Salinity Effects on the Threshold Wind Velocity Necessary to Initiate Erosion

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Methods

Table 1. Taxa, texture,clay % and native conductivity of soils used in our investigations

Soil series	Texture	Clay	EC_{sp} (dSm^{-1})
Brownfield (BFS): Loamy, mixed, superactive, thermic Arenic Aridic Paleustalfs	Fine sand	2%	0.50
Amarillo (ASL): Fine, mixed, superactive, thermic Aridic Paleustalfs	Sandy loam	8%	0.67
Olton (OCL): Fine, mixed, superactive, thermic Aridic Paleustolls	Clay Loam	18%	1.03

- Soils were sieved, placed in soil trays, wetted and dried and wetted and dried a second time with saline solution containing Na, Ca, and Mg salts
- Trays were allowed to cool and equilibrate with atmosphere < 40% RH before testing in a suction-type wind tunnel with up to 18 m s^{-1} wind speed
- Modified 'Sensit Seconds' technique used to fit the threshold

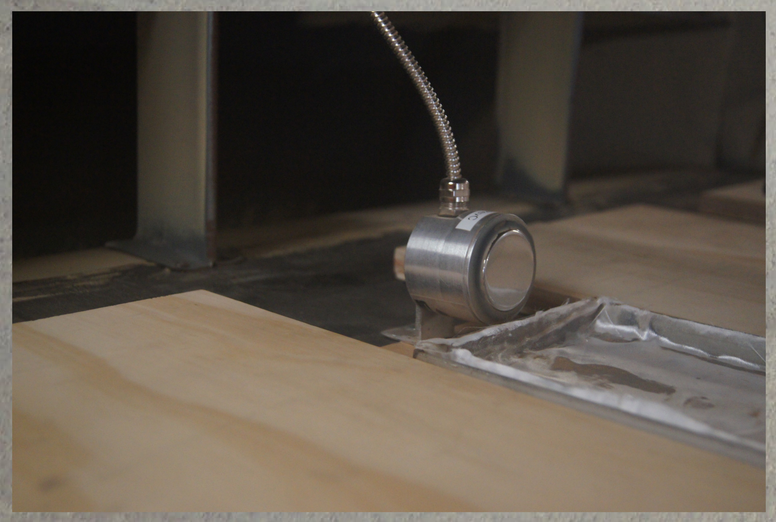

Fig. 1. Empty soil tray and downwind piezo impact detector used in the wind tunnel study of threshold wind velocity.

- Post-threshold wind speed determination, soil trays were tested in a second wind tunnel at 12.5 m s^{-1} with clean abrader sand added upstream and samples were taken to determine final salinity of soil in the tray

Fig. 2. soil tray post-wind tunnel threshold testing

Results

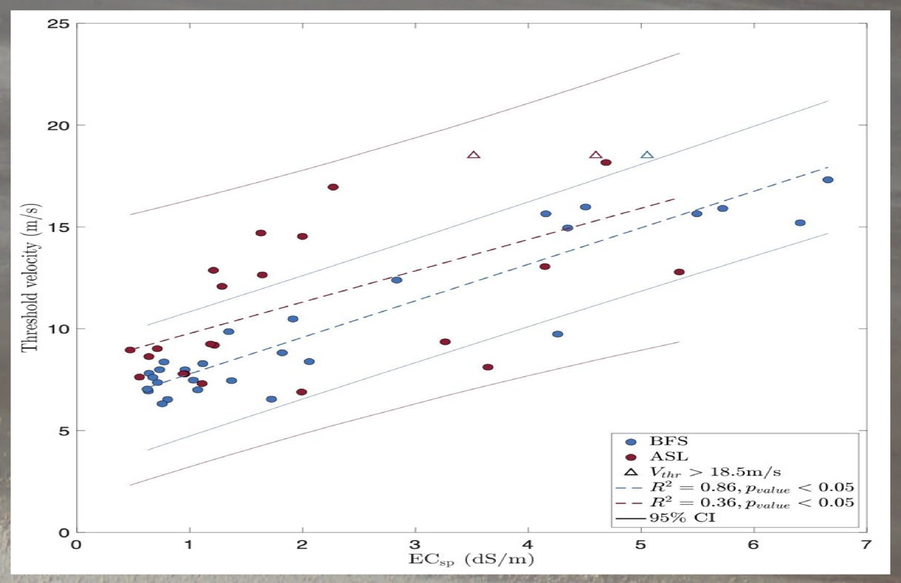

Fig. 3. Response of threshold wind speed to salinity for sandy soils tested. The Olton Clay Loam resisted erosion at all wind speeds

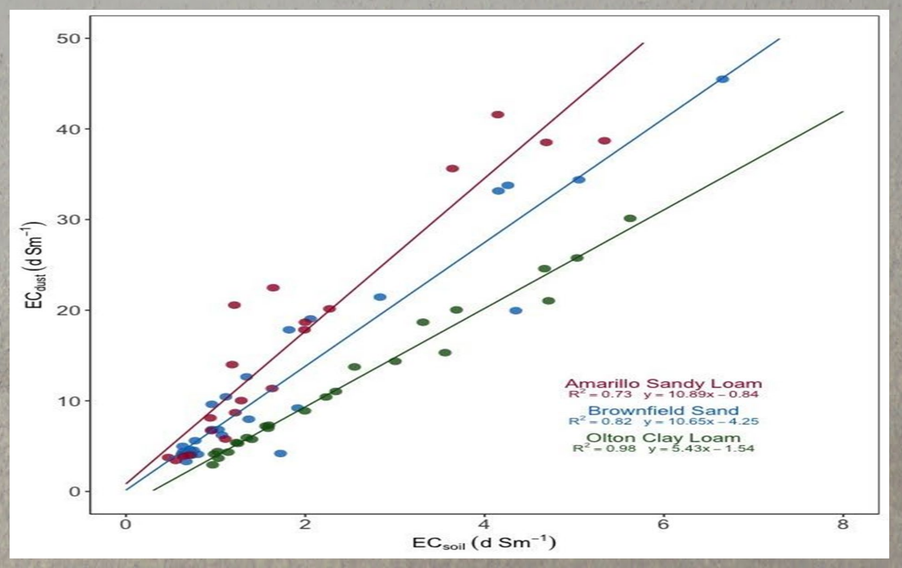

Fig. 4. Soil salinity effects on dust salinity for each of the three soils tested in the wind tunnel at 12.5 m s-1 using clean sand abrader upstream of soil tray

Takeaways

- Threshold velocities for wind erosion increase with increasing soil salinity because salts induce the formation of a soil crust.
- Crust formation can delay emissions from soil surfaces even under low salinity conditions
- Salts are preferentially emitted and enriched in fugitive dust

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