

Title: Applying and Evaluating the Performance of a non-Local Thermodynamic Equilibrium Archive for Spectral Inversion

Student: Chantelle Kiessner (University of Hawaii at Hilo)

Mentors: Christian Beck (NSO) and Sanjay Gosain (NSO)

Abstract:

An inversion of spectra determines the thermodynamic and magnetic properties of the atmospheric volume from which the spectra originated. The assumption of local thermodynamic equilibrium (LTE) strongly simplifies the calculation, but is partially invalid at low mass densities because of an insufficient number of collisions. Consistent non-LTE calculations are, however, computationally extremely demanding. We have generated a pre-calculated archive of spectra in both LTE and non-LTE for an automatic analysis of solar spectra. The application of the archive to observations retrieves the thermal stratification in the solar atmosphere, which allows one to study the atmospheric state and the physical processes that modify it in detail. The aim of this project is to apply the non-LTE archive to solar chromospheric observations to confirm that its performance is sufficient and comparable to that of the much larger LTE archive. The work done consists of the application of the archive to observed spectra, determining the quality of the inversion results, and verifying that the non-LTE inversion method shows the expected statistical behavior. The initial approach used high-resolution data of the Ca II IR spectral line at 854 nm acquired with the IBIS instrument at the Dunn Solar Telescope.