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Solar wind driven thermospheric winds over the Venus North Polar region

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A lateral, +Y directed, flow of Energetic Neutral Atoms (ENAs) is observed over the Venus polar region. The general similarity between the solar wind H+ (SWH+), ionospheric O+, and ENA flow pattern over the North Pole suggests that ion Charge Exchange (CE) processes produce the ENAs in the Venus thermosphere. The dusk-dawn +Y directed flow, and height distribution of ion and ENA fluxes supports the CE scenario. Moreover, the ENA dusk-dawn and noon-midnight flux asymmetry is also consistent with the asymmetric interaction, leading to higher ENA fluxes in the dayside and dawn (+Y). A model that derives the ENA flux distribution based on SWH+ and O+ fluxes in a model thermosphere is consistent with ENA fluxes observed by the Neutral Particle Imager (NPI). Furthermore, from a comparison between ENA model fluxes derived from CE of ion fluxes versus altitude, and measured sensitivity corrected ENA fluxes, we conclude ENAs over the Venus North Pole constitute a mix of O and H ENAs.
The net intensity of the ENA flow is sufficiently high at 200 km to have a major impact on the wind pattern in the thermosphere above 200 km. The net effect of the dawn- and tail-ward O+ and ENA flow should therefore be a local depletion of thermospheric neutrals in the polar region.