. Features of interest are extracted by segmenting the data on the basis of a scale-independent bounded variable called shape index (Si). Si gives a quantitative measurement of the local shape of the field with respect to its surroundings. To illustrate the capabilities of the method, we have employed it in the extraction of different types of features. Cyclones and atmospheric rivers are extracted from the ERA5 reanalysis dataset to show how the algorithm extracts points as well as surfaces from climate datasets. Extraction of sea surface temperature fronts depicts how SCAFET handles unstructured grids. Lastly, the 3D structures of jetstreams are extracted to demonstrate that the algorithm can extract 3D features too. The detection algorithm is implemented as a jupyter notebook [<https://colab.research.google.com/drive/1D0rWNQZrIfLEmeUYshzqyqiR7QNS0Hm-?usp=sharing>] accessible to anyone to test out the algorithm.