

# Electric sand findings could lead to better climate models

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Wind isn't acting alone in the geological process behind erosion, sand dunes and airborne dust particles called aerosols. The other culprit is electricity. By taking both factors into account, researchers at the University of Michigan have developed a new model that matches real-world measurements of "saltation" better than the decades-old classical theory.

Saltation is the process of wind blowing grains of sand across a landscape, sending them bouncing against the ground and each other. The bouncing motion of the saltating grains on the soil bed kicks dust aerosols into the air.

This new knowledge could lead to better climate models because it helps scientists understand how aerosols are released, U-M researchers say. Dust is one type of aerosol. Burning fossil fuels releases another type. They are known to affect Earth's climate by blocking and absorbing sunlight and seeding clouds.

Nilton Renno, associate professor in the Department of Atmospheric, Oceanic and Space Sciences, and doctoral student Jasper Kok have demonstrated that saltation creates a field of static electricity that can be strong enough to double the concentration of bouncing sand particles, compared to previous assumptions. A paper on their findings will be published in the Jan. 11 issue of *Physical Review Letters*.

"The effect of aerosols is one of the most uncertain processes in climate

change modeling," Kok said. "We now know more of the physics of how dust aerosols get into the atmosphere, so we should be able to improve on the way that climate models account for their emission."

Saltation itself has never been fully understood. Only recently have detailed measurements been made in nature, as opposed to in a wind tunnel. And those natural measurements disagreed with classical theory.

Renno first noticed that electricity might be missing from the equation while studying dust devils in Arizona years ago. The devils had a strong electric field.

"I was surprised at how large the field was," Renno said.

Others had suggested that electricity may be involved in saltation, but Renno said no one determined the extent of that role and created a model to describe the process including electricity, until now.

"What we discovered is as these particles bounce and rub against each other, the surface of the ground gets a positive charge and the particles get a negative charge," Renno said. "The electric field can become strong enough to directly lift sand from the surface."

The surface of the ground acts as a conductor, Kok explains, because it has a thin film of water on top.

The researchers say this model can accurately reproduce observations.

"It's a fundamental change in our understanding of the physics of saltation," Renno said.

Renno, who is a co-investigator on NASA's Phoenix and Mars Science Laboratory missions to Mars, speculates that these saltation electric

fields get so large on the Red Planet they produce ground-level sparks.

Source: University of Michigan

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