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## Proper Orthogonal Decomposition on Vortex surfaces

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Multi-scale vortex motions are ubiquitous in the solar atmosphere. They are already extensively studied by using a number of numerical (magneto-hydrostatic and magnetoconvection simulations) and observational (analysis of different spectral lines) approaches. The high-resolution magnetoconvection MuRAM data has been used in this study. For the first time, full 3D photospheric intergranular vortices, defined as coherent structures are subtracted from the numerical domain. Lagrangian Averaged Vorticity Deviation (LAVD; Haller, 2016, Silva, 2020, 2021) and fluid elements advection were used to identify vortex flows, namely the centre of circulation and their 3D surfaces. The analysis of vortex surfaces was performed by using Proper Orthogonal Decomposition (POD). A number of similarities with hydrodynamic Whirlpool dynamics have been identified. Additionally, the presence of persistent in time surface deformations and possible associated MHD wave propagation will be discussed.

### Student poster?

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