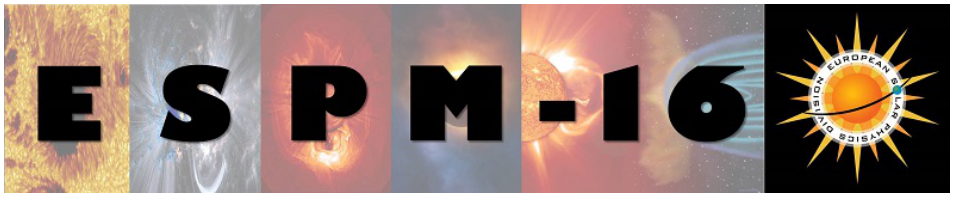

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Sunspot oscillations in Ca II 854.2 nm

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The Ca II 854.2 nm line is currently one of the most favored spectral lines for spectropolarimetric studies of the solar chromosphere. The interpretation of the line is commonly supported by sophisticated NLTE inversion codes, which look for the atmospheric stratification whose Stokes profiles best match the observed data. Several studies have employed this line to analyze oscillatory phenomena in sunspots, such as umbral flashes. Umbral flashes are sudden brightenings in the core of the line produced by the propagation of waves coming from photospheric layers and developing into shocks. In this work, we evaluate the potential of the Ca II 854.2 nm line for studying chromospheric oscillations in umbrae. We have developed numerical simulations of wave propagation in a sunspot. The Stokes profiles emerging from these models have been computed using the NLTE code NICOLE. We have compared the oscillations in velocity, temperature, and magnetic field inferred from the inversions of the synthetic profiles with the original oscillations. The chromospheric velocity and temperature oscillations are reasonably captured by the inversions since the output models reproduce their amplitude and main period. Their power spectra exhibit a secondary power peak, possibly due to fluctuations in the formation height of the line. The inferred magnetic field shows spurious fluctuations with peak-to-peak amplitude around 300 G, which is absent in the original data. Our results support the use of the Ca II 854.2 nm line for the analysis of chromospheric waves, but suggest caution with the interpretation of oscillations in the magnetic field.

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