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Sampling height effects on airborne horizontal mass flux calculated with different equations

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The calculation of the amount of airborne material passing by a vertical plane, the horizontal mass flux (Q), is an important step for quantifying the wind erosion of soils. This calculation is based on the integration of the equation that better describes the variation of the amount of material transported by wind with height. In this study we speculated that Q can be different if the material transported by wind is sampled at different heights, and if calculated with different equations. Because of that we compared Q values calculated from samplings made with BSNE dust samplers placed at heights of a) 13.5, 50 and 150 cm (Q3), b) 7, 12, 13.5, 22.5, 50 and 150 cm (Q6), and c) 0.15, 0.7, 1.5, 7, 12, 13.5, 22.5, 50 and 150 cm (Q9) in 1 ha bare field of Santa Rosa, Argentina, with a soil classified as a sandy loam Entic Haplustoll. Calculations were made for 86 storms in Argentina, using the following equations: Q = a Z^{-b} [1], Q = fo (1+ $(Z/ð)^{-ß}$) [2], and Q = a$e^{(-bz)}$ [3]. Results showed that Q3 correlated well with Q9 when calculated with any equation. Nevertheless equation [1] underestimated Q by 91%, equation [2] by 35% and equation [3] by 62%. Q6 correlated well with Q9 with equations [2] and [3], but not with equation [1]. These results indicated that equations [2] and [3] can be indistinctly used to predict Q even when samples are collected not close enough to the soil surface. Equation [1] can be only used when a complete set of samplers is available, particularly at heights lower than 7 cm.