Polar Ozone Workshop Abstract

"Transport into the South Polar Vortex in Early Spring"

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Estimates of the mean circulation and diffusive transport of ozone and other species into the antarctic polar vortex during the spring of 1987 are made using data from the Airborne Antarctic Ozone Experiment. Measurements of long-lived tracers of tropospheric origin remained relatively constant at the levels of the maximum rate of decline of ozone during September. At lower levels in the stratosphere some evidence exists to support intrusions of tropospheric or low latitude air. Given the distribution in latitude and height of these tracers measured from the ER-2 aircraft, it can be inferred that the Lagrangian or diabatic mean circulation was zero or downward over Antarctica during the period of the ozone decline. The observation of a decline in ozone therefore requries a photochemical sink for ozone.

The magnitude of the required photochemical sink must be sufficient to offset the transport of ozone into the polar region and produce the observed decline. Quasi-isentropic mixing and downward motion are coupled and are difficult to estimate from a single tracer. The full suite of measured tracers and auxiliary information are brought together to provide an estimate of the rate at which air is cycled through the polar vortex during spring. Estimates of large-scale transport of potential vorticity and ozone from previous years are generally consistent with the data from the airborne experiment in suggesting a relatively slow rate of mass flow through the polar vortex in the lower stratosphere during September.