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Inferring density irregularities due to the effect of turbulence in the solar corona by forward modeling

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One of the possible reasons for heating both open and closed magnetic field regions of the solar corona is due to the MHD turbulence. In this work, we have estimated the density filling factor which plays a crucial role as a correction factor for the energy flux for the Alfv{\'e}n waves and kink waves. We have employed an ideal 3D MHD simulation for an open magnetic structure using MPI-AMRVAC by incorporating density inhomogeneities in a background atmosphere along the transverse direction of the magnetic field for a spatial domain of 50 Mm $\times$ 5 Mm $\times$ 5 Mm. Once the simulation reaches equilibrium, we excite the system by implementing transverse MHD waves at the base of the simulation domain. The presence of the transverse inhomogeneities leads to the generation of turbulence, which creates density irregularities (or structure irregularities) in the atmosphere. We estimate the filling factor by two different methods: (i) by calculating the fraction of the volume which is more than a density threshold to the entire volume of the simulation domain, and (ii) from the synthetic observations of the LOS intensity from the line ratio of the Fe XIII 10749\AA \ and 10800\AA \ density sensitive line pairs by the spectroscopic forward modeling using FoMo. The results obtained from both methods are in reasonable agreement with the observations of coronal holes, coronal loops, and fan-like structures. We also infer from the obtained results that the generation of turbulence increases the density filling factor of the medium.

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