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Stratospheric ozone climatology and its variability over Reunion Island (21 S; 55 E)

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Ozone is formed and ruined naturally in the atmosphere, causes ozone variations as a function of altitude, latitude and time. In recent years, over the globe, the scientific community has addressed substantial decrease/increases in stratospheric/tropospheric ozone. Over tropical and sub-tropical regions, the ozone measurements are very few, though it has a considerable significance in modifying the global climate. Reunion Island (21 S; 55 E) is located at sub-tropics and influenced by a number of atmospheric perturbing events, such as cyclone, Inter Tropical Convective Zone (ITCZ) passages, strong jet streams and etc., where the study on ozone variation plays an important role in addressing different aspects of the climate. In this study, we report the climatological characteristics of stratosphere ozone over Reunion Island using in-situ Ozonesonde and satellite measurements (UARS-HALOE Satellite, SAGE-II and TOMS). The satellite measurements are corresponding to overpasses nearby Reunion Island. Here, we use the Ozonesonde data collected from September 1992 to December 2002 (11 years), SAGE-II data from October 1984 to February 1999 (15 years), HALOE data from January 1991 to December 2002 (12 years) and TOMS data from January 1978 to 2002 (25 years). The integrated ozone concentration in terms of Dobson unit has been obtained from Ozonesonde, individually, for the troposphere (0.5 km to the tropopause height) and lower stratosphere (between the tropopause height and 30 km) and compared with the SAGE-II, HALOE and TOMS measurements. The following features are observed from the present study;

The obtained height profiles of ozone concentrations from Ozonesonde (1.5-28.5 km), HALOE (18.5-50.5 km) and SAGE-II (18.5-50.5 km) show a good agreement between

each other.

The estimated bias in the ozone measurements by HALOE and Ozonesonde with reference to SAGE-II are within +/-5 % for the height range from 18 to 50 km and a high bias values is observed for the Ozonesonde for the heights lower than 18 km.

The constructed monthly evolution of mean ozone concentrations from the above instruments shows the maximum ozone concentration at 28.5 km. It shows semi-annual trend with peaks during February-March and October-November months. The calculated standard deviations show a high value for February-March and September-November months.

Height profile of AO (Annual Oscillation) and SAO (Semi-Annual Oscillation) amplitude show the pre-dominant SAO over the height region (15-50 km) with maximum amplitude located at 23 km.

The calculated ozone tropopause from Ozonesonde data, follows an annual variation with maximum during June-July periods. It reveals an anti-correlation with the integrated troposphere ozone concentration (0.5 km to the tropopause height), by displaying the high ozone tropopause corresponds to low troposphere ozone concentration and vice versa.

The time evolution of TOMS data for Reunion revealed an annual trend with maximum during May-June. Also, the temporal variations of tropospheric, stratospheric and total column ozone (TOMS) indicate a four months shift, illustrating the stratospheric ozone reaches the lower troposphere by four months time period.

The integrated ozone obtained from SAGE-II (1.5-70.5 km) and HALOE (18.5-70.5 km) follows TOMS measurement and the SAGE-II values are lowered by 10-20 DU in comparison with TOMS values.