M05a Statistical Spectral Diagnosis on Synthetic Ca II 8542 Å Stokes Profiles for Chromospheric Shock Waves in Simulated Quiet Sun Regions

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Shock waves are widely involved in the continuous evolution of chromospheric magnetic field structures. The polarization signatures associated with these shocks offer valuable insights into the local magnetic fields around the shock fronts. These signatures enable the inference of field strength, topology and formation processes within the sensitive layers of the spectrum as the shocks propagate through. Thus, it is important to investigate the statistical relationship between polarization signatures and local magnetic fields. We studied the Ca II 8542 Å synthetic disk-center Stokes profiles from a 2D realistic radiative MHD simulation, which reproduced a well-relaxed unipolar atmosphere. Chromospheric shocks, which appear ubiquitously, were categorized into two types based on the shock angle: perpendicular shocks (exclusively fast mode shocks) and parallel/oblique shocks (containing both fast and slow shocks). We selected 76705 fast shocks and 15959 slow shocks which are dominant in the associated core profiles based on the contribution function. We found that more than 70% of these observable shocks are propagating upward. Fast shocks are predominantly concentrated around shock angle of 90° and slow shocks are mainly found around shock angle of 0°. Consequently, fast shocks result in higher linear polarization and lower circular polarization, whereas slow shocks exhibit the opposite behavior.