

# **BOW SHOCK CONTRIBUTION TO REGION 1 FAC AND CROSS-TAIL CURRENT: RESULTS FROM GLOBAL MHD SIMULATIONS**

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We perform a series of global MHD simulations to study the magnetic current system under different solar wind conditions. Under strong southward interplanetary magnetic field conditions, the bow shock contributes significantly to the region 1 field-aligned current (FAC). More than 50 percent of the total region 1 FAC may originate from the bow shock in certain circumstances. Stronger southward interplanetary magnetic field, higher solar wind speed, or larger ionospheric Pedersen conductance, leads to greater contribution from the bow shock to the region 1 current. The cross-tail current totally closes within the magnetopause forming the classical theta structure when IMF is set to be zero. Situation changes for southward IMF cases: part of the cross-tail current passes through the magnetosheath and closes across the bow shock, thus an overlapped theta structure of the cross-tail current forms when viewed from the Sun. Quantitative analysis shows that a larger strength of the southward IMF  $B_z$  results in a higher percentage of current closed through the bow shock. An increase in the ionospheric Pedersen conductance leads to increase in the bow shock contribution but decrease in the magnetopause contribution to the cross-tail current, therefore the net cross-tail current is almost independent of the ionospheric conductance. Cross-tail current that closes across the bow shock rather than the magnetopause can be classified as the magnetic reconnection current, provide energy supply for dissipation need at the magnetic reconnection region in the magnetotail.

Bow Shock, FAC, Cross-tail Current

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