THESE RESEARCHERS TAKE “THE SKY’S THE LIMIT” TO HEART
By Susan Thompson

For decades, Iowa State University researchers have studied the cycling of water through soil, vegetation and the atmosphere that is vital to production agriculture.

Now a team of Iowa State and University of Iowa researchers is working to perfect the use of remote sensing technology to monitor the water cycle. The team has received a $1.3 million, five-year grant from NASA.

The research is taking place on 200 acres of Iowa State farmland south of campus, referred to as the “Iowa Validation Site.” At the site equipment automatically measures soil moisture, precipitation, radiation and evapotranspiration. Manual measurements also are taken.

Remote sensing equipment is mounted on a boom lift, airplanes and eventually will be on satellites to observe the field periodically, so data from the on-site monitoring and the remote monitoring can be compared.

Brian Hornbuckle, assistant professor in agronomy, is the project’s principal investigator. “We know the landscape in which we live changes on many scales over space and time,” Hornbuckle says. “Remote sensing is the only tool available that can capture all these changes.”

Hornbuckle says remote sensing instruments work like cameras to record the “brightness” of the earth’s surface. But instead of detecting visible light like normal cameras, the remote sensing instrument “sees” microwaves. Wet soils appear dark and dry soils appear bright.
In the next few years, both the European Space Agency and NASA will launch satellites to measure soil moisture. Each mission will produce global maps of soil moisture at about the scale of a typical Iowa county.

“This information could be used by meteorologists to improve forecasts of weather and climate,” Hornbuckle says. “Our team is focused on determining if the satellite data is accurate enough to be useful.”

Last September, an airplane carrying a remote sensing instrument from NASA’s Jet Propulsion Laboratory made passes over the site on three consecutive days. The collected data was analyzed to determine the accuracy and value of remotely sensed measurements of soil moisture.

The team also collaborates with researchers at the United States Department of Agriculture – Agriculture Resource Service National Soil Tilth Laboratory on the Iowa State campus, and shares data with other interested researchers.

Amy Kaleita, assistant professor in agricultural and biosystems engineering, is a co-investigator. “We know a key driver of crop yield is climate. Drought predictions can show up in soil moisture patterns,” Kaleita says. “Anything we can do to support monitoring and projections of field conditions helps producers make better management decisions.”

For Hornbuckle, Kaleita and the rest of their research team, the old saying “the sky’s the limit” has a more personal meaning.

“The use of remote sensing to monitor the water cycle is a big idea but we’re starting small in this one field,” Hornbuckle says. “Eventually we expect the technology to be expanded and used on a larger scale, such as river basins, states and regions.”
A remote sensing instrument called a microwave radiometer will be used in an Iowa State University research field as part of a new project to perfect the use of remote sensing technology to monitor the water cycle. Amy Kaleita and Brian Hornbuckle are the Iowa State researchers involved. A forklift moves the radiometer throughout the field and holds it about 40 feet above the ground.