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Westward and eastward subauroral ion drifts coupled to a magnetospheric generator by field-aligned currents

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The dynamics of the premidnight magnetosphere on subauroral magnetic field lines is dominated by strong mesoscale electric fields and the associated convective motion, the so-called subauroral polarization stream (SAPS). These electric fields often become narrow (1-2 degrees invariant latitude) and very intense, giving rise to subauroral ion drifts (SAID) of more than 1 km/s in the ionosphere. Although such strong ion drifts are known to be predominantly westward, recent satellite observations at the top of the ionosphere have revealed occasional eastward ion drifts, also with speeds larger than 1 km/s and widths of 1-2 degrees, events that have been called abnormal sub-auroral ion drifts (ASAID). The goal of this contribution is to demonstrate that the structure of ASAID can be understood in terms of a magnetosphere-ionosphere coupling that is very similar to the earlier explanations for SAID. This model considers a flow shear across the interface between hot injected plasmasheet or ring current material and colder plasmasphere or plasmatrough plasma to be the source of an electromotive force that is coupled through field-aligned currents to the subauroral ionosphere. We discuss the peculiar magnetospheric configuration that would be required for ASAID, and how it differs from that needed for the much more common SAID.