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abstract	Magnetohydrodynamic (MHD) simulations of the solar atmosphere are often performed under the assumption that the plasma is fully ionized. However, in the lower solar atmosphere a reduced temperature often results in only the partial ionization of the plasma. The interaction between the decoupled neutral and ionized components of such a partially ionized plasma produces ambipolar diffusion. To investigate the role of ambipolar diffusion in propagating wave characteristics in the photosphere and chromosphere, we employ the Mancha3D numerical code to model magnetoacoustic waves propagating through the atmosphere immediately above the umbra of a sunspot. We solve the non-ideal MHD equations for data-driven perturbations to the magnetostatic equilibrium and the effect of ambipolar diffusion is investigated by varying the simulation to include additional terms in the MHD equations that account for this process. Analyzing the energy spectral densities for simulations with/without ambipolar diffusion, we find evidence to suggest that ambipolar diffusion plays a pivotal role in wave characteristics in the weakly ionized low density regions, hence maximizing the local ambipolar diffusion coefficient. As a result, we propose that ambipolar diffusion is an important mechanism that requires careful consideration into whether it should be included in simulations, and whether it should be utilized in the analysis and interpretation of particular observations of the lower solar atmosphere.	**abstract**	Magnetohydrodynamic (MHD) simulations of the solar atmosphere are often performed under the assumption that the plasma is fully ionized. However, in the lower solar atmosphere a reduced temperature often results in only the partial ionization of the plasma. The interaction between the decoupled neutral and ionized components of such a partially ionized plasma produces ambipolar diffusion. To investigate the role of ambipolar diffusion in propagating wave characteristics in the photosphere and chromosphere, we employ the Mancha3D numerical code to model magnetoacoustic waves propagating through the atmosphere immediately above the umbra of a sunspot. We solve the nonideal MHD equations for data-driven perturbations to the magnetostatic equilibrium and the effect of ambipolar diffusion is investigated by varying the simulation to include additional terms in the MHD equations that account for this process. Analyzing the energy spectral densities for simulations with/without ambipolar diffusion, we find evidence to suggest that ambipolar diffusion plays a pivotal role in wave characteristics in the weakly ionized low density regions, hence maximizing the local ambipolar diffusion coefficient. As a result, we propose that ambipolar diffusion is an important mechanism that requires careful consideration into whether it should be included in simulations, and whether it should be utilized in the analysis and interpretation of particular observations of the lower solar atmosphere.		
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