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Observations of black carbon characteristics and radiative forcing over a global weather watch supersite in Korea

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Black carbon (BC) concentrations were measured and radiative forcing has been estimated for the first time over a Korean Global weather watch (GAW) site, Anmyeon-Do during 2003-04 periods. BC showed significant monthly and seasonal variations with highest value observed during winter (December-February) and early spring (March) months. The average BC concentrations during 2003-04 found to be up to 2.2± 0.44 µg/m3 during spring, up to 1.8±0.33 µg/m3 during summer, 1.82±0.51 µg/m3 during autumn and up to 2±0.42µg/m3 during winter. Chemistry datasets of water soluble, BC and Total Suspended Particulate (TSP) components were used in Optical properties of aerosols and clouds(OPAC) model to derive aerosol optical parameters for total (composite) aerosol fraction and further used in SBDART model to derive total aerosol radiative forcing. While, BC fraction alone used in OPAC to derive BC optical properties and further used in SBDART to derive radiative forcing solely due to BC fraction. The atmospheric forcing due to total aerosol fraction found to be +22.9 to +30.2 Wm-2 during spring, +17 to +19 Wm-2 during summer, +15.8 to +19.3 Wm-2 during autumn and +16.6 to +19.6 Wm-2 during winter respectively in both years. The respective BC atmospheric forcing were +1.2 to +16.6 Wm-2, +13 to +14.2 Wm-2, +14.4 to +15.8 Wm-2 and +15.4 to +16.6 Wm-2 during spring, summer, autumn and winter in both the years. The study suggests that Black carbon induced atmospheric forcing contributes up to 70-80% of total aerosol atmospheric radiative forcing, and hence enhancing green house warming. This strong atmospheric heating along with surface cooling can give way to reduced convection and hence can inhibit cloud formation processes. Acknowledgements: This work is supported by National Research Foundation of Korea (NRF) through a grant provided by the Korean Ministry of Education, Science & Technology (MEST) in 2010 (No. K20607010000). MODIS data used in this study were produced with the Giovanni online data system, developed and maintained by the NASA-GES DISC is acknowledged with thanks.