GPS-soil moisture measurements at SMAP ISST

xenon.colorado.edu/reflections/GPS_reflections/PBO_H2O.html

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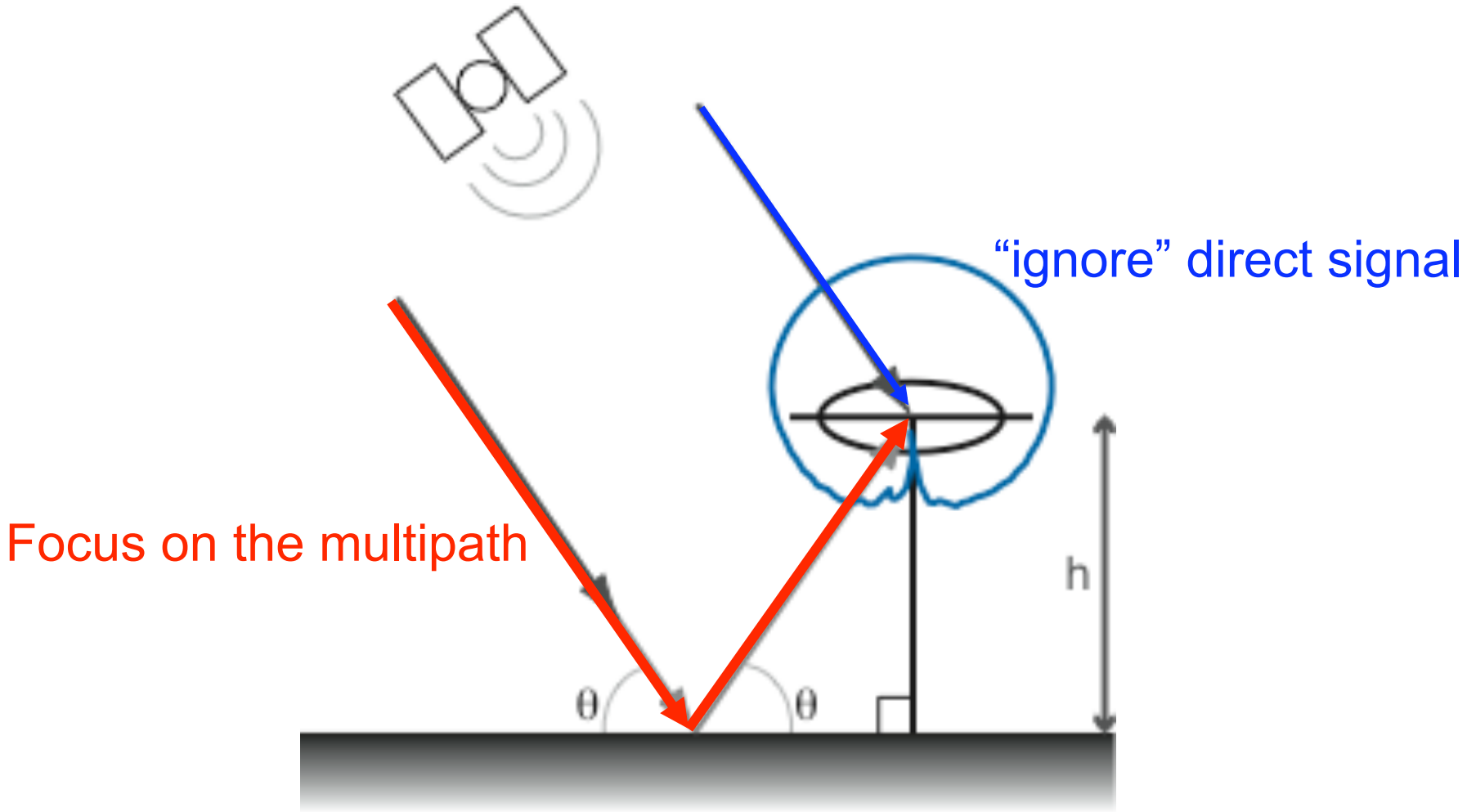
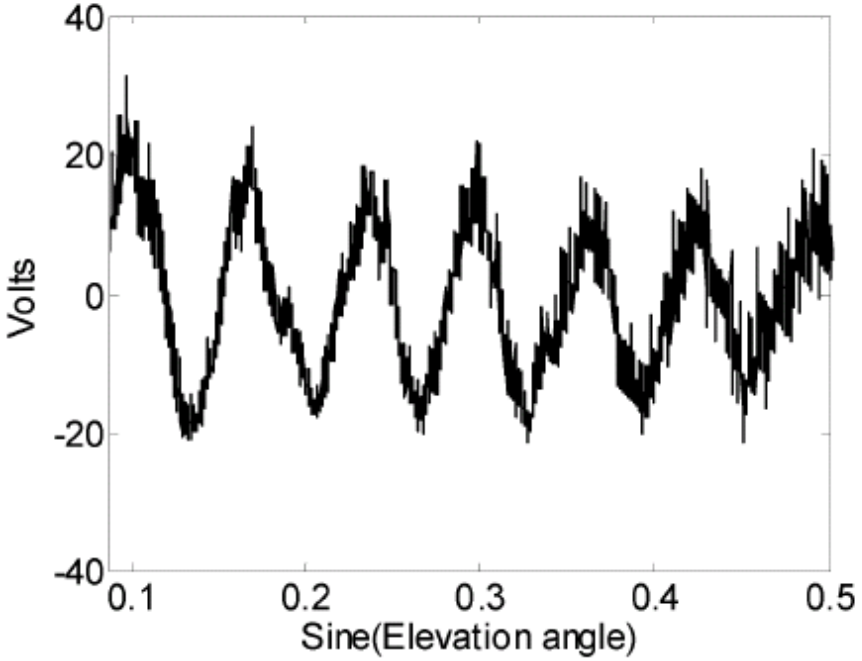
Use GPS multipath for L-band environmental sensing

