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* Parameter effects on the total intensity of H I Lya line for a modeled CME and its driven shock

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The combination of the H I Lyα (121.6 nm) line formation mechanism with white-light and ultraviolet (UV) Lyα observations provides an effective method for determining the electron temperature of coronal mass ejections (CMEs). A key to ensuring the accuracy of this diagnostic technique is the precise calculation of theoretical Lyα intensities. This study performs a modelled CME and its driven shock via the three-dimensional numerical magneto-hydrodynamic simulation. Then, we generate synthetic UV images of the CME and shock to quantify the impact of different assumptions on the theoretical Lyα intensities, such as the incident intensity of the solar chromospheric Lyα line (I_{disk}), the geometric scattering function ($p(\theta)$), and the kinetic temperature (T_n) assumed to be equal to either the proton (T_p) or electron (T_e) temperatures. Through comparing relative variations of the Lyα intensities of the CME and shock under these assumptions, we find that: (1) Using the uniform or Carrington maps as input for I_{disk} underestimates the Lyα intensity (with relative errors below 10%) compared to the Real-time map, but the Carrington map yields better results than the uniform disk. (2) Neglecting the geometric scattering process leads to a relatively symmetric influence, with an error reversal interface at a latitude of approximately 40°. The Lyα intensity is overestimated above this latitude and underestimated below it. The relative errors increase with heliocentric distance, but do not exceed 10%. (3) Compared to the assumption $T_n = T_p$, using $T_n = T_e$ leads to more complex relative errors in CME Lyα intensity. The CME core and void are almost overestimated, with maximum values exceeding 50%. In the CME front, both overestimates and underestimates exist with relative uncertainties of less than 35%. However, the electron temperature assumption has a smaller impact on the shock, with an underestimated relative error of less than 20%.

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