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Bipolar Pulse (Electron Hole) Onsets, Ion Conics, and Kinetic Alfvén Waves in the Magnetopause Boundary Layer: Polar

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We will show numerous magnetopause boundary layer events that all have a common signature: an onset of electric bipolar pulses, the formation of ion conics, an onset of electron (isotropic) heating, and the presence of kinetic Alfvén waves (KAWs). Contrary to the usual picture of ion heating in $T_\perp$ at ionospheric altitudes and upflow of ions into the magnetosphere, we will show that these events are consistent with KAW heating of magnetospheric ions in $T_\parallel$ with ion propagation down towards the ionosphere (causing ion conics). The generation of bipolar pulses and the heating of electrons will be discussed as well.