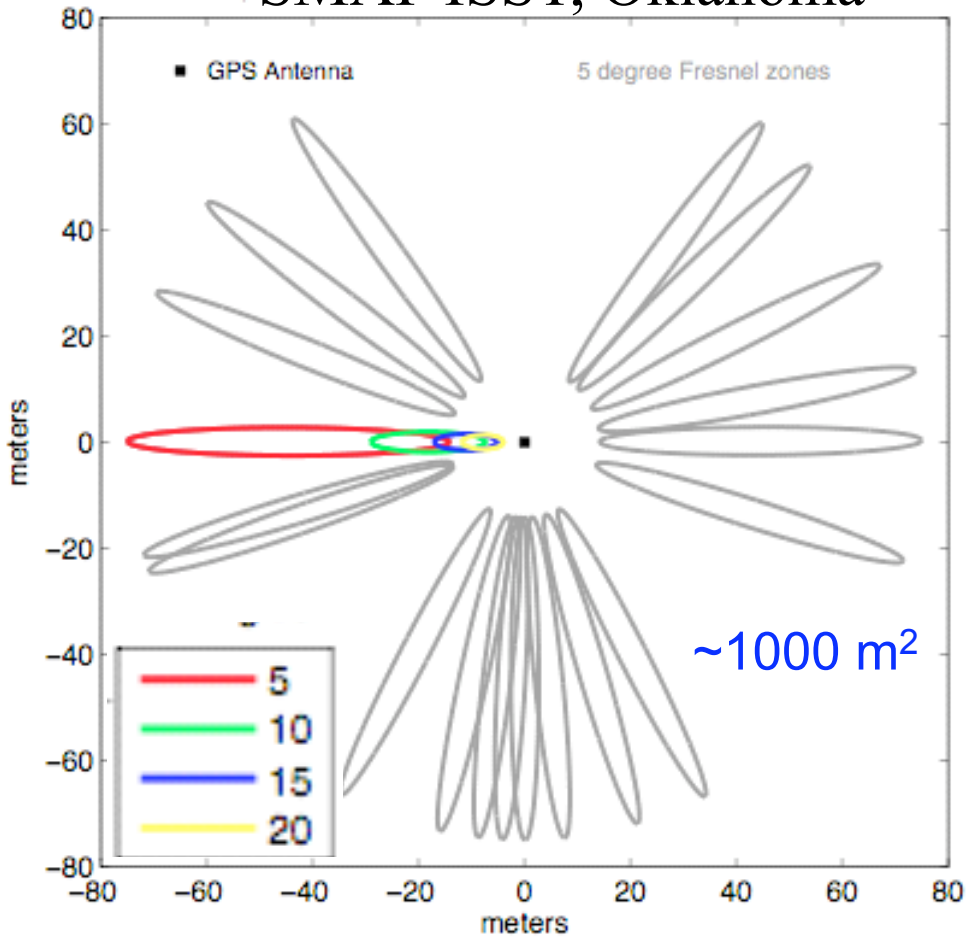


Sensing Footprint

SMAP ISST, Oklahoma

Detrended multipath signal

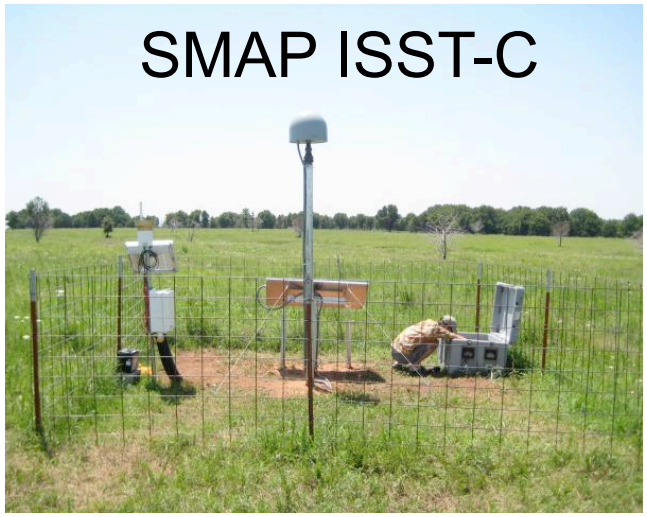


