

The response of electron temperature to field-aligned current carried by thermal electrons

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A one-dimensional high latitude ionospheric model is constructed by solving the continuity, momentum and energy equations numerically. With the assumption that FAC be carried by thermal electrons in the polar ionosphere, the ionospheric temperature response due to upward and downward FAC is investigated. The results show that, at higher altitudes, electron temperature increases in upward FAC and decreases in downward FAC. This result is consistent with Satellite observational result [Abe, et al., 1993]. This effect might be caused by advection due to drift of electrons along the magnetic line of force. The electron temperature increases in upward FAC more easily than decreases in downward FAC. In both downward and upward FAC, the ion temperature increases. But the response is not as sensitive as that of the electron. For downward FAC cases, electron temperature also increases for larger magnitude of downward FAC. In the current calculation, the electron temperature decreases only in the magnitude range between 0 to 40 mA m^{-2} for downward FAC. The difference between the increased temperature with upward FAC and the background temperature without FAC is not simply a linear relationship with the strength of FAC.