

SATELLITE INFRARED MEASUREMENTS OF SMOKE AEROSOLS FROM FOREST FIRES: IMPLICATIONS FOR GLOBAL WARMING

Yongseung Kim

Korea Aerospace Research Institute

45 Eoeun-dong Yuseong-gu, Daejeon 305-333, Korea

yskim@kari.re.kr

Abstract

Massive smoke aerosols and greenhouse gases (e.g., CO₂ and CH₄) from forest fires are released into the atmosphere and thus affect the global climate and environment. Smoke aerosols containing black carbon elements are known to be effective in absorbing solar radiation and in turn (by heating the air) contribute to global warming. To analyze the radiative effect of smoke aerosols, we have examined the AIRS infrared (IR) radiance measurements and the AMSU atmospheric temperature profiles over the region of forest fires occurred in the northeast Asia. Several types of scene pixels are carefully selected for comparison.

As expected, clouds and smoke plumes substantially reduce the IR radiances at the top of the atmosphere (TOA), compared to clear-sky pixels. It is, however, interesting to see that IR radiances over the region contaminated by smoke aerosols are higher than the counterparts of uncontaminated region over most of the AIRS spectral range. Such enhanced IR radiances appear to be closely linked to increases in atmospheric temperature in the lower atmosphere, which are produced from atmospheric heating by black carbon aerosols. Further analysis with MODIS measurements supports this finding.

Keywords: Smoke Aerosols, Global Warming, Infrared Radiances, Atmospheric Temperature, AIRS, MODIS

[Bibliography]

○ Selected Publications

▪ Journal Paper

- Development and verification of the compact airborne imaging spectrometer system, Kwangjae Lee, Sangsoon Yong, and Yongseung Kim, Korean Journal of Remote Sensing, Vol. 24(5), 397-408, 2008.
- Application of hyperion hyperspectral remote sensing data for wildfire fuel mapping, Yeosang Yoon and Yongseung Kim, Korean Journal of Remote Sensing, Vol. 23(1), 21-32, 2007.
- Monitoring of land-cover moisture using multi-temporal SAR images, Boyeol Yoon, Kwangjae Lee, Younsoo Kim and Yongseung Kim, Korean Journal of Remote Sensing, Vol. 22(5), 433-437, 2006.
- Characteristics of MODIS satellite data during fog occurrence near the Incheon international airport, Jung-Moon Yoo, Young-Mi Kim, Myoung-Hwan Ahn, Yong-Seung Kim and Chu-Yong Chung, J. of the Korean Earth Science Society, Vol. 26(2), 149-159, 2005.
- Examination of cross-calibration between OSMI and SeaWiFS: Comparison of ocean color products, Yong-Seung Kim and Sun-Gu Lee, Korean Journal of Remote Sensing, Vol. 19(3), 201-208, 2003.
- Effect of anthropogenic sulfate aerosols on low-level cloud albedo over oceans, Y. Kim and R. Cess, Journal of Geophysical Research, 98, 14883-14885, 1993.
- Natural versus anthropogenic factors affecting low-level cloud albedo over the north Atlantic, P. Falkowski, Y. Kim, Z. Kolber, C. Wilson, C. Wirick, and R. Cess, Science, 256, 1311-1313, 1992.

▪ Conference Proceedings

- KOMPSAT Remote Sensing Applications, Yongseung Kim, SG2009, Jhongli, Taiwan, Aug. 27-28, 2009.
- Observation of Crude Oil Spill off the West Coast of Korea Using TERRASAR-X, ENVISAT, ERS-2, RADARSAT-1, AND ALOS, Duk-jin Kim, Jinho Kang, Boyeol Yoon, Younsoo Kim, and Yongseung Kim, IGARSS 2008, Boston, Massachusetts, U.S.A., July 6-11, 2008.
- An experimental study on the image-based atmospheric correction method for high resolution multispectral data, Yongseung Kim and Kwangjae Lee, IGARSS 2005, Seoul, Korea, July 25-29, 2005.