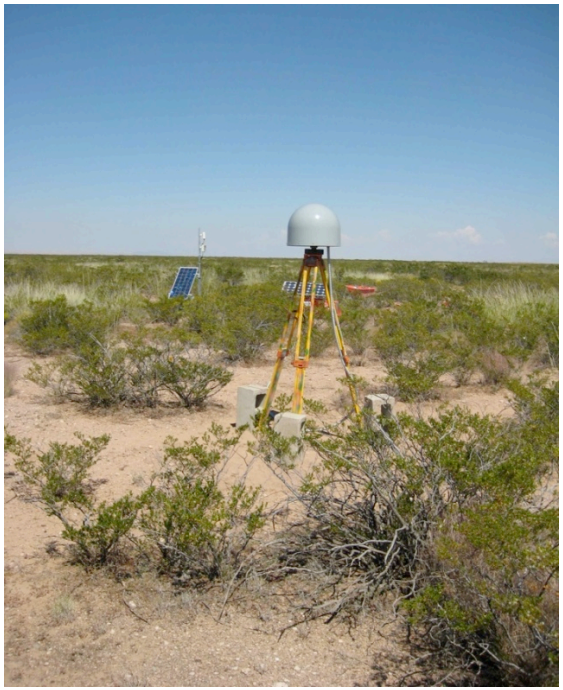


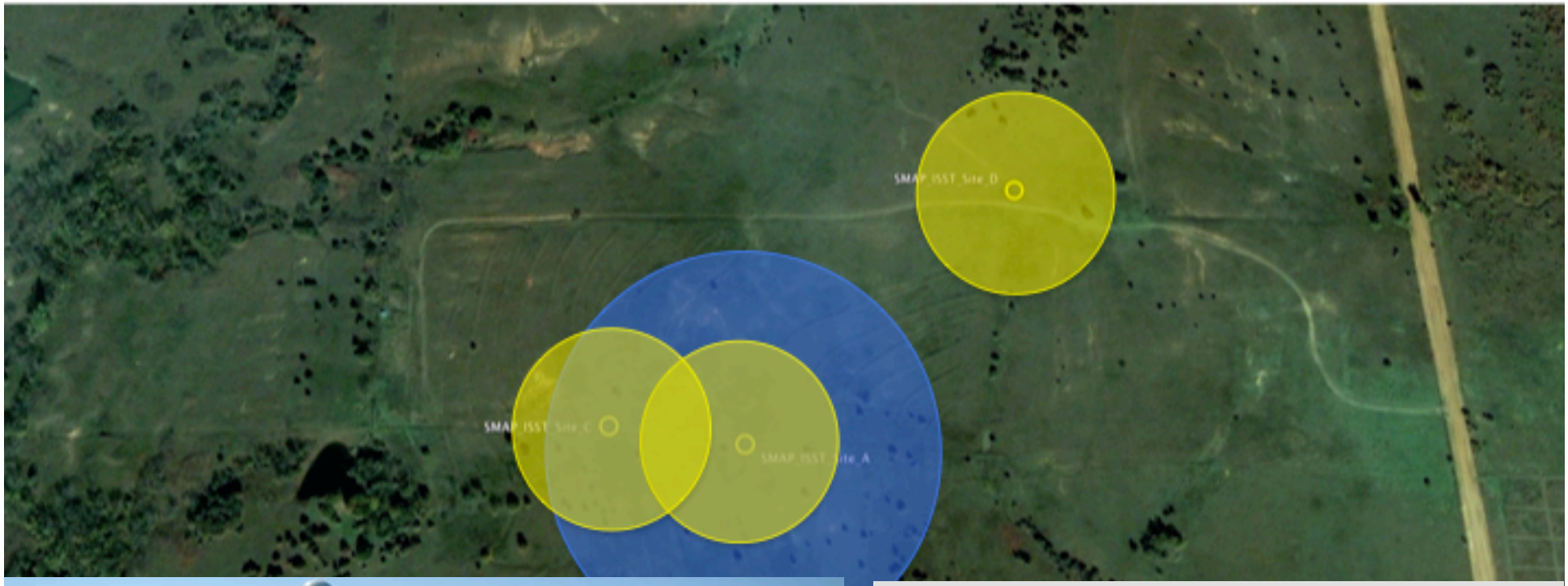
Soil moisture → phase shift and frequency change

