

Long-Term Observations from 1982 to 2009 of Ozone in the Southern Ocean Marine Boundary Layer from Cape Grim, Tasmania 41°S

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Ozone in the troposphere is an important greenhouse gas, ranked third in anthropogenic radiative forcing after CO₂ and CH₄; ozone in the troposphere makes up an important fraction of the atmospheric shield against ultraviolet radiation particularly when ozone depletion events occur, and tropospheric ozone drives tropospheric chemistry. Increases in background ozone, as have been observed to the present, have impacts also on the occurrence of urban and regional photochemical smog, related health effects and crop damage [Royal Society, 2008]. In the Southern Hemisphere there are few surface ozone monitoring stations and one can reasonably argue that around two thirds of the Southern Hemisphere lacks surface ozone measurements.

Ozone has been measured in the surface air at Cape Grim Tasmania, 41°S since 1976. These ozone measurements have been made with ultraviolet adsorption methods since December 1981. Dual instruments, an external daily zero and span check, and a separate calibrator have been maintained over most of the period. External calibration checks traceable to international primary standards were made in 1986, 2002 and 2010. The task of producing a homogeneous record via long-term instrument inter-comparisons and external calibrations will be described, along with the exploration of trends and their causes.

Selection of data by wind direction and speed and consistency of record, allows the determination of baseline ozone concentrations at Cape Grim, those concentrations that are representative of ozone in the Southern Ocean marine boundary layer. Surface ozone in Austral spring (SON) and summer (DJF) show positive trends in the 1980s and 1990s and non-significant trends in the 2000s and positive trends over the three decades combined. These trends and some associated variables will be described.

Cape Grim Monthly Mean Anomalies: All Baseline Data

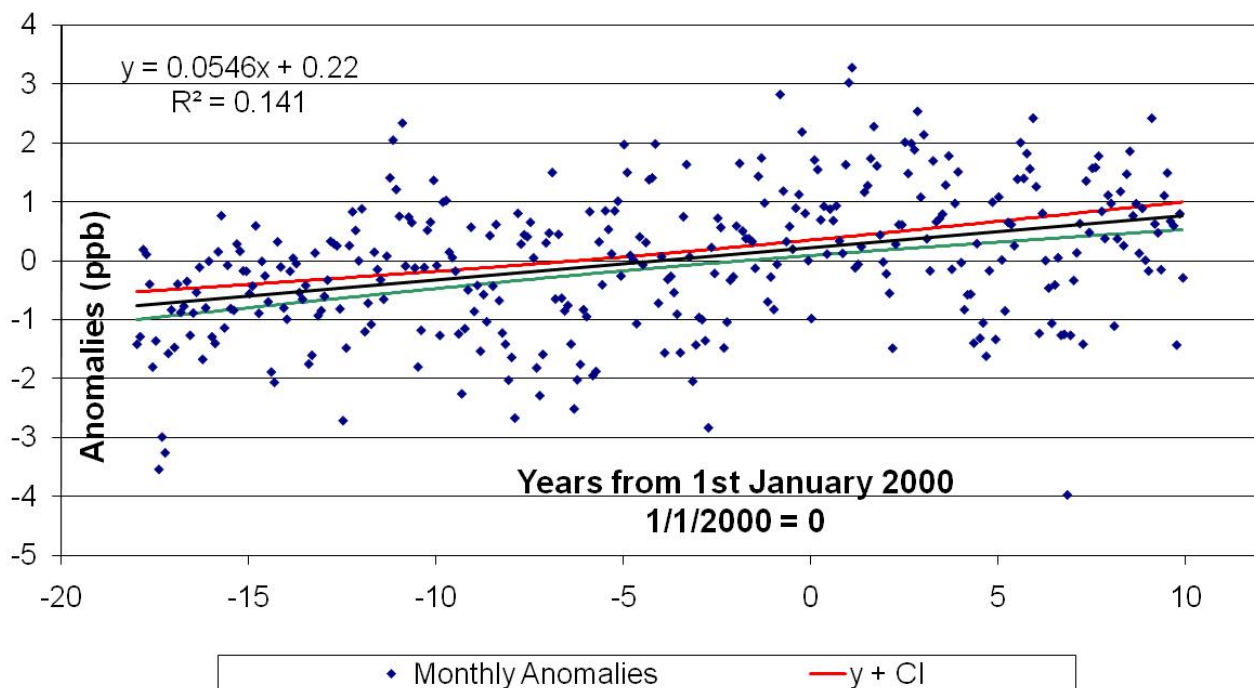


Figure 1. Surface ozone monthly anomalies from the long-term monthly mean mixing ratios, 1982-2009.