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A collisional kinetic model of the large field-aligned currents in the auroral ionosphere

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The aim of that work is to study the dynamic of a collisionnal plasma under a parallel electric field. These kinds of issues are very important in different fields such as nuclear fusion or heating of the solar corona. Here we will concentrate on the terrestrial ionosphere where large field-aligned currents were observed by satellites or radar measurements and calculated by numerical models. Indeed, Different authors and kinds of studies (experimental and measurements) agree that the current density can reach up to 1 mA/m^2. These current densities could be the cause of many phenomena such as tall red rays or triggering of unstable ion acoustic waves. We consider the issue of electrons moving through an ionospheric gas of positive ions and neutrals under the influence of a parallel electric field. We developed a 1-D kinetic ionospheric model, including electron/electron, electron/ion and electron/neutral collisions. We use the Fokker-Planck approach to describe binary collisions between charged particles with a long range interaction. We present the essential elements of this collision operator: The Langevin equation for electron/electron and electron/ion collisions and the Monte-Carlo and null collision methods for electron/neutral collisions. We will show the temporal and spatial evolution of the different characteristics (Temperature, density, mean velocity). We will present comparisons between a fluid model and our kinetic model.