Vegetation → amplitude

9 test sites: Identical GPS and hydrology infrastructure and gravimetric and vegetation sampling





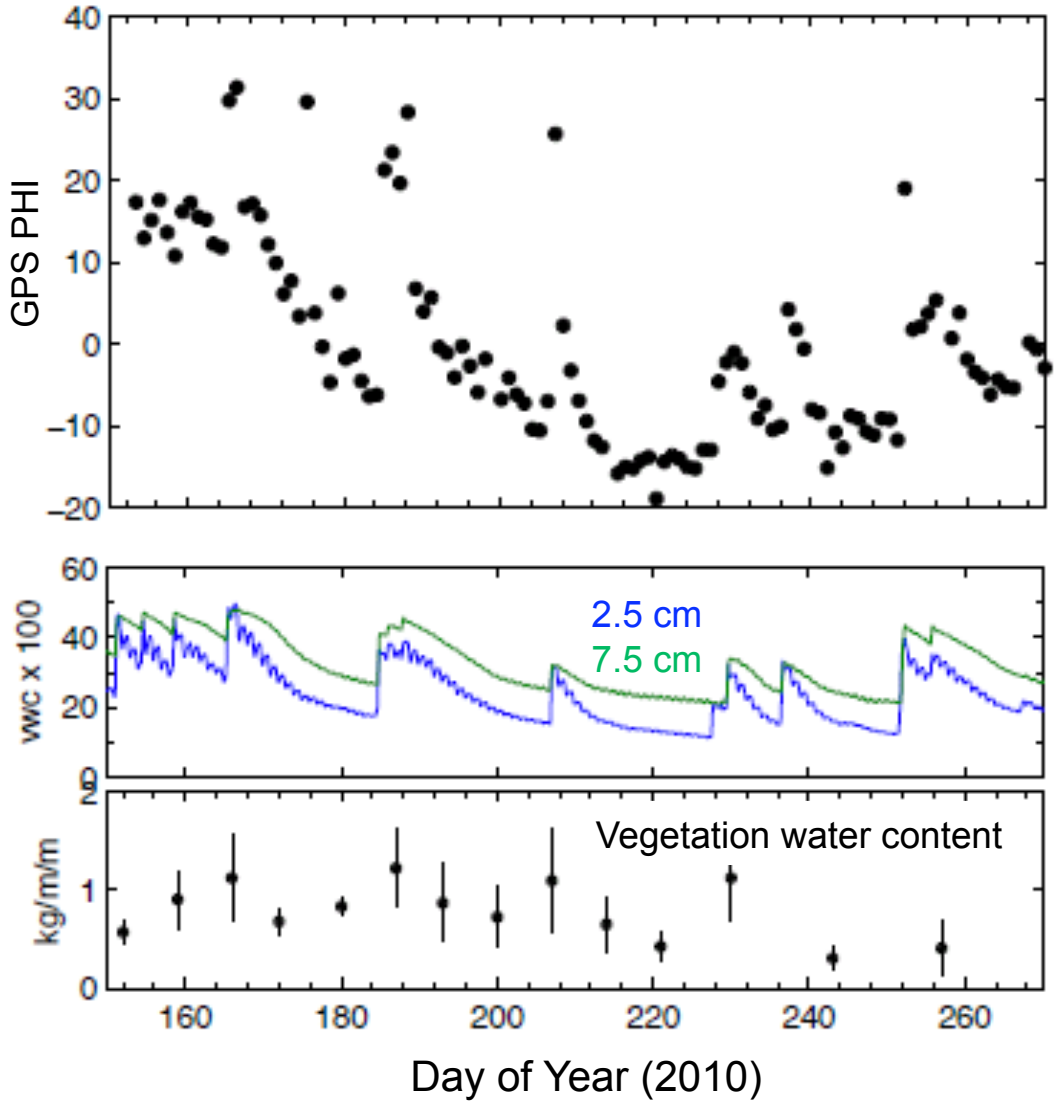


SMAP ISST

