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Contribution ID: **417** Type: **Poster (+) Presentation**

Variations in Airflow Field and Soil Grain-Size of Simulated Shrubs with Different Spatial Configurations based on Wind Tunnel Experiments

Monday, 31 May 2021 19:35 (1 hour)

Wind erosion is an ecological and environmental issue of global concern, with many adverse effects such as damage to infrastructure, economic loss, increased regional poverty, and social instability [1, 2]. Desertification directly caused by wind erosion affects 32% of the world's population, 67% of countries, and 40% of the land area, making it a serious threat [3]. The United Nations Convention to Combat Desertification (UNCCD) calls for attention and action to be taken in the science of combating desertification [4]. Extensive research has shown that that natural vegetative and artificial windbreak forests are the most widely used measure to reduce wind velocity and trap sand [5]. However, the construction of natural vegetative in arid and semiarid areas is limited by scarce water resources and unique soil texture [6]. On the contrary, artificial windbreak forests have been successfully applied in wind and sand engineering projects with low cost and water demand that effectively reduce wind speed and trap sand particles. Although windbreak forests have been implemented to control wind erosion for many years as a wind erosion control measure in arid and semiarid areas, there are few studies on the comprehensive efficiencies between the geometric configuration and spatial arrangement of windbreak forests in terms of the near-surface airflow field and soil grain-size variation, and there are still controversies regarding the optimal design of windbreak forests to maximize the efficiency of the windbreak forests. Given this, we designed a series of wind tunnel experiments with the first goal of clarifying the variations of the near-surface airflow field and soil grain-size of simulated shrubs (equivalent to windbreak forests) with different spatial configurations that contain three form configurations (spindle-shaped, broom-shaped, and hemisphere-shaped) and row spaces (17.5×17.5 cm, 17.5×26.25 cm, and 17.5×35 cm) under the net wind speeds of 8 m/s, 12 m/s, and 16 m/s. Our object was to reveal how to arrange the windbreak forests in terms of form configurations and row spaces for preventing desertification in the most convenient and efficient ways. A better understanding of the airflow field and soil grain-size around the simulated shrubs is essential to provide optimized design and maximize the efficiency of the windbreak forests. Simulated shrubs used in this study are not only polymerized by anti-aging polymer compounds which are new wind-resistant materials but also it has beautiful visual effects in deserts.

Time Block Preference

Time Block B (14:00-17:00 CET)

References

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