A Parameterization of Dust Concentration(PM10) of Dust Events Observed at Erdene in Mongolia Using the Monitored Tower Data

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A 20m monitoring tower was installed at Erdene (44.45^{o}N, 111.08^{o}E, elevation of 988 m) in the dust source region of Mongolia to observe the dust events with various meteorological parameters in 2008, since then it has been operated continuously.

The 10-minute averaged time series of the dust concentration (PM_{10}) measured at 3 m above the ground and the sonic anemometer measured momentum and heat fluxes at 8 m above the ground at the tower site are smoothed with one hour running mean and then averaged to make one hour averaged time series to get a relationship between the dust concentration of a dust event and the momentum and heat fluxes for each month in 2009. The dust event at the tower site is determined when the peak value of the observed one hour mean dust concentration (PM_{10}) exceeds 150 µg m^{-3} and the duration time of each dust event in determined by the period for the one-hour mean dust concentration (PM_{10}) starting to increase to the peak value and then to become an minimum value.

The hourly mean time series of the dust concentration, momentum and heat fluxes of dust events in each month are regressed to find an optimal regression equation for the dust concentration of the dust event in terms of the friction velocity (u_*) obtained from momentum flux and the convective velocity scale (w_*) obtained from heat flux and mean temperature. It is found that the optimal regression equation has a form of $\log C = A + B (u_* + Dw_*)^n$, where C is the dust concentration (µg m^{-3}), u_* the friction velocity (m s^{-1}), w_* the convective velocity scale (m s^{-1}) and A, B, D, and n are constants that depend on month to month. It is also found that the inclusion of the convective velocity scale (w_*) in the optimal regression equation yields better estimates of dust concentrations for dust events.

Keywords: Asian dust concentration (PM_{10}), Asian dust monitoring tower, Erdene, Optimal regression equation