

Title: Determining properties of the solar atmosphere by inversion

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Abstract: The Daniel K. Inouye Solar Telescope (DKIST), upon completion, will be the most advanced solar telescope in the world. As such, observing time will be valuable and it is important that the time is used efficiently. With DKIST better views of the solar spectrum will be available, and inversion techniques, which are used to determine solar atmospheric properties from observed spectra, should be tailored to maximally exploit these new capabilities. In the presented work we employ the specific inversion code Stokes Inversion based on Response functions (SIR). Specifically, we use the SIR code to test whether a fine sampling of two spectral lines or a coarse sampling of five spectral lines is a more viable inversion approach to which observations could be tailored accordingly. To this goal we generate theoretical spectra from two-dimensional model atmospheres, apply noise, and run them through SIR inversions to recover atmospheric parameters. We then determine the RMS differences between the model atmospheres and the SIR inversions to determine which method produced more accurate inversions. It was found that neither sampling method stood out as superior regarding RMSD values. In some situations, the inversions from the fine sampling had lower RMSD values and in other situations it was the opposite. The inversions done on two spectral lines could be computed much faster so the fine sampling is a more efficient method in post-processing, but not necessarily in observing strategy.