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On the role of deformation in the maintenance of (stationary) vortex systems

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Deformation is a fluid property rarely used in the analysis of vortex systems. However, it seems to be plausible that a ring of deformation surrounding a vortex core can help in sustaining or even strengthening the vortex. The reason for this behavior is probably that environmental perturbances are stirred around and led away from the vortex core. The aim of this work is to prove or disprove this hypothesis.

In this work, we will study the deformation associated with long-living stationary and instationary vortex systems. Stationary vortex systems can pose a high threat to society and economics. Probably the highest impact is caused by large-scale atmospheric blocking situations. Hence, as a first example, large-scale atmospheric blockings will be systematically analysed in order to study the role of the deformation in the maintenance of the vortex systems. Furthermore, we will try to link the results to convective-scale (instationary) vortex systems. In order to study the role of deformation, idealized supercell simulations carried with the WRF model will be investigated comparing different deformational environments.

With this work, we hope to improve the understanding of the underlying reasons leading to the long durations observed in such weather situations.