

STUDY OF OZONE HOLE OVER MAITRI, ANTARCTICA

S.L. Jain, B.C. Arya, S. Ghude, P.S. Kulkarni

National Physical Laboratory, New Delhi, India

Detailed analysis of the measurement during 16th, 21st, 22nd and 23rd Indian Antarctic Scientific Expedition carried out from a high latitude remote site at Schirmacher region of East Antarctica (Indian station Maitri) ($70^{\circ} 45' S$, $11^{\circ} 44' E$) is presented here. It is found that the ozone hole depth is fluctuating year-to-year. The minimum columnar ozone observed over Maitri was $135 (\pm 9.3)$ DU, $185 (\pm 12)$ DU, $126 (\pm 9.7)$ DU and $159.8 (\pm 8.8)$ DU during spring 1997, 2002, 2003 and 2004 respectively. Ozone concentration below 220 DU during Antarctic spring (day 225 – 365) over Maitri has been observed 45.1 %, 20.7 %, 62.7 % and 60 % in 1997, 2002, 2003 and 2004, respectively. The chemical loss of ozone (total ozone values below 220 DU) over Maitri during 2003 (day 225 – 365) was found to be increase by a factor of 0.4 when compared to 1997, and by a factor of 2 when compared to 2002. The observations at Maitri also showed event of major stratospheric warming during 2002. The ozone hole in the year 2002 was not deeper and recovered quite early when compared to 1997, 2003 & 2004. Particular attention is also given to compare the measurements made for direct cloudless sky condition using MICROTOSPS II Sunphotometer at 305, 312 and 320 nm with the model calculations done using the tropospheric ultraviolet visible radiation transfer model (TUV), and show a reasonable agreement. The theoretical increase in UV irradiance during deep ozone hole period (30-09-2004 to 10-10-2004) is also estimated by the model using observed columnar ozone values. The highest theoretical increase in UV irradiance is estimated to be 403 % at 305 nm, 84 % at 312 nm and 24 % at 320 nm for an average loss of 44% total ozone during deep ozone hole period. The relationship between the columnar ozone and direct UV irradiances was investigated by the TUV model to calculate change in direct UV irradiance per DU change in columnar ozone (range 320-100 DU) at different solar zenith angle. The irradiance estimated by this relationship are compared with the observed values and found in reasonable agreement