

The Sahara is expanding, thanks in part to climate change

Scientists say the world's largest desert has crept south in recent years

BY DARRYL FEARS

Earth's largest hot desert, the Sahara, is getting bigger, a new study finds. It is advancing south into more tropical terrain in Sudan and Chad, turning green vegetation dry and soil once used for farming into barren ground in areas that can least afford to lose it.

Yet, it is not just the spread of the Sahara that is frightening, the researchers say. It's the timing: The growth is happening during the African summer, when there is usually more rain. But the precipitation has dried up, allowing the boundaries of the desert to expand.

"If you have a hurricane come suddenly, it gets all the attention from the government and communities galvanize," said Sumant Nigam, a professor of atmospheric and oceanic science at the University of Maryland and the senior author of the study. "The desert advance over a long period might capture many countries unawares. It's not announced like a hurricane. It's sort of creeping up on you."

The study was published Thursday in the *Journal of Climate*. The authors said that while their research focused only on the



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Camels walk in the Sahara on March 1. A new study says the Sahara's growth suggests that other deserts around the world might also be widening, which could have harsh economic consequences.

Sahara, it suggests that climate changes also could be causing other deserts to expand — with potentially harsh economic and human consequences.

Deserts form in subtropical regions because of a global weather circulation called the Hadley cell. Warm air rises in the tropics near the equator, producing rain and thunderstorms. When the air hits the top of the atmosphere, it spreads north and

south toward the poles. It does not sink until it is over the subtropics, but as it does, the air warms and dries out, creating deserts and other areas that are nearly devoid of rain.

"Climate change is likely to widen the Hadley circulation, causing northward advance of the subtropical deserts," Nigam said in a statement that announced the study.

At the same time, he added, the

Sahara's southward creep suggests that additional mechanisms are at work, as well. One is probably the natural climate cycle called the Atlantic Multidecadal Oscillation, or AMO, in which temperatures over a large swath of the northern Atlantic Ocean fluctuate between warm and cold phases for 50 to 70 years. The warm cycles deliver precipitation to subtropical areas, and the cold cycles keep it away. Human-

caused climate change can increase the intensity and length of the drier cycle.

Nigam and the study's lead researcher, Natalie Thomas, a doctoral candidate at the University of Maryland, used data from the Global Precipitation Climatology Center to arrive at their findings. They studied grids and patterns from 1920 to 2013, mixing in satellite data compiled "over the last three decades," Nigam said.

They determined that the AMO was in a positive phase that delivered more rain to areas near the Sahara from the 1930s to the early 1960s. It then switched to a negative cycle that lasted 40 years. A 1980s drought — "the most intense ... of the 20th century" — was attributed to the latter phase and linked to "higher levels of greenhouse gases in the atmosphere."

Over the second phase, the Sahara crawled south mostly, encroaching on a more tropical area known as the Sahel. Its effect could be seen on a water basin that drains into Lake Chad.

"The water level has been falling precipitously," Nigam said. "It's very depleted. We can't attribute it all to rainfall. There may be human draws from the lake. But it's telling, a visible element, and it clearly lies in the area where the Sahara is encroaching southward."

Africa is the continent least responsible for human-caused climate change, but it's the most vulnerable to its effect because

of unique features. It is, for example, a land mass almost evenly divided between the Southern and Northern hemispheres, creating a wide variety of climate zones.

Thomas said she started the research as a way to characterize century-long trends but focused on Africa's Northern Hemisphere when she noticed "really strong trends over the proximity of the Sahara."

As the researchers went about their work, downloading satellite data and information from the global climatology center, the evidence became more concerning.

"The finding was impressive because it was happening in the summer season, the growing season where Africa receives most of its rainfall, a really important season for agriculture," Nigam said.

Yet, that is when the greatest southward advance of the Sahara occurred, he said. A season of rain was being replaced by the expansion of a desert, without the affected governments, Chad and Sudan mostly, noticing.

The future implications for countries already affected by lack of rain and drought could be dire, Nigam said. "Water resource planning, water use and long-term planning is important."

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