Supplementary Materials: Dust Emission from Gobi under Different Dust Content Conditions: A Wind Tunnel Study atop the Mogao Grottoes

Linhao Liang [1,2,3], Weimin Zhang [1,3,*], Lihai Tan [1,3] and Shuyi Chen [1,2,3]

In order to determine the weight of each influencing factor on the " contribution" of dust generation, different wind speeds and surface dust content were used as independent variables, and PM10 concentration at 15cm and 25cm heights were used as dependent variables for multiple regression analysis. Firstly, each variable was tested for normal distribution, and the experimental samples all satisfied the normal distribution.

Multiple regression analysis using origin's built-in POLY2D regression model, the following regression equation has been obtained:

$$C_{15} = 32792 - 26875 * U_* - 1560 * C + 12475 * {U_*}^2 + 20.4 * C^2 + 621 * U_* * C \quad (1)$$

$$C_{25} = 5109 - 2691 * U_* - 295 * C + 4146 * {U_*}^2 + 4.6 * C^2 + 29 * U_* * C \quad (2)$$

Where (1) (2) Equations C_{15} and C_{25} are PM10 concentrations at 15 cm and 25 cm height (μg·m^{-3}), respectively; U_* is the frictional wind speed (m·s^{-1}); C is the surface dust content (%), and the fitted adjusted R^2 values correspond to 0.92 and 0.91 ($P < 0.05$).

To better visualize the weighting of influencing factors, the data were further normalized use Minitab19 software and then fitted to a multiple regression, the following regression equation has been obtained:

$$C_{15} = 0.71U_* + 0.58C \quad (3)$$

$$C_{30} = 0.85U_* + 0.37C \quad (4)$$

The coefficients before each variable in equations of (7) and (8) represent the weights accounted by this factor, and the R^2 are greater than 0.85 after equation fitting adjustment ($p < 0.05$), which can predict 78.95% and 88.07% of the occurrence events. The standard error of coefficients (i. e. standard deviation of coefficient estimates) corresponds to 0.0895 and 0.0706, and the variance inflation factor (i. e. characterizing the degree of covariance between independent variables value, generally considered less than 10 acceptable) is 1, with a high degree of confidence, and the standardized residuals conform to a normal distribution (Fig.S1).

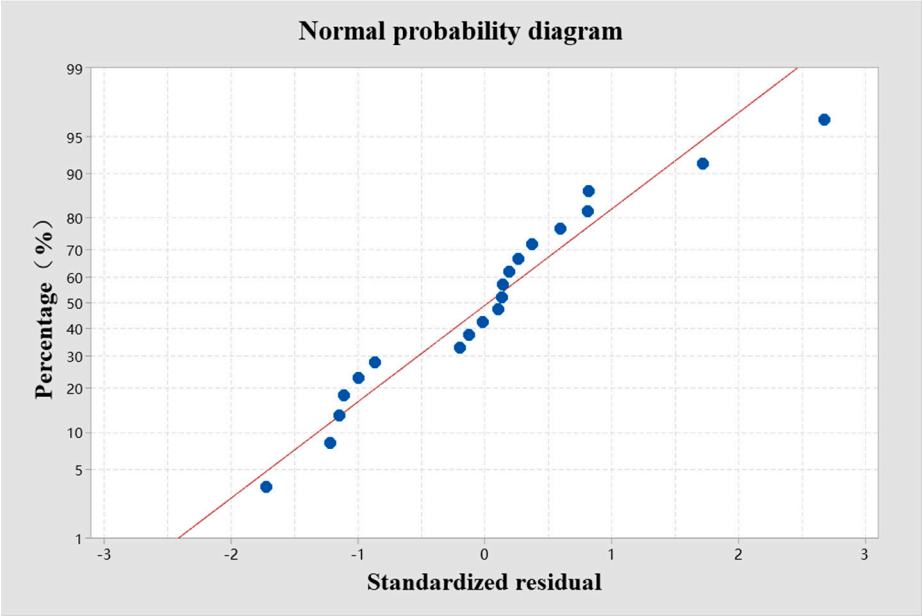


Figure S1. Normal probability distribution of standardized residuals of PM10 concentration at 15cm height.