

Science News

from research organizations

Sand dunes can 'communicate' with each other

Date: February 4, 2020

Source: University of Cambridge

Summary: Even though they are inanimate objects, sand dunes can 'communicate' with each other. A team from the University of Cambridge has found that as they move, sand dunes interact with and repel their downstream neighbors.

Share: [f](#) [t](#) [p](#) [in](#) [✉](#)

FULL STORY



Sand dunes (stock image).

RECEIVED AT PSLU MEETING ON 2/19/20
(COMMITTEE CHAIR)

Credit: © aiisha / Adobe Stock

Even though they are inanimate objects, sand dunes can 'communicate' with each other. A team from the University of Cambridge has found that as they move, sand dunes interact with and repel their downstream neighbours.

Using an experimental dune 'racetrack', the researchers observed that two identical dunes start out close together, but over time they get further and further apart. This interaction is controlled by turbulent swirls from the upstream dune, which push the downstream dune away. The results, reported in the journal *Physical Review Letters*, are key for the study of long-term dune migration, which threatens shipping channels, increases desertification, and can bury infrastructure such as highways.

When a pile of sand is exposed to wind or water flow, it forms a dune shape and starts moving downstream with the flow. Sand dunes, whether in deserts, on river bottoms or sea beds, rarely occur in isolation and instead usually appear in large groups, forming striking patterns known as dune fields or corridors.

It's well-known that active sand dunes migrate. Generally speaking, the speed of a dune is inverse to its size: smaller dunes move faster and larger dunes move slower. What hasn't been understood is if and how dunes within a field interact with each other.

"There are different theories on dune interaction: one is that dunes of different sizes will collide, and keep colliding, until they form one giant dune, although this phenomenon has not yet been observed in nature," said Karol Bacik, a PhD candidate in Cambridge's Department of Applied Mathematics and Theoretical Physics, and the paper's first author. "Another theory is that dunes might collide and exchange mass, sort of like billiard balls bouncing off one another, until they are the same size and move at the same speed, but we need to validate these theories experimentally."

Now, Bacik and his Cambridge colleagues have shown results that question these explanations. "We've discovered physics that hasn't been part of the model before," said Dr Nathalie Vriend, who led the research.

Most of the work in modelling the behaviour of sand dunes is done numerically, but Vriend and the members of her lab designed and constructed a unique experimental facility which enables them to observe their long-term behaviour. Water-filled flumes are common tools for studying the movement of sand dunes in a lab setting, but the dunes can only be observed until they reach the end of the tank. Instead, the Cambridge researchers have built a circular flume so that the dunes can be observed for hours as the flume rotates, while high-speed cameras allow them to track the flow of individual particles in the dunes.

Bacik hadn't originally meant to study the interaction between two dunes: "Originally, I put multiple dunes in the tank just to speed up data collection, but we didn't expect to see how they started to interact with each other," he said.

The two dunes started with the same volume and in the same shape. As the flow began to move across the two dunes, they started moving. "Since we know that the speed of a dune is related to its height, we expected that the two dunes would move at the same speed," said Vriend, who is based at the BP Institute for Multiphase Flow. "However, this is not what we observed."

Initially, the front dune moved faster than the back dune, but as the experiment continued, the front dune began to slow down, until the two dunes were moving at almost the same speed.

Crucially, the pattern of flow across the two dunes was observed to be different: the flow is deflected by the front dune, generating 'swirls' on the back dune and pushing it away. "The front dune generates the turbulence pattern which we see on the back dune," said Vriend. "The flow structure behind the front dune is like a wake behind a boat, and affects the properties of the next dune."

As the experiment continued, the dunes got further and further apart, until they form an equilibrium on opposite sides of the circular flume, remaining 180 degrees apart.

The next step for the research is to find quantitative evidence of large-scale and complex dune migration in deserts, using observations and satellite images. By tracking clusters of dunes over long periods, we can observe whether measures to divert the migration of dunes are effective or not.

Story Source:

Materials provided by **University of Cambridge**. The original story is licensed under a Creative Commons License. *Note: Content may be edited for style and length.*

Related Multimedia:

- Sand dunes can 'communicate' with each other

Journal Reference:

1. Karol A. Bacik, Sean Lovett, Colm-cille P. Caulfield, Nathalie M. Vriend. **Wake Induced Long Range Repulsion of Aqueous Dunes**. *Physical Review Letters*, 2020; 124 (5) DOI: 10.1103/PhysRevLett.124.054501

Cite This Page:

MLA APA Chicago

University of Cambridge. "Sand dunes can 'communicate' with each other." ScienceDaily. ScienceDaily, 4 February 2020. <www.sciencedaily.com/releases/2020/02/200204091403.htm>.

RELATED STORIES

Ages of the Navajo Sandstone

Sep. 9, 2019 — The Navajo Sandstone is known for its beautiful red and tan crossbedded sandstones that grace many of the national parks and monuments in the southwest USA. The sands were deposited in dunes within ... [read more »](#)

Shifting Sands on Mars

Apr. 4, 2016 — Researchers are traveling to Iceland to better understand sand dunes found all over the planet Mars. They hope the Iceland site will show how Martian sands have changed, which could yield more clues ... [read more »](#)

Rotting Oaks Lead to Hazardous Voids in Indiana's Mount Baldy Sand Dune

Nov. 3, 2015 — Mount Baldy, a sand dune in Indiana Dunes National Lakeshore, may appear to be no more than an innocent pile of sand grains speckled with vegetation, but the rolling slopes hide narrow, deep holes, ... [read more »](#)

Rare Dune Plants Thrive on Disturbance

Apr. 27, 2015 — A demographic study of two endangered plants at Point Reyes National Seashore north of San Francisco shows that they favor recently disturbed open areas over areas that have established plant cover. ... [read more »](#)

FROM AROUND THE WEB

Below are relevant articles that may interest you. ScienceDaily shares links with scholarly publications in the TrendMD network and earns revenue from third-party advertisers, where indicated.

MEASURING THE EFFECTS OF NEUROSTIMULATION IN DRUG-RESISTANT EPILEPSY AND DEPRESSION

Charles Conway et. al., Eur Neurol Rev, 2019

SLEEP POSITION AND STILLBIRTH – IS IT TIME TO CHANGE SLEEP PRACTICES?

Meera Simoes et. al., European Respiratory & Pulmonary Diseases, 2019

Cost-effectiveness Analysis of a Flash Glucose Monitoring System for Patients with Type 1 Diabetes Receiving Intensive Insulin Treatment in Sweden

S Pinar Bilir et al., Eur. Endocr., 2018

MAINTENANCE TREATMENT FOR RECURRENT OVARIAN CARCINOMA – EVIDENCE SUPPORTING THE EFFICACY AND SAFETY OF PARP INHIBITORS

Robert L Coleman, Jonathan A Ledermann, Eur Oncol Haematol, 2019

Targeting Atrial Fibrillation Patients for Left Atrial Appendage Occlusion with Epicardial Closing Devices

Harry J Crijns et al., European Journal of Arrhythmia & Electrophysiology, 2018

Empagliflozin and Cardio-renal Outcomes in Patients with Type 2 Diabetes and Cardiovascular Disease – Implications for Clinical Practice

David H Fitchett, Eur. Endocr., 2018

Hypoglycaemia Remains the Key Obstacle to Optimal Glycaemic Control – Continuous Glucose Monitoring is the Solution

Peter Adolfsson et al., Eur. Endocr., 2018

EXPLORING THE ROLE OF THE MICROBIOME IN MULTIPLE SCLEROSIS


Lloyd Kasper et. al., US Neurol, 2019

Powered by **TREND MD**

Free Subscriptions

Get the latest science news with ScienceDaily's free email newsletters, updated daily and weekly. Or view hourly updated newsfeeds in your RSS reader:

 Email Newsletters

 RSS Feeds

Follow Us

Keep up to date with the latest news from ScienceDaily via social networks:

 Facebook


 Twitter

 LinkedIn

Have Feedback?

Tell us what you think of ScienceDaily -- we welcome both positive and negative comments. Have any problems using the site? Questions?

 Leave Feedback

 Contact Us

[About This Site](#) | [Staff](#) | [Reviews](#) | [Contribute](#) | [Advertise](#) | [Privacy Policy](#) | [Editorial Policy](#) | [Terms of Use](#)

Copyright 2020 ScienceDaily or by other parties, where indicated. All rights controlled by their respective owners.

Content on this website is for information only. It is not intended to provide medical or other professional advice.

Views expressed here do not necessarily reflect those of ScienceDaily, its staff, its contributors, or its partners.

Financial support for ScienceDaily comes from advertisements and referral programs, where indicated.
California residents: CCPA opt-out request form.