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Preparing for DKIST: Using SUNRISE/IMaX Data to Compute Energy Fluxes from the Quiet Sun

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Understanding processes in the quiet Sun is crucial for understanding the Sun in general. The overarching goal of our study is to quantify the energy output of the quiet Sun, which can be expressed in terms of the Poynting flux. To compute this quantity, one can use Maxwell's equations, provided the full orientation of magnetic, electric, and velocity fields are available. All of those can be recovered from spectropolarimetric data using different inversion methods.

Quiet Sun magnetic fields have only recently become observable with the launch of missions such as Hinode and SUNRISE. The Daniel K. Inouye Solar Telescope (DKIST) is expected to improve the quality of these observations even further. While the SUNRISE/IMaX images have a resolution of 0.15 ‘’/pixel, the DKIST ViSP instrument available in the first cycle will provide magnetograms with a resolution of 0.05”/pixel. The cadence of images provided by the VBI is 7 seconds compared to 12 seconds by IMaX. The signal-to-noise ratio of Stokes vectors measurements is likewise expected to improve.

We present our preliminary results obtained from velocity and electric field inversions of photospheric images, magnetograms and Doppler velocities from SUNRISE/IMaX, the challenges associated with these inversions, and implications for DKIST observations. Specifically, we use Fourier Local Correlation Tracking (FLCT) and machine-learning-based algorithm, DeepVel, to obtain, respectively, optical flows and velocity fields, and compare these with quantities derived using the PDFI electric-field inversion method.

Student poster?

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