1.052 Surface ozone over the coastal Antarctica during Austral summer.

Early Career Scientist

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Abstract:

Surface ozone was measured at the coastal Antarctic station, Bharati (69.4°S, 76.2°E, ~35 m amsl) during the Austral summer (December-January-February) of 2015, 2016 and 2017. Average ozone mixing ratios (~18 ± 3 ppbv) at Bharati are comparable with other coastal stations of Antarctica but lower than those over inland Antarctic stations (20–25 ppbv). The Copernicus Atmosphere Monitoring Service (CAMS) model reproduces the observed levels of ozone (bias: 2–3 ppbv) and variability (correlation coefficient of ~0.4–0.5). Many events with an ozone enhancement of 4–8 ppbv were observed. The analysis of potential vorticity along with the vertical profiles of ozone from CAMS simulations shows that these enhancements are caused by the intrusions of stratospheric air into the troposphere and subsequent descend of ozone-rich air. The analysis of an event observed on 23 February 2016, using the airmass back trajectory in conjunction with in-situ measured vertical profile of ozone, showed that the high ozone levels, moslty located at around 3 km, descended (descent rate ≥ 250 m hr^{-1}) to the ground causing enhancement of ~4 ppbv in the surface ozone. A global chemistry-climate model ECHAM5/MESSy Atmospheric Chemistry (EMAC) reproduces the mean levels with a bias of ~ 2 ppbv. Analysis of a stratospheric tracer in the EMAC model shows that stratospheric influences enhance surface ozone levels by 35–38% at Bharati station during austral summer. Computations of ozone production and loss using EMAC results show that the

study region acts as a net sink and indicating that the surface ozone levels are sustained by the influx from stratosphere.