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	authors		authors	<ul style="list-style-type: none"><li>Ben Snow</li><li>Andrew Hillier</li></ul>		
	title	Stability of two-fluid partially-ionised slow-mode shock fronts	title	Stability of two-fluid partially-ionised slow-mode shock fronts		
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	id	id881689921040367751	id	id-5765669469195819731		
	abstract	A magnetohydrodynamic (MHD) shock front can be unstable to the corrugation instability, which causes a perturbed shock front to become increasingly corrugated with time. An ideal MHD parallel shock (where the velocity and magnetic fields are aligned) is unconditionally unstable to the corrugation instability, whereas the ideal hydrodynamic (HD) counterpart is unconditionally stable. For a partially ionised medium (for example the solar chromosphere), both hydrodynamic and magnetohydrodynamic species coexist and the stability of the system has not been studied. In this paper, we perform numerical simulations of the corrugation instability in two-fluid partially-ionised shock fronts to investigate the stability conditions, and compare the results to HD and MHD simulations. Our simulations consist of an initially steady 2D parallel shock encountering a localised upstream density perturbation. In MHD, this perturbation results in an unstable shock front and the corrugation grows with time. We find that for the two-fluid simulation, the neutral species can act to stabilise the shock front. A parameter study is performed to analyse the conditions under which the shock front is stable and unstable. We find that for very weakly coupled or very strongly coupled partially-ionised system the shock front is unstable, as the system tends towards MHD. However, for a finite coupling, we find that the neutrals can stabilise the shock front, and produce new features including shock channels in the neutral species. We derive an equation that relates the stable wavelength range to the ion-neutral and neutral-ion coupling frequencies and the Mach number. Applying this relation to umbral flashes give an estimated range of stable wavelengths between 0.6 and 56 km.	abstract	A magnetohydrodynamic (MHD) shock front can be unstable to the corrugation instability, which causes a perturbed shock front to become increasingly corrugated with time. An ideal MHD parallel shock (where the velocity and magnetic fields are aligned) is unconditionally unstable to the corrugation instability, whereas the ideal hydrodynamic (HD) counterpart is unconditionally stable. For a partially ionised medium (for example the solar chromosphere), both hydrodynamic and magnetohydrodynamic species coexist and the stability of the system has not been studied. In this paper, we perform numerical simulations of the corrugation instability in two-fluid partially-ionised shock fronts to investigate the stability conditions, and compare the results to HD and MHD simulations. Our simulations consist of an initially steady 2D parallel shock encountering a localised upstream density perturbation. In MHD, this perturbation results in an unstable shock front and the corrugation grows with time. We find that for the two-fluid simulation, the neutral species can act to stabilise the shock front. A parameter study is performed to analyse the conditions under which the shock front is stable and unstable. We find that for very weakly coupled or very strongly coupled partially-ionised system the shock front is unstable, as the system tends towards MHD. However, for a finite coupling, we find that the neutrals can stabilise the shock front, and produce new features including shock channels in the neutral species. We derive an equation that relates the stable wavelength range to the ion-neutral and neutral-ion coupling frequencies and the Mach number. Applying this relation to umbral flashes give an estimated range of stable wavelengths between 0.6 and 56 km.		
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