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Regional variation of carbonaceous aerosols from space and simulations

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Satellite remote sensing provides us with a systematic monitoring in a global scale. As such, aerosol observation via satellites is known to be useful and effective. However, before attempting to retrieve aerosol properties from satellite data, the efficient algorithms for aerosol retrieval need to be considered. The characteristics and distributions of atmospheric aerosols are known to be complicated, owing to both natural factors and human activities. It is known that the biomass burning aerosols generated by the large-scale forest fires and burn agriculture have influenced the severity of air pollution. Nevertheless the biomass burning episodes increase due to global warming and climate change and vice versa. It is worth noting that the near ultra violet (NUV) measurements are helpful for the detection of carbonaceous particles, which are the main component of aerosols from biomass burning. In this work, improved retrieval algorithms for biomass burning aerosols are shown by using the measurements observed by GLI and POLDER-2 on Japanese short term mission ADEOS-2 in 2003. The GLI sensor has 380nm channel. For detection of biomass burning episodes, the aerosol optical thickness of carbonaceous aerosols simulated with the numerical model simulations (SPRINTARS) is available as well as fire products from satellite imagery. Moreover the algorithm using shorter wavelength data is available for detection of absorbing aerosols. An algorithm based on the combined use of near-UV and violet data has been introduced in our previous work with ADEOS (Advanced Earth Observing Satellite) -2 /GLI measurements [1]. It is well known that biomass burning plume is a seasonal phenomenon peculiar to a particular region. Hence, the mass concentrations of aerosols are frequently governed with spatial and/or temporal variations of biomass burning plumes. Accordingly the satellite data sets for our present study are adopted from the view points of investigation of regional and seasonal effect on carbonaceous aerosols. And then the selected data observed by ADEOS-2/GLI and POLDER in 2003 are treated by using Vector form Method of Successive Order of Scattering (VMSOS) for radiative transfer simulations in the semi-infinite atmosphere [2].

Finally the obtained optical properties of the carbonaceous aerosols are investigated in comparison with the numerical model simulations of SPRINTARS. In spite of the limited case studies, it has been pointed out that NUV-channel data are effective for retrieval of the carbonaceous aerosol properties. Therefore we have to treat with this issue for not only detection of biomass burning plume but also retrieval itself. If that happens, synthetic analysis based on multi-channel and/or polarization measurements become practical, and the proposed procedure and results are available for a feasibility study of coming space missions.

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