

Response of the middle atmosphere in the southern hemisphere to energetic particle precipitation in the latest reanalysis data

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Research on the effects of energetic particle precipitation (EPP) on earth' s atmosphere is rapidly growing. However, these effects have not been well distinguished from those of other climate forcings. This study extracts EPP effects on the middle atmosphere in the southern hemisphere from the latest reanalysis datasets using multiple regression analysis and composite analysis. Statistically significant temperature anomalies in the winter polar upper stratosphere and lower mesosphere are found, but a simple dynamical signature explaining the anomalies is not evident. On the other hand, it is found that a negative temperature anomaly extending from the polar lower mesosphere to the midlatitude upper stratosphere in July is driven by anomalous Eliassen-Pam flux divergence in the midlatitude lower mesosphere. This result suggests that EPP effects are distinguishable from other climate forcings in the latest reanalysis data.

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