

IUPUI ecohydrologist studies fog, dew and other novel water sources for dryland vegetation

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IUPUI ecohydrologist Lixin Wang studies fog, dew and other novel water sources for dryland vegetation. Credit: School of Science at Indiana University-Purdue University Indianapolis

As fresh water becomes more scarce due to population growth and climate warming, both of which are projected to increase over the coming decades, ecohydrologist Lixin Wang of the School of Science at Indiana University-Purdue University Indianapolis is investigating how non-rainfall water sources—especially fog and dew—impact drylands with important implications for their agriculture. His work is supported by a new CAREER award from the National Science Foundation.

Drylands, which are expanding, currently cover nearly 40 percent of the globe and are home to approximately 2.5 billion people. In the United States, these arid areas are found in southern California, Arizona, New Mexico and portions of the Great Plains. With global warming, more areas in the United States and around the world are becoming increasingly dry and desert-like.

"Despite existing research highlighting the importance of non-rainfall moisture on the dryland biome, we actually have little knowledge of the sources of fog and dew—clouds, surface water or groundwater—in dryland environments and how these non-rainfall sources of moisture contribute to ecosystem functions and interactions," said Wang, an assistant professor of earth sciences in the School of Science who works at the intersection of ecology and hydrology. "With less future rainfall amounts predicted for these already arid environments and more people to feed around the world, it is critical that we know more about non-rainfall water use for vegetation and soil moisture dynamics."

As air cools, atmospheric water vapor condenses into droplets. Fog comprises these droplets suspended in the atmosphere at or near the earth's surface. When the droplets condense on exposed, cooler surfaces, they are known as dew. Wang says that no commonly accepted method to measure amounts of fog or dew exists, and little is known about how vegetation utilizes fog and dew. Uniquely trained in hydrology, ecology and isotope geochemistry, he is among the first researchers to comprehensively investigate the ecohydrology of fog and dew.

The CAREER grant is the most prestigious award in support of junior faculty given by the NSF. Wang's new five-year, \$770,000 grant also supports community outreach, programs for elementary and [middle school students](#) through IUPUI's Center for Earth and Environmental Science, and summer laboratory research opportunities for local [high school students](#). A high [school](#) teacher-training program on climate change and hydrological cycles will be offered each summer. The grant also provides funding for training doctoral student researchers and purchasing a new state-of-the-art laser-based isotope instrument.

Fieldwork for the project will be conducted by Wang and IUPUI undergraduate and graduate students in the Namib Desert of Namibia. This desert, which follows the Atlantic coast for 1,243 miles from Angola to South Africa, is almost completely devoid of surface water. It receives virtually no rain but has frequent fog occurrences that have been monitored for over half a century by the Gobabeb Research and Training Center in Namibia, providing unique data on this source of non-rainfall water.

"The historic information from Namibia and the information we gather ourselves in the desert there will enable us to comprehensively assess the non-rainfall moisture effects on drylands and to better predict ecosystem responses to future climate change," Wang said. "The long-term goal is to expand our research to global scale."

NSF CAREER grants are awarded to individuals who "exemplify the role of teacher-scholars through outstanding research, excellent education, and the integration of education and research."

"NSF CAREER awards are very competitive grants given to faculty who excel in both research and teaching," said Simon J. Rhodes, dean of the School of Science at IUPUI. "This award reflects Dr. Wang's commitment, both to outstanding research that will help the people of Indiana and beyond and to educating Indiana students from elementary school through the Ph.D."

Current School of Science at IUPUI faculty members who also have received the prestigious award include Lisa M. Jones, Lei Li and Haibo Ge (chemistry and chemical biology); Yogesh Joglekar (physics); Gavriil Tsechpenakis, Murat Dundar and Mohammad Al Hasan (computer and information [science](#)); Roland Roeder (mathematical sciences); and Gregory Druschel (earth sciences).

The School of Science at IUPUI is committed to excellence in teaching, research and service in the biological, physical, behavioral and mathematical sciences. The school is dedicated to being a leading resource for interdisciplinary research and science education in support of Indiana's effort to expand and diversify its economy.

Provided by Indiana University-Purdue University Indianapolis School of Science

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