

Evaluation of the JPSS GCOM-W Soil Moisture Product in the Caribbean region: A Case Study of Puerto Rico

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Introduction

This project combines the CREST-owned L- band microwave radiometer and NRSC Scan sites to observe local scale soil moisture in Puerto Rico in order to provide ground validation data for satellite soil moisture data products (SMDP).

Soil moisture observations are being collected on soils under variable conditions like bare soil and soil under a variation of crops. Throughout the last year microwave brightness temperature and soil moisture were observed for different land cover patterns and vegetation conditions including: bare soil, short grass, tall grass and agricultural fields which are representative of the study area (Island of Puerto Rico.

Results and Discussion

I. Validation

Data from GCOM-W (L2), SMAP (L3) and GOES-PRWEB (Local/Physical Model) was compared against NRCS-SCAN & UPRM-AES sites.

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The variability of SMDP was investigated (Table 1). Modeled and Satellite SM data obtained from GCOM-W and GEOS-PRWEB were between the expected values of SM when compared with ground data. In the contrary SMAP data consistently shows saturated soils (50% of SM). The overestimation was due SMAP 36 Km pixel mixing(water/soil).

Table:1 SMDT Spatial Resolutions and SM Variability for 2015-2016

Scope and Objectives

- Validation of GCOM-W soil moisture data using L-band microwave radiometer and observed local scale soil moisture in Puerto Rico.
- Downscaling of GCOM-W soil moisture data over the Caribbean Region.
- Develop and test a framework to integrate JPSS/GCOM-W soil moisture data to improve NWS' flash flood guidance for Puerto Rico.
- Train up to two graduate students in applied science research with using satellite remote sensing.

Study Area

The coarse resolution (> 10 km) of remotely sensed soil moisture data sets, limited his applicability over the Caribbean islands like Puerto Rico, where is generally required a very fine resolution, due to varied topographic and land-cover patterns.

In this context, ground-truth measurements observed at relevant scales are necessary for calibration and validation of such algorithms in Puerto Rico.

Product	Туре	Spatial Resolution	Mean SM	SM Value Ranges
		(Km)	(Vm)	(Vm)
NRCS -SCAN Sites	In-Situ	0.001	0.31	0.58 - 0.03
GOESPR-Web	Modeled	1.0	0.29	0.40 - 0.14
GCOM-W	Satellite	10.0	0.27	0.66 - 0.06
GCOM-W	Satellite	25.0	0.25	0.63 – 0.06
SMAP	Satellite	36.0	0.51	0.55 – 0.47



Figure 3 : The effect rainfall in the GCOM-W SM pixel was also analyzed. As expected, events of rainfall are followed by a spike in the SM values, however the magnitude of the change tends to be overestimated. The data will be Bias corrected.

II. Downscaling:



Figure 1: General distribution of GCOM-W 10Km Pixel Size vs. NRSC & Radiometric observational Sites.



High Resolution Flash Flood Guidance in PR

Currently, discussing with NWS Puerto Rico and assessing current system for providing frame-work for GCOM-W soil moisture in distributed Flash Flood Guidance System in Puerto Rico



The prepossessing of physical controls such as vegetation cover, soil type, topography and sand fraction for the GCOM-W downscaling was completed. GCOM-W 25 Km pixel footprint and the corresponding ground station (NRCS/UPRM-AES) were used to resample the physical controls at 4 km pixels. Currently, we are optimizing the GCOM-W SM downscaling.



Figure 4: Resampling of physical controls.

Planned work

- Quantify the effect of surface heterogeneity and meteorology in the satellite vs. point scale comparison.
- 2nd phase of the field soil moisture mapping experiment will be carried out

for quantification of the effect of land cover heterogeneity on GCOM-W soil moisture retrievals. The camping is schedule for February 2017. In collaboration with USACE/ERDC/GRL.

• Implementation of framework for GCOM-W soil moisture in Flash Flood Guidance System in Puerto Rico.

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