Trees are more efficient than shrubs in controlling aeolian erosion

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By renewing the methods used to model aeolian erosion in the presence of vegetation, INRA and CNRS researchers have shown that trees are more efficient that shrubs in reducing this type of soil erosion.

The replanting of land is a common technique used to limit aeolian erosion in arid regions. By renewing the methods used to model aeolian erosion in the presence of vegetation, INRA and CNRS researchers have shown that trees are more efficient that shrubs in reducing this type of soil erosion. The model thus developed constitutes a promising tool to quantify aeolian erosion in semi-arid regions which causes numerous environmental problems. This work was published in the *Journal of Geophysical Research* Earth Surface in February 2014.

Aeolian erosion corresponds to the transportation of sand grains by the wind (saltation) and the emission of dusts into the atmosphere following the impact of these grains on the ground. Saltation can damage crops by abrading, burying or uprooting them, and forming sand dunes in desert regions. Dust emissions can locally reduce the fertility of agricultural soils, and have a global impact on cloud formation and the terrestrial radiation balance. This atmospheric dust can also have health consequences linked to its inhalation by humans, the spread of potentially pathogenic agents and the dispersal of pollutants. The replanting of land is a common technique used to reduce aeolian erosion in regions vulnerable to desertification, but its efficiency as a function of the type of vegetation, and its organisation, are not yet well understood. Furthermore, the models currently available to quantify aeolian erosion

are poorly adapted to sparsely planted surfaces because of their crude representation of the wind.

A digital model to renew the modelling of erosion in the presence of vegetation

INRA and CNRS scientists have developed an original modelling technique for soil saltation by instantaneously reproducing the overall interaction between the movement of several million sand grains and the wind at that time, and their interactions with soil and vegetation. An initial version of this model without vegetation had previously been designed by the same authors to reproduce sand ridges oscillating on the surface of a beach in a stiff wind. By including vegetation in this second version of the model, the team was able to show that for the same land area, trees were more efficient than shrubs in reducing aeolian erosion. Although shrubs trap saltation particles, trees induce a reduction in wind speed at a larger scale the the simply local protective effect of shrubs. Furthermore, a reduction in aeolian erosion seems to be strongly dependent on the arrangement of vegetation relative to wind direction.

A first step to quantify the aeolian erosion of soils in semi-arid regions

Semi-arid regions are a major source of atmospheric dust. Unlike deserts, these regions are characterised by sparse, seasonal vegetation. These research findings will help to better quantify dust emissions in these regions. This is particularly important because the loss of fertility of agricultural soils in these regions is expected to increase in future years under the combined effects of climate change and modifications to land use linked to human activities. Indeed, these regions are climatic transition zones, notably in terms of the amplitude and frequency of rainfall that affect plant cover on the land and hence aeolian erosion of

the soil. These regions are also subject to marked growth in the population, leading to radical changes in land use such as the extension and intensification of cultivated areas.

More information: S. Dupont, G. Bergametti, and S. Simoëns, "Modeling Aeolian erosion in presence of vegetation." *Journal of Geophysical Research* Earth Surface, Vol. 119, pp168-187, DOI: 10.1002/2013JF002875, February 2014.

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