FORM A: GACP ACCOMPLISMENT REPORT

NAME: Ming-Dah Chou

INSTITUTION: Climate and Radiation Branch, NASA/Goddard Space Flight Center

TITLE: Investigations of Radiative Forcing of Indonesian Biomass Burning using GMS Radiance Measurements

ABSTRACT:

The objective is to assess the effect of tropical biomass burning in Southeast Asia on the solar and thermal IR radiation budgets at the top of the atmosphere using the albedos and brightness temperatures measured by Japan's Geostationary Meteorological Satellite-5 (GMS-5). During the months of September and October, 1997, the largest forest fires in history caused by human beings and augmented by the dry climate associated with a strong El Nino occurred in Indonesia and choked cities in Southeast Asia. The troposphere was loaded with aerosols of biomass burning extending from Indonesia to Thailand and from Malaysia to the Philippines. While the GMS-5 does not have the spectral information and accuracy as the new Earth Observing System (EOS) Moderate-Resolution Imaging Spectroradiometer (MODIS) instrument, it is the only sensor that can provide the diurnal cycle of the radiative forcing of the smoke. The period of this study will start from September 1997, when the collection and processing of GMS data at Goddard began, and will extend for three years so that the radiation budgets of Southeast Asia during the period of the big fires can be compared with that during normal conditions. Components of the proposed research will include:

(1) Identification of cloud-free regions.
(2) Assessment of the aerosol effect on albedo.
(3) Retrieval of aerosol optical thickness and mass loading.
(4) Estimation of cloud amount.
(5) Estimation of the direct radiative forcing of aerosols.
(6) Analysis of temporal and spatial distributions of the direct aerosol radiative forcing.

We also plan to use the EOS MODIS results and the surface radiation measurements during the GEWEX Asian Monsoon Experiment-Tropical (GAME-T) and the South China Sea Monsoon Experiment (SCSMEX) field campaigns from April through August 1998, to augment this research. We anticipate that the proposed study will provide us information on the extent of radiative forcing due to biomass burning we have never experienced before.

GOALS: To reliably assess the impact of tropical forest burning on Earth's climate

OBJECTIVES: To provide information on the aerosol optical properties due to forest burning in Southeast Asia and on the aerosol impact on solar heating of the Earth

APPROACH:

(1) Identify cloud-free regions and derive aerosol optical properties using Japan's GMS radiance measurements.
(2) Analyze spatial and temporal distributions of the aerosols derived from the Sea-viewing Wide Field-of-view Sensor (SeaWiFS).

(3) Calculate the direct aerosol radiative forcing using a radiative transfer model.

TASKS COMPLETED:

(1) Accessed, calibrated, and calculated geographical location of GMS data with a temporal resolution of one hour and a spatial resolution of 5 km for the period for October 1997 to June 1998.
(2) Compiled a cloud-screening scheme for identifying cloud-free regions, which used all four GMS channels and the difference between the brightness temperatures of the IR split-window channels.
(3) Compared the cloud-free albedos and brightness temperatures between the South China Sea region and the Northern hemispheric sector of the Pacific warm pool
(4) Analyzed the spatial and temporal distributions of the SeaWiFS-derived aerosol optical thickness in the Indian Ocean, South China Sea, and the tropical western Pacific.

FUTURE PLANS:

(1) To continue the access, calibration, and calculation of geographical location of GMS data.
(2) To derive the aerosol optical thickness from the GMS radiances.
(3) To continue the access and analysis of the SeaWiFS-derived aerosol optical thickness and radiances.
(4) To compare the aerosol optical thickness derived from GMS radiances with that derived from SeaWiFS radiances.
(5) To identify the aerosol type and the spectral optical thickness from the SeaWiFS-measured radiances.
(6) To compile a solar radiation model for calculating the direct radiative effect of aerosols.

FORM C: FUTURE PLANS

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