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Interpretation of high cloud formation over the Tibetan Plateau by convective transport of water vapor and polluted air from Asia

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Abstract

The Asian summer monsoon circulation becomes predominant from May to September due to thermal contrast between the Tibetan Plateau and its adjacent oceans, leading to the synoptic evolution of the monsoon anticyclone (i.e., Tibetan anticyclone) that accompanies deep convection extending to the upper troposphere or even the lower stratosphere. Satellite observations and model simulations have indicated that deep convection could provide high levels of water vapor and pollution in the upper troposphere over the Tibetan Plateau. In this regard, Li et al. (2005) suggested that the Tibetan anticyclone could trap anthropogenic emissions, such as carbon monoxide and anthropogenic aerosols, originated from South and Southeast Asia, leading to high cloud (e.g., cirrus, cirrocumulus, cirrostratus) formation. During the Asian summer monsoon period, we conducted in-situ measurements of aerosol particles using a balloon-borne optical particle counter (OPC), and detected pecks of relatively larger size particles (with particle diameter > 3.6 μm) between about 300 and 150 hPa within the Tibetan anticyclone. In particular, distinct high concentrations of them were present around 150 hPa. On the other hand, relatively smaller size particles (with particle diameter < 1.2 μm) were reduced around this altitude range. We speculate that the peaks of larger size particles are probably due to the presence of high clouds, which are induced by convective transport of tropospheric emissions. In this presentation, we will present the results and discuss possible processes of them.

Reference

Li et al. (2005) *Geophys. Res. Lett.* **32**, L14826, doi:10.1029/2005GL022762.