

EMS8/ECAC7 Abstracts,
Vol. 5, EMS2008-A-00000, 2008
8th Annual Meeting of the EMS / 7th ECAC
© Author(s) 2008



COSMOS: COsmic-ray Soil Moisture Observing System

M. Zreda (1), J. Shuttleworth (1), X. Zeng (2) and C. Zweck (1)

(1) Department of Hydrology and Water Resources, University of Arizona, Tucson, AZ 85721, USA (marek@hwr.arizona.edu), (2) Department of Atmospheric Sciences, University of Arizona, Tucson, AZ 85721, USA

Soil water exerts a critical control on weather, climate, ecosystem, and water cycle, and hence is crucial for many fields within natural sciences. A serious handicap in soil moisture measurements is the mismatch between limited point measurements using contact methods and remote sensing estimates over large areas. A novel method to measure soil moisture non-invasively on an intermediate spatial scale will alleviate this problem. The method takes advantage of the dependence of cosmic-ray neutron intensity on the hydrogen content of soils. Low-energy cosmic-ray neutrons are produced and moderated in the soil, transported from the soil into the atmosphere, where they are measured with a cosmic-ray neutron probe to provide integrated soil moisture content over a footprint of hundreds of meters and a depth up to 60 cm. The method and the instrument are intended for deployment in the continental-scale COSMOS network that is designed to cover the contiguous region of the USA. Fully deployed, the COSMOS network will consist of 500-700 probes, and will provide continuous soil moisture content measured and reported hourly. These data will be used for initialization and assimilation of soil moisture conditions in weather and short-term (seasonal) climate forecast, for drought monitoring, for calibration and validation of remote sensing methods, and for numerous other applications.