

## 5.136 Secondary Ozone Peaks over northern India.

Early Career Scientist

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Abstract:

High ozone concentrations in the middle-tropospheric altitudes, sometimes also referred to as Secondary Ozone Peaks (SOPs), have been observed over different regions of the world. Here we use the global model ECHAM5/MESSy for Atmospheric Chemistry (EMAC) to (i) understand the key processes causing SOPs, (ii) explore both their frequency and seasonality of occurrence, and (iii) assess effects on the tropospheric ozone budget over the Indian region.

The EMAC model reproduces the observed SOP events over the central Himalayas in the northern Indian region. The vertical profiles of stratospheric ozone tracer and potential vorticity, in conjunction with the structure of SOPs, suggest that SOPs over the central Himalayas are formed by Stratosphere-to-Troposphere Transport (STT) of ozone. The distribution of EMAC simulated stratospheric ozone tracer during the events shows that such effects are confined to the central Himalayas (edge of northern India), with minor influence over other parts of the Indian subcontinent. This disparity in the spatial distribution of STT is found to be in agreement with ozonesonde observations over other stations in India. Further, the EMAC simulated ozone distribution is analyzed based on backward air trajectories. This indicates that ozone rich air masses associated with STTs originate as far as northern Africa and the North Atlantic Ocean, as well as nearby regions in Pakistan, Afghanistan and Iran, and are transported to the Himalayas. Long-term simulations (2000-2014) were used to show that SOP events are most frequent during the pre-monsoon season, while no intense SOP events are found during the July-November period. Our analysis suggests a significant role of STT in the formation of SOPs over northern India and the Himalayas.