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Impact of near-surface wind speed variability on wind erosion in the eastern agro-pastoral transitional zone of Northern China, 1982-2016

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Wind erosion is a serious environmental issue in arid and semi-arid areas over the world, and near-surface wind speed changes play a key role on wind erosion dynamic. Here, the Revised Wind Erosion Equation Model (RWEQ) is applied to simulate the variability of wind erosion and quantify the impact of long-term near-surface wind speed changes on wind erosion over the eastern agro-pastoral transitional zone of Northern China for 1982-2016. Our simulations show a negative trend for the annual soil loss of wind erosion (SLWE, -6.20 t hm-2 year-1; $p<0.05$), with significant ($p<0.05$) declining trends in all seasons, particularly in spring (-3.49 t hm-2 year-1) and autumn (-1.26 hm-2 year-1), followed by summer (-0.85 t hm-2 year-1) and winter (-0.52 t hm-2 year-1). At the same time, the near-surface wind speed decreased significantly ($p<0.05$) annually (-0.070 m s-1 dec-1), with a significant ($p<0.05$) declining trend in spring (-0.100 m s-1 dec-1) and autumn (-0.092 m s-1 dec-1), and a non-significant ($p>0.10$) decreasing trend in winter (-0.026 m s-1 dec-1) and summer (-0.012 m s-1 dec-1). Further, we exclude the influence of wind speed variability on soil erosion by the model variable control method, which shows that wind speed variability affect winderosion at -8.14t hm-2 year-1 ($p<0.05$) annually, with the strongest impacts in spring (-4.77 t hm-2 year-1, $p<0.05$), followed by autumn (-1.44 t hm-2 year-1, $p<0.05$) and winter (-1.42 t hm-2 year-1, $p<0.05$). Meanwhile, a weak and significant ($p<0.10$) opposite influence is found in summer (+0.40 t hm-2 year-1). Long-term wind erosion studies are rather limited and deserve more attention due its socioeconomic and environmental impacts.