Aerosol Properties over Asia with ADEOS-1 & -2/POLDER

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The major properties of atmospheric aerosols are the optical thickness (AOT: τ_λ) and the Ångström exponent (α) which is calculated from the spectral tendency of optical thickness of aerosols as below:

$$\alpha = -ln(\tau_{\lambda 1}/\tau_{\lambda 2}) \,/\, ln(\lambda_1/\lambda_2), \qquad (1)$$

where wavelengths λ_1 and λ_2 take values of the central wavelength of observing channels, respectively. The values of α are closely related to the aerosol size distribution. For example, the small values of α indicate the large particles, and the large values represent small particles such as artificial aerosols. In general, the values of Ångström exponent (α) from ~0 to 1 shows coarse particles (such as sea salt solution, and soil dusts), on the contrary, $1 < \alpha < \sim 2.5$ indicates small particles (such as sulfate, biomass burning etc.).

Figure 1 and 2 show the aerosol optical thickness and Ångström exponent on 13 April 2003. These results are derived from ADEOS-2/POLDER polarization as well as radiance data. Although the details of retrieval procedure have been interpreted in the previous paper [1], the basic idea of our aerosol retrieval is that the scattering behavior of aerosols plays a sufficient role in the polarization field of the Earth atmosphere-surface system in the near infrared wavelengths. The area loading lots of Asian dust flown from China is circled by the solid curve in Figure 1. It is clear that Asian dusts distribute over from the Yellow sea to Japan. Note that there are some uncertainties to distinguish the heavy aerosol loading from the thin cloud.

It is found that aerosol optical thickness in the dust event is more than double of clear value, and Ångström exponent takes small values in dust event.

These space-based aerosol properties are validated from the ground based AERONET data in a global scale. It is of interest to mention that the annual change of aerosol characteristics is found from comparison of POLDER products from ADEOS-1 with those from ADEOS-2.

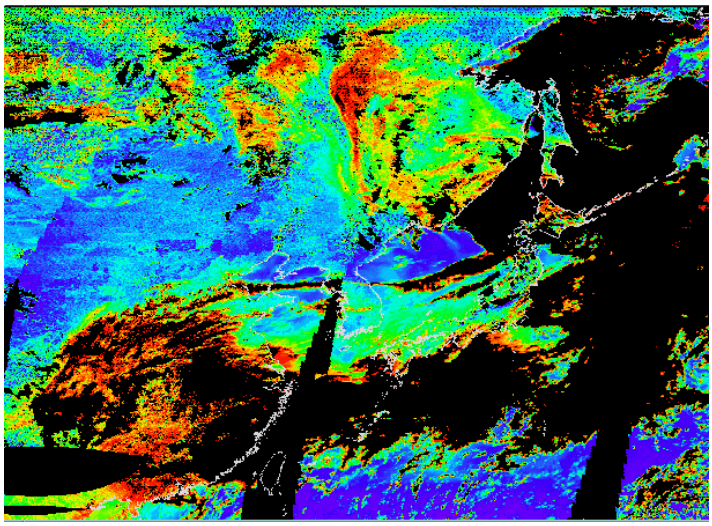

Figure.1. Distribution of aerosol optical thickness at a wavelength of 0.55 μm over East Asia on 13 April 2003 derived from ADEOS-2 / POLDER.

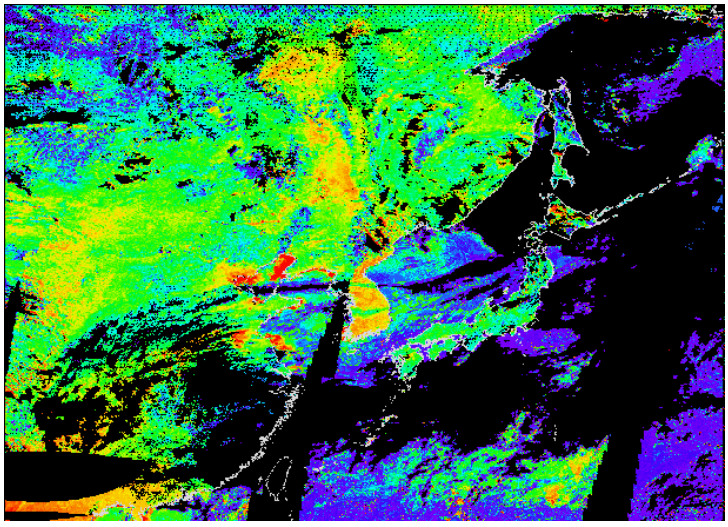

Figure.2. Distribution of Ångström exponent on 13 April 2003 derived from ADEOS-2 / POLDER

The ADEOS-2/POLDER data were provided by CNES / France.

REFERENCES

[1] I. Sano, "Optical properties and Angstrom exponent of aerosols over the land and ocean from space-borne polarimetric data", *Adv. Space Res.*, **34**(4), pp 833-837, doi:10.1016/j.asr.2003.06.039, (2004).