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Viscous and resistive heating in the night side of the Hermean magnetosphere

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We show MHD simulations of the solar wind interaction with the magnetosphere of Mercury. We use the open source code AMRVAC in spherical geometry to study the regions of viscous and resistive heating in the Hermean magnetosphere depending on the orientation of the interplanetary magnetic field for a multipolar expansion of the Hermean magnetic field (Anderson, B. J. et al, 2012). We made two simulations with the same solar wind configuration but different magnetic field orientations (southward and northward cases). In the simulation with the southward orientation the plasma is heated nearby the magnetic X point in the magnetotail, where there is a transfer of magnetic energy (resistive dissipation) and by the damping of the flows (viscous dissipation) in internal and kinetic energy of the plasma, result of the balance between the Poynting and the non reversible energy fluxes with the enthalpy and kinetic energy fluxes. The hottest plasma is located in the equatorial plane close to the reconnection zone and is correlated with a region of large current and vorticity. If the solar wind is oriented in the northward direction there is no magnetic energy transfer to the plasma, the main heating mechanism is the viscous dissipation in the regions of shear flows nearby magnetopause. The hottest plasma is observed in the North of the magnetosphere where there is a local maximum of the vorticity. The plasma temperature in the Southward simulation is more than one order larger compared with the Northward case because there are two heating mechanism active at the same time. Both heating mechanisms are correlated and enhanced in the proximity of the magnetotail X point.

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