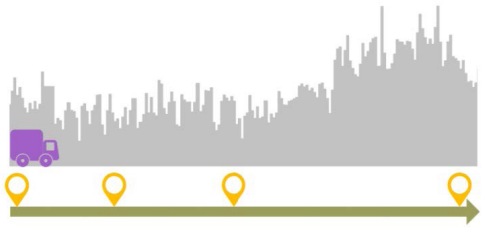
# SOIL MOISTURE MONITORING

Building upon our new, cutting-edge Cosmic Ray Neutron Rover technology, Oklahoma NSF EPSCoR researchers have been actively working to produce the first statewide, high-resolution soil moisture maps. The data included in these maps have the potential to benefit Oklahomans through more accurate prediction of floods and wildfires.

## CUTTING-EDGE TECHNOLOGY

### Cosmic Ray Neutron Rover

The Rover infers soil moisture at a field scale by translating neutron counts near the Earth's surface into a soil moisture measurement as the Rover is driven across a 90-mile transect. There are only a few of these rovers in use today. As cosmic rays enter into our atmosphere, the rays collide with molecules in the atmosphere, causing the molecules to eject neutrons that travel at a very high rate of speed towards the Earth's surface. As the fast-moving neutrons near the surface, they interact with hydrogen molecules, which begin to slow the neutrons. A lower count of fast-moving neutrons translates to a higher soil moisture for that area.



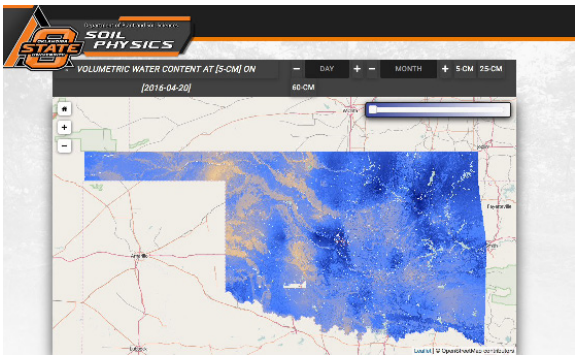
800 m pixel size × 190 points = 150 km

### KEY FINDINGS

- Soil moisture is extremely variable across the land, as shown in the Rover's transect graph above.
- Mean soil moisture is strongly related to sand content.
- The Rover transects also show how rainfall variability affects soil moisture patterns.

### Building Upon the Rover

Our researchers are taking the relationships found between soil moisture, sand content, and precipitation from the Rover's 90-mile transect study in the Cimarron River Watershed and are scaling them up to produce statewide soil moisture maps.




### High-Resolution Soil Moisture Maps

The statewide maps (shown left) are generated using a combination of different datasets: in-situ soil moisture data from the Oklahoma Mesonet, soil texture estimates from USDA-NRCS SSURGO, radar precipitation estimates, and the soil's "memory," which is captured by including an antecedent precipitation index. The map is at a 800-meter resolution and is updated daily. The high-resolution maps can be viewed at: http://soilmoisture.okstate.edu.

The purpose of generating these maps was to reveal dynamic and detailed spatial patterns of soil moisture, unable to be seen with the Oklahoma Mesonet. Moving forward, our researchers aim to use these new maps to inform wildfire prediction and groundwater management.

### FOR MORE INFORMATION

**Dr. Tyson Ochsner**
tyson.ochsner@okstate.edu

OKLAHOMA STATE REGENTS FOR HIGHER EDUCATION
*Improving our future by degrees*

9/28/16

*This material is based on work supported by the National Science Foundation under Grant No. OIA-1301789. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.*