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Magnetic Field Aligned Potentials as an Acceleration Mechanism at Jupiter

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Since arriving at Jupiter, Juno has observed instances of field-aligned proton and electron beams, in both the upward and downward current regions. These field-aligned beams are identified by inverted-V structures in plasma data, which indicate the presence of potential structures aligned with the magnetic field. The direction, magnitude and location of these potential structures is important, as it affects the characteristics of any resultant field-aligned current. At high latitudes, Juno has observed potentials of 100's of kV occurring in both directions. Charged particles that are accelerated into Jupiter's atmosphere and precipitate can excite aurora; likewise, particles accelerated away from the planet can contribute to the population of the magnetosphere.

Using a time-varying 1-D spatial, 2-D velocity space Vlasov code, we examine magnetic field lines which extend from Jupiter into the middle magnetosphere. By applying and varying a potential difference at the ionosphere, we can gain insight into the effect these have on the plasma population, the potential structure, and plasma densities along the field line. Utilising a non-uniform mesh, additional resolution is applied in regions where particle acceleration occurs, allowing the spatial and temporal evolution of the plasma to be examined. Here, we present new results from our model, constrained, and compared with recent Juno observations, and examining both the upward and downward current regions.