3 standard GPS (2.5 m)
1 raised GPS (6 m)

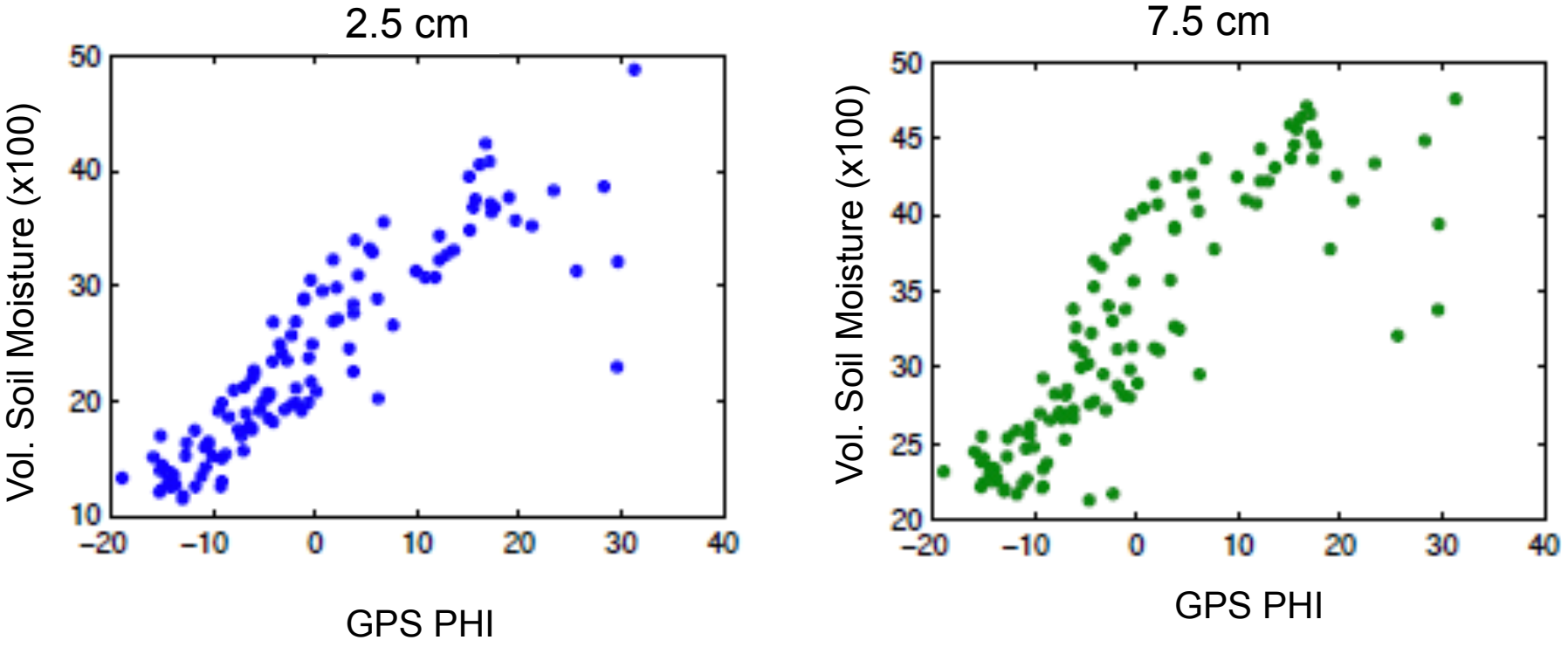
CS616
- Five at 2.5 and 7.5 cm probes outside the pen

Estimates from GPS phase shift
SMAP ISST Site D



