



Soil Moisture Sensing Using Reflected GPS Signals: Description of the GPS Soil Moisture Product.

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As first demonstrated by the GPS reflections group in 2008, data from GPS networks can be used to monitor multiple parameters of the terrestrial water cycle. The GPS L-band signals take two paths: (1) the “direct” signal travels from the satellite to the antenna, which is typically located 2-3 meters above the ground; (2) the reflected signal interacts with the Earth’s surface before traveling to the antenna. The direct signal is used by geophysicists and surveyors to measure the position of the antenna, while the effects of reflected signals are a source of error. If one focuses on the reflected signal rather than the positioning observables, one has a method that is sensitive to surface soil moisture (top 5 cm), vegetation water content, and snow depth. This method - known as GPS Interferometric Reflectometry (GPS-IR) - has a footprint of $\sim 1000 \text{ m}^2$ for most GPS sites. This is intermediate in scale to most in situ and satellite observations. A significant advantage of GPS-IR is that data from existing GPS networks can be used without any changes to the instrumentation. This means that there is a new source of cost-effective instrumentation for satellite validation and climate studies. This presentation will provide an overview of the GPS-IR methodology with an emphasis on the soil moisture product. GPS water cycle products are currently produced on a daily basis for a network of ~ 500 sites in the western United States; results are freely available at <http://xenon.colorado.edu/portal>. Plans to expand the GPS-IR method to the network of international GPS sites will also be discussed.