Measuring ice particles and water vapor in the upper troposphere

February 28 2014, by Kortny Rolston

A Colorado State University-led research team is designing and building a new instrument to help NASA measure ice particles in clouds and water vapor in the upper troposphere.

NASA recently awarded Steven Reising, CSU electrical and computer engineering
professor, $4.5 million to construct the Tropospheric Water and Cloud ICE - or TWICE – over the next three years.

Reising and his students will design TWICE to fit in nano-satellites known as CubeSats, which NASA launches with larger satellites (such as the Global Precipitation Measurement mission going up Feb. 27) to reduce costs. TWICE weighs just 17.6 pounds and will be installed in a CubeSat approximately the size of two loaves of bread placed next to each other.

"It's a very exciting project and is a great opportunity for engineering students to build instruments that fit on these smaller satellites," Reising said.

Once launched, TWICE will scan the atmosphere at multiple frequencies and measure the size of ice particles in clouds at different times of day. It also will observe water vapor across most of the troposphere in nearly all weather conditions.

Information collected by the instrument will be used to improve global

climate models and provide a steady stream of data about ice particles in the upper atmosphere.

"None of the instruments on current satellites are dedicated specifically to measuring these ice crystals, in particular along with water vapor at different times of day," Reising said. "This will provide critical information about an area in which more observations are certainly needed."

The size of ice particles in clouds is influenced by several factors, including dust from deserts, smoke from fires and air pollution caused by human activity. TWICE will measure cloud ice particle size in both pristine and polluted environments, to help researchers determine the effect of human-produced air pollution on cloud properties and climate.

When large amounts of pollutants are present, clouds tend to grow deeper, contain smaller particles, rain less frequently, and appear brighter from above, affecting Earth's climate.

"There is a lot of uncertainty about the effects of air pollution on clouds and climate," Reising said. "Our goal is to reduce this uncertainty to help improve climate predictions."

Reising is leading not only Colorado State students but also researchers from NASA's Jet Propulsion Laboratory and Northrop Grumman to develop the TWICE instrument.

Provided by Colorado State University