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Satellite observations of the polar vortex variations related to energetic electron precipitation

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Energetic electron precipitation (EEP) directly impacts the high-latitude thermosphere and mesosphere by forming ozone-depleting NOx and HOx. During winter the EEP-NOy (NOx and its reservoir species such as HNO3 formed by EEP) molecules descend to the stratosphere and establish the indirect effect of EEP. Earlier studies based on models and reanalysis datasets have shown that increased EEP is related to a strengthening of the northern winter polar vortex, a westerly wind system around the pole in the stratosphere. Here we examine the EEP effect on chemical and dynamical properties of wintertime mesosphere and stratosphere with satellite observations of both EEP (POES/MEPED) and atmospheric variables (Aura/MLS). We confirm earlier findings that EEP decreases ozone, affects the temperatures in the polar stratosphere and strengthens the stratospheric polar vortex. We find that increased EEP is associated with a weakening of the mesospheric polar vortex. We also confirm our recent results based on reanalysis data that the EEP effect on polar vortex depends on planetary waves and their latitudinal distribution.

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