

EGU2020-17802

<https://doi.org/10.5194/egusphere-egu2020-17802>

EGU General Assembly 2020

© Author(s) 2020. This work is distributed under the Creative Commons Attribution 4.0 License.



On the use of circulation classifications by self-organizing maps toward studying extreme weather

Jan Stryhal and Eva Plavcová

Institute of Atmospheric Physics CAS, Prague 4, Czechia (stryhal@ufa.cas.cz)

The self-organizing maps (SOMs) have become a widespread tool for studying atmospheric circulation and its links to weather elements. The SOMs do not only produce a classification, but also a topology-preserving representation of the input data—a 2D array of circulation types (CTs). Consequently, one can analyse not only CT frequencies, persistence, and their conditioning of weather elements, but also visualise these parameters in a “continuum” of representative patterns. This latter characteristic makes it in theory plausible to define a (considerably) larger number of CTs compared to other classification approaches, and thus better represent extremes of circulation variability, without necessarily compromising the utility of the output by making it unintelligible.

Here, we investigate whether increasing the number of CTs (enlarging the SOM) leads to a classification better suitable to study synoptic forcing of extreme weather, and, in particular, what the effect is of various SOM parameters, which have to be chosen a priori more or less subjectively—such as array shape and size, radius and function of neighbourhood, learning rate, and initialization—on the utility of the resulting classification. Furthermore, we present the Sammon mapping, typically used to evaluate the topological structure of SOMs, as a standalone classification tool that shares some of the advantages with SOMs while potentially circumventing some of their weaknesses.