Title: **The Soil Moisture Active and Passive (SMAP) Mission**

Journal: **Proceedings of the IEEE**

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Abstract:

The Soil Moisture Active and Passive (SMAP) Mission is one of the first Earth observation satellites being developed by NASA in response to the National Research Council's Decadal Survey. SMAP will make global measurements of the moisture present at Earth's land surface and will distinguish frozen from thawed land surfaces. Direct observations of soil moisture and freeze/thaw state from space will allow significantly improved estimates of water, energy and carbon transfers between land and atmosphere. Soil moisture measurements are also of great importance in assessing flooding and monitoring drought. SMAP observations can help mitigate these natural hazards, resulting in potentially great economic and social benefits. SMAP soil moisture and freeze/thaw timing observations will also reduce a major uncertainty in quantifying the global carbon balance by helping to resolve an apparent missing carbon sink on land over the boreal latitudes. The SMAP mission concept would utilize an L-band radar and radiometer. These instruments will share a rotating 6-meter mesh reflector antenna to provide high-resolution and high-accuracy global maps of soil moisture and freeze/thaw state every two to three days. The SMAP instruments provide direct measurements of

surface conditions. In addition, the SMAP project will use these observations with advanced modeling and data assimilation to provide deeper root-zone soil moisture and estimates of land surface-atmosphere exchanges of water, energy and carbon. SMAP is scheduled for a 2014 launch date.

Popular Summary:

Knowledge of the amount of moisture stored in the soil and whether the soil is frozen is important for many applications, but global observations of soil moisture and the freeze/thaw state of the soil have not been available at the spatial and temporal resolution and with the accuracy necessary to meet applications requirements. The Soil Moisture Active and Passive (SMAP) mission, scheduled for launch in 2014, addresses this observational gap. SMAP is one of the first Earth observation satellites being developed by NASA in response to the National Research Council's Decadal Survey. SMAP will make global measurements of the moisture present at Earth's land surface and will distinguish frozen from thawed land surfaces. Direct observations of soil moisture and freeze/thaw state from space will allow significantly improved estimates of water, energy and carbon transfers between land and atmosphere. Soil moisture measurements are also of great importance in assessing flooding and monitoring drought. SMAP observations can help mitigate these natural hazards, resulting in potentially great economic and social benefits. SMAP soil moisture and freeze/thaw timing observations will also reduce a major uncertainty in quantifying the global carbon balance by helping to resolve an apparent missing carbon sink on land over the boreal latitudes. The SMAP mission will provide high-resolution and high-accuracy global maps of soil moisture and freeze/thaw state every two to three days. The SMAP instruments provide direct measurements of surface conditions. In addition, the SMAP project will use these observations together with models of land surface processes and optimization tools to provide deeper root-zone soil moisture and estimates of land surface-atmosphere exchanges of water, energy and carbon. SMAP is scheduled for a 2014 launch date.