INFLUENCE OF LANDUSE AND CLIMATE CHANGE ON WIND EROSION SUSCEPTIBILITY IN CENTRAL ARAGON (SPAIN)

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For the last centuries the agricultural landscape in semi arid central Aragon (NE Spain) has been subject to climate change as well as land use change. The accompanying effects on wind erodibility of different soil surfaces in this region are largely unknown, but knowledge is required to evaluate mitigation strategies against increasing soil loss. In this study present wind erosion susceptibility is assessed based on meteorological data and land use data for the Province of Aragon in order to highlight the relative importance of climate and land use on future wind erosion susceptibility in this region.

Information about present wind erosion susceptibility in respect of the three dominating land uses in Aragon – fallow land, sheep pasturing, and dry farming – was obtained from 86 in-situ wind tunnel simulations on modified and genuine soil surfaces. Mean and maximum wind velocities at 10 m above ground and number of days with wind velocity above 10 ms^{-1} since 1986 were analyzed, as well as mean daily precipitation and mean daily air temperature for the last five decades. The analysis of land use change focused on the development of total agricultural area, arable land, and fallow land during the last four centuries.

The considered climatic and human (land use change) impacts show a contrary signal for future development of wind erosion susceptibility in Aragon. The increase of air temperature of about 1.75°C from 1952 to 2006 and the accentuation of precipitation within the year indicate an intensification of future wind erosion susceptibility, whereas land use with increasing areas of fallow land appears to diminish it. Combined with the results of the wind tunnel test runs, which show negligible wind erosion on undisturbed, crusted surfaces (< 1 gm^{-2}) and severe wind erosion on grazed (1-13 gm^{-2}) and rolled surfaces (1-52 gm^{-2}), reduced wind erosion susceptibility due to increasing areas of fallow land becomes evident.

Although we cannot clearly specify the relative importance of climate and land use change on wind erosion susceptibility, our results strongly suggest the importance of the combination of both in understanding future soil loss. Since human impact by land use change appears to have very immediate effects on soil loss, we conclude that mitigation strategies should focus on adapting agricultural use to minimize soil loss in the future.