

Scientists study connection between Great Plains precipitation and agricultural irrigation

July 11 2018, by Cheryl Dybas



The Doppler On Wheels 7 mobile radar deployed at a GRAINEX site near Dwight, Nebraska. Credit: Maiana Hanshaw, CSWR

Can crop irrigation affect the clouds that form high above farm fields? Indeed it can, say atmospheric scientists.

Agricultural [irrigation](#) to meet a growing demand for food is adding significant amounts of water to the [land surface](#) and altering regional land use and land cover. These changes affect lower atmosphere circulation, potentially influencing cloud development and precipitation.

To further understand how irrigation may be affecting precipitation, scientists from several institutions have teamed up for a National Science Foundation (NSF)-funded project known as the Great Plains Irrigation Experiment, or GRAINEX.

"Prior studies have found that the Great Plains is a hotspot where soil moisture plays an important role in cloud formation and precipitation," said Nick Anderson, a program director in NSF's Division of Atmospheric and Geospace Sciences, which funded the research.

"Changes in land use and irrigation for agricultural activities could be important in land-atmosphere interactions in this region. The results from this study will be valuable to our understanding of the link between irrigation and precipitation."



GRAINEX scientists Udaysankar Nair and Eric Rappin install a weather station.
Credit: GRAINEX

Scientists from six partner institutions—the University of Nebraska-Lincoln (UNL), Western Kentucky University (WKU), University of Alabama at Huntsville (UAH), University of Colorado at Boulder (CU), National Center for Atmospheric Research (NCAR) and the Center for Severe Weather Research—began collecting data in late May across a 3,600-square-mile area in southeastern Nebraska. The data collection will continue through the end of July.

The results of the study will eventually help agricultural planning and weather forecasting in the United States and other parts of the world, the researchers said.

Rezaul Mahmood, director of the High Plains Regional Climate Center at UNL, is leading the project. Other co-leaders are Udaysankar Nair of UAH, Eric Rappin of WKU, and Roger Pielke Sr. of CU.



GRAINEX researchers get ready to launch a weather balloon. Credit: GRAINEX

"We designed this research project to take place over a two-month period to allow us to understand the impacts of irrigation right when it begins, and during its maximum application in mid- to late July," Mahmood said.

"The study includes the transition region between extensively irrigated areas and dry land or non-irrigated areas. The experiment's setting offers a unique opportunity to investigate the influence of these different land surface and [land cover](#) regions side by side."



A GRAINEX energy and water flux measuring station, shown on-site in Nebraska. Credit: GRAINEX

The project includes deployment of 80 meteorological stations and several different methods to collect data:

- Measurements of fluxes of water and energy from six irrigated and six non-irrigated locations.
- Radar observations of the lower atmosphere from three locations.
- Weather balloon-based observations of the atmosphere from five locations.
- Two surface locations with a series of instruments that collect data on the lower atmosphere.

These data will be analyzed and used, along with model applications, to determine the impacts of irrigation on precipitation in the Great Plains. The team will use NCAR's supercomputing facility, in addition to computational facilities at WKU, UAH and UNL, for the modeling.

Provided by National Science Foundation

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