

**Atmospheric Aerosols and their Impact on UV
Radiation in Northeast Asia (APN 2000-16)**

Project Leader:

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APN Funding

US \$80,000

Participating countries

China, Korea, Japan, Mongolia

Introduction/Background

Atmospheric aerosol particles influence the Earth's radiation balance in two ways. First, aerosols may affect climate directly by scattering and absorbing visible and infrared energy. Secondly, they may also affect climate indirectly by modifying the properties of clouds through microphysical processes and by altering abundance of radiatively important gases through heterogeneous chemistry. The radiative forcing by anthropogenic aerosol particles due to combined effects is estimated to be between -0.4 and -3.0 W/m^2 on a global scale. There is substantial uncertainty in the magnitude and spatial distribution of the radiative forcing by aerosols. This uncertainty significantly limits our ability to assess the effect of natural and human induced changes in the chemistry of the atmosphere on global climate. There exists a need for monitoring change in global atmospheric aerosol loading.

Increased UV radiation has effects on human health, in particular human skin disease, as well as effects on the biosphere. Thus it is necessary to monitor aerosols and UV radiation at ground stations. The spatial and temporal variations of aerosol are affected by regional meteorological conditions. Because emitted air pollutants have effects on not only the originating country but also neighboring nations, it is therefore not just a national problem but an international one too. Therefore there exists a need for international collaboration on characterizing atmospheric aerosols and their impact on UV radiation in Northeast Asia.

Outline of activities conducted

1) Chemical properties of aerosols over Northeast Asia

Aerosol samples were collected with $\text{PM}_{2.5}$ and MOUDI (Micro-Orifice Uniform Deposition Impactor) samplers. Three intensive samplings were conducted during August 2000, November 2000 and January 2001 in China, Korea, and Japan. Through ion chromatography and carbon analysis, the chemical properties of atmospheric aerosol were determined.

2) Physical and optical properties of aerosols

Using Nephelometer, Aethalometer and MOUDI, the scattering and absorption coefficients as well as size distribution of atmospheric aerosols were characterized in Japan and Korea.

3) Aerosol radiative properties over Northeast Asia

Using RSRs (Rotation Shadowband Radiometer) and a MFRSR (Multi-Filter Rotating Shadowband Radiometer, in Kwangju), aerosol optical depth (AOD) was measured to investigate changes in atmospheric aerosol loading in Northeast Asia. (Korea, China, Japan, Mongolia).

4) Surface UV radiation

Changes in UV radiation were monitored by UV-B radiometers at ground stations. Measured aerosol and UV data were analyzed to characterize atmospheric aerosols impact on UV radiation and to provide information on atmospheric compositions changes in the region. (Korea, China, Japan, Mongolia).

Summary of Measurement activities:

Site	Continuous Monitoring		Intensive Aerosol Sampling		
	RSR	UV-B	1 st	2 nd	3 rd
Kwangju, Korea	Apr. 2000 ~	Apr. 2000 ~	PM 2.5 URG Cyclone Sampler	PM 2.5 URG Cyclone Sampler	PM 2.5 URG Cyclone Sampler, MOUDI
Kyoto, Japan	Apr. 2000 ~	Oct. 2000 ~			
Beijing, China	Aug. 2000 ~		14. Aug. ~ 21. Aug. 2000	30. Oct. ~ 6. Nov. 2000	14. Jan. ~ 21. Jan. 2001
Ulanbator, Mongolia	Oct. 2000 ~	Oct. 2000 ~			

Outcomes/Products

- 1) CD-ROM containing solar radiation data, UV radiation data, aerosol optical depth, and results of intensive aerosol samplings including aerosol mass concentration, ion concentration and scattering and absorption coefficients will be released.
- 2) Conference presentations have been made:
 - “Aerosol Optical Depth Monitoring in Kwangju, Cheju and Seoul using Rotating Shadowband Radiometers Data”, J.E. Kim, S.Y. Ryu and Y.J. Kim, The 3rd International Symposium on Advanced Environmental Monitoring, 31 Oct.-2 Nov. 2000, Korea;

- “Changes in Aerosol Optical Depth during the Yellow Sand Events at Kwangju in 2000”, J.E. Kim, S.Y. Ryu and Y.J. Kim, Proceedings of 31st Meeting of KOSAE, 10-11 Nov. 2000, Korea; and
- “Comparison of the effects of African dust and Asian dust on the atmospheric optical depth over Nigeria and South Korea”, Y.J. Kim, S.Y. Ryu, K. Ogunjobi, J. Adedokun, AGU 2000 Fall Meeting, 15-17 Dec. 2000, USA.

- 3) Scientific journal papers are being prepared for submission.
- 4) Web page will be available for access in March 2001.
- 5) ADEMRC (Advanced Environmental Monitoring Research Center) will create and maintain a website dedicated to the APN project. Thus all scientific results from the proposed study will be available for immediate dissemination to the scientific community.

Future directions/Follow-up work

We are to take part in the ACE (Aerosol Characterization Experiment)-Asia program, one of the activities of IGAC (International Global Atmospheric Chemistry) of IGBP (International Geosphere-Biosphere Program), which will begin March 2001. The proposed APN program will provide regional scientists with an opportunity to collaborate with ACE-Asia program. Through data exchange and collaboration with ACE-Asia program the proposed APN program will be greatly benefited.

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