Plain Language Summary: We propose an algorithm detecting atmospheric blockings by extracting topological features of geo-potential height data at 500 hPa. The method is based on Topological Flow Data Analysis (TFDA), providing a unique symbolic representation (COT representation) and a discrete graph structure (Reeb graph) to every structurally stable Hamiltonian vector field. The algorithm objectively detects not only the period of blocking events but also the morphological types such as an Omega shape and a dipole pattern.
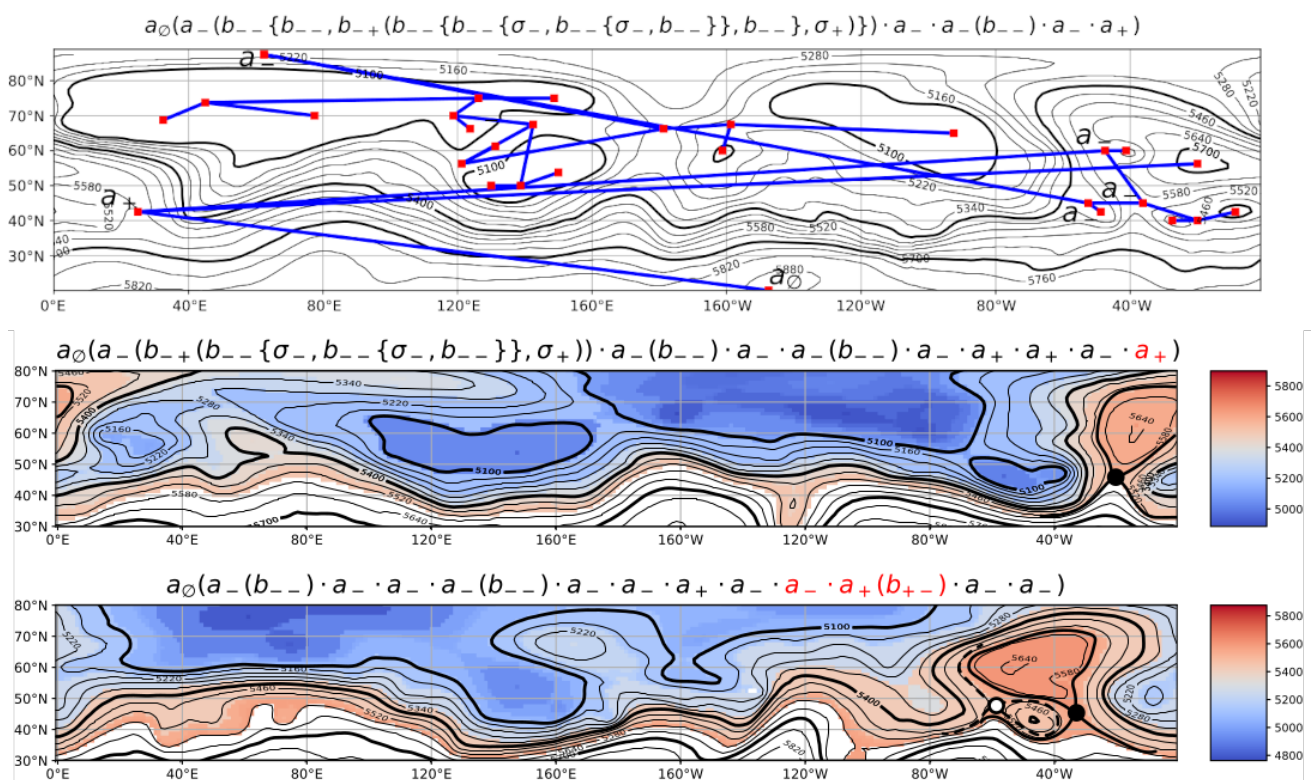
Figure A. Outputs of the algorithm: The COT representation and its associated Reeb graph for an isopleth plot (top). An Omega-type blocking (middle) and a dipole-type blocking (bottom) detected by the algorithm. The COT symbols in red indicate the locations of the blocking domains.

- An objective algorithm of Topological Flow Data Analysis, detecting atmospheric blockings from a dataset of the geo-potential height at 500 hPa, is proposed.
- The algorithm extracts all characteristic isopleth patterns in terms of topology, which are converted into discrete expressions in terms of COT representations and Reeb graphs.
- The detected blocking events and their morphological types agree with subjective judgements made by synopticians, while the algorithm requires fewer parameters than conventional methods.