



## Dynamics and Chemistry of the Middle and Upper Atmosphere and Its Response to External Forcing—Observations and Models

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### Message from the Guest Editors

Dear Colleagues,

In recent years, the IPCC has recognized processes in the middle and upper atmosphere as important for future climate projections. This region of the Earth's atmosphere maintains a balance between external forcings and forcing emanating from the lower atmosphere in the form of planetary waves, tides and gravity waves. Quantifying how these forcings drive the general circulation of the atmosphere and control the chemical balance and its variability is crucial to understanding how the different layers couple vertically and horizontally in the atmosphere and ionosphere. Still, many of these processes have been only quantified poorly, leading to large uncertainties in their variability.

This special issue invites both observation-based and modelling contributions that concern the chemistry and dynamics of the **middle and upper atmosphere** with respect to

- the treatment of energetic particle precipitation (EPP) in chemistry-climate models
- the coupled climate system response to EPP and UV forcing
- the response to Stratospheric Warming events
- natural variability induced by gravity waves and tides