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Soil magnetism and climate change across the Shanxi loess plateau, China

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Soil magnetism is an increasingly important natural source of climatic and environmental information. Magnetic properties and climate of 21 modern arable topsoil samples across a 680 km transect on the Shanxi loess plateau were analysed. The samples cover major climatic gradients ranging from semi-arid to semi-humid region. Along the transect annual rainfall varies from 358 mm yr-1 to 621mm yr-1 and annual temperature from 4.2 degree to14.2 degree. The results show that magnetic concentration parameters (magnetic susceptibility χ, saturation isothermal remanent magnetization SIRM and anhysteretic remanence ARM) of modern soils have a significant correlation with mean annual precipitation in the study area. Strong association exists between ARM and mean annual temperature. The spatial distribution of surface soils magnetism demonstrates a strong gradient from north to south, which is consistent with the climate variations. Frequency dependence FD bigger than 5 percentage and ARM/χ indicate the importance of superparamagnetic grains. In summary, it can be concluded that soil magnetic properties reflect the influence of climate, especially rainfall. This may be essential for testing and predicting modern climate change.