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Recent and past Saharan dust deposition in the Carpathian Basin and its possible effects on interglacial soil formation

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Several hundred tons of windblown dust material are transported every year from Saharan dust source areas into direction of Europe, modifying important climatic and other environmental processes of distant areas. North African aerosols have been also identified several times a year in the Carpathian Basin, where under the influence of certain synoptic meteorological conditions Saharan dust accumulation can clearly be observed.

Previous satellite based studies were suitable to estimate the frequency and magnitude of Saharan dust episodes in the investigation area, however, the assessment of North African dust deposition can be done with model simulations. In this study, calculations were made by using the data of BSC-DREAM8b (Barcelona Supercomputing Center's Dust REgional Atmospheric Model) v1.0 and v2.0 database. Simulation results of the BSC-DREAM8b v1.0 are available from 1 January 2000 to 31 December 2012, while the results of the updated v2.0 calculations are ready for the period between 1 January 2006 and 31 December 2014. BSC DREAM8b v1.0 model simulations for the period between 2000 and 2012 provided an annual mean of 0.0285 g/m^2/y dry and 0.034 g/m^2/y wet deposition values in the Carpathian Basin, which is equivalent to a total of 0.0636 g/m^2/y. The updated v2.0 version for the period of 2006-2014 gave significantly larger values: 0.133 g/m^2/y dry; 0.085 g/m^2/y wet and 0.219 g/m^2/y total annual dust deposition. By comparing the results of the overlapping period between 2006 and 2012 of the v1.0 and v2.0 simulations, the updated depositional scheme of the newer version provided $\sim$3.7-fold values in case of dry deposition and $\sim$1.9-fold increase in results of the wet deposition. Information available from individual events showed that the simulated wet and dry dust deposition rates are significantly underestimated. This is also suggested by previous model calculations which reported values between 5 and 10 g/m^2/y for modern dust flux in the investigated area. According to our deposition adjustment estimations the annual amount of deposited Saharan dust can be set into the range between 3 and 5 g/m^2/y.

This study is also aimed at providing an estimate on the Saharan dust sedimentation in past interglacials based on stratigraphic and sedimentary data of loess-paleosoil sequences and by using the values of recent dust accumulation simulations. The possible influence of accumulated aeolian material on soil properties and on paleoenvironmental interpretation of paleosoils (modified by syngenetic, external dust addition) will also be discussed.

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