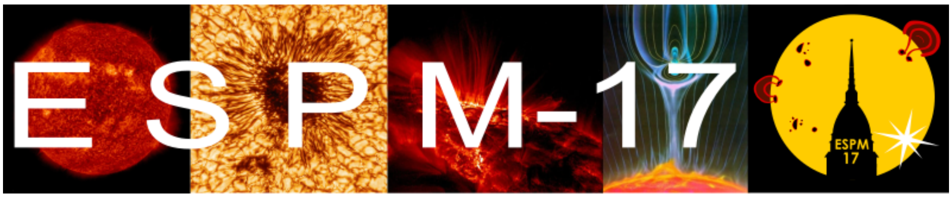

Contribution ID: **21**

Type: **Poster**

Validating Fourier Local Correlation Tracking of quiet photospheric vortex flows using MURaM and DKIST

Vortex flows in the solar photosphere are ubiquitous and are thought to inject energy into the upper solar atmosphere in the form of Poynting flux. However, observing photospheric intensity vortices is challenging due to their small size and the fact that the flow field is primarily parallel to the plane-of-sky. Despite this, a large number of photospheric intensity vortices have been observed by applying Fourier Local Correlation Tracking (FLCT) to high-resolution observations. Validating these detections raises two questions: i) Are changes in photospheric intensity a suitable proxy for tracking the plasma velocity field? ii) Are the statistics on the observed properties of photospheric vortices accurate, given a significant number of vortices are considered to remain unresolved by most instruments? To address these questions, we compare observations from the Daniel K. Inouye Solar Telescope (DKIST) with a synthetic observation produced by a radiative magnetohydrodynamic MURaM simulation. We employ FLCT to infer the velocity field from the observations and use the Γ-functions method to identify and track the properties of vortices therein. We find a discrepancy between the number of vortices identified in the DKIST observation, the synthetic observation, and the plasma properties derived from the simulation. Here, we compare the simulated and inferred velocity fields and outline the potential implications of the validity of FLCT. This research draws important conclusions on the photospheric intensity vortices with further consequences on the expected energy transfer to the upper solar atmosphere.

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Session Classification: Coffee break and poster session 1

Track Classification: Energy and mass transfer throughout the solar atmosphere and structures within