Numerical Global Atmospheric Model Findings vis-à-vis International Experiments, I-STEP, INDOEX and GEWEX, relevant to Atmospheric Environment and Global Climate

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Abstract

This study shows the effect of aerosols and gases on the global energy balance, global environment and climate. Our results provide some insight relevant to global atmospheric models and are in agreement with the findings of the international experiments/programmes, viz., INDOEX, I-STEP and GEWEX.

***Keywords*:** Modified AGCM, Atmospheric Environment, Global Climate.

1. Introduction

The interaction of clouds and aerosols plays a major role in the total radiative forcings and vertical distribution of radiative fluxes within the atmosphere. The convective processes provide the mechanism of vertical transport of heat, moisture and momentum, apart from giving rain clouds. It is for this reason that a high priority has been given to cloud-radiation and aerosol radiation interaction studies in some of the International atmospheric research programmes, such as, I-STEP (International Solar-Terrestrial Energy Programme) [1] and INDOEX (Indian Ocean Experiment) [2,3] and GEWEX (Global Energy and Water Cycle Experiment) [4]. Such observations not only improve our understanding of the global experiments, but also help to improve the representation of these processes in the Atmospheric General Circulation Model (AGCM) [5]. We have modified the physical parameterization scheme in the model, which is being referred here as AGCM-M [6-8], where the last alphabet 'M' stands for 'modified'. The modified model has been used to compute the aerosol optical depth and global energy balance.

2. Results and discussion

We have studied the global energy balance computed by using AGCM-M and its comparison with the radiation budget prepared by using the comprehensive radiation budget data collected from the Earth Radiation Budget Experiment (ERBE) (which is a part of I-STEP on global annual mean basis. Due to limitations of space, the data are not presented here. It is found that the present model derived values show similar trend as those reported by Acuha et al. [1], though some slight variation is noticed in the values of some of the parameters.

In Fig. 1 we have plotted the aerosol optical depth computed at 500 nm wavelength using the modified model (AGCM-M) as a function of latitude. It is compared with the INDOEX results obtained by the Indian research vessel Sagar Kanya during 1996-1999 [3,9]. It shows as how much direct sunlight is prevented from reaching the ground by the aerosol particles.

3. Conclusion

These investigations provide some research insight of the model predictions and its role in understanding atmospheric-environmental findings of INDOEX, GEWEX and I-STEP programmes.

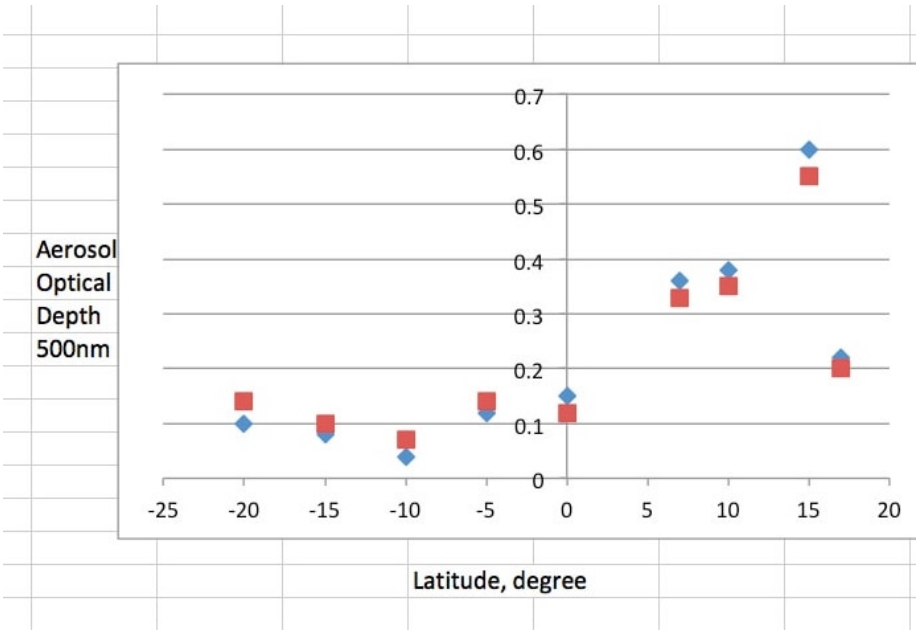

Fig.1. Latitude variation of the aerosol optical depth at 500 nm measured by the Indian Research Vessel 'Sagar Kanya' during 1996 to 1999.

■ INDOEX (Ref. [11]); ◆ AGCM-M (Present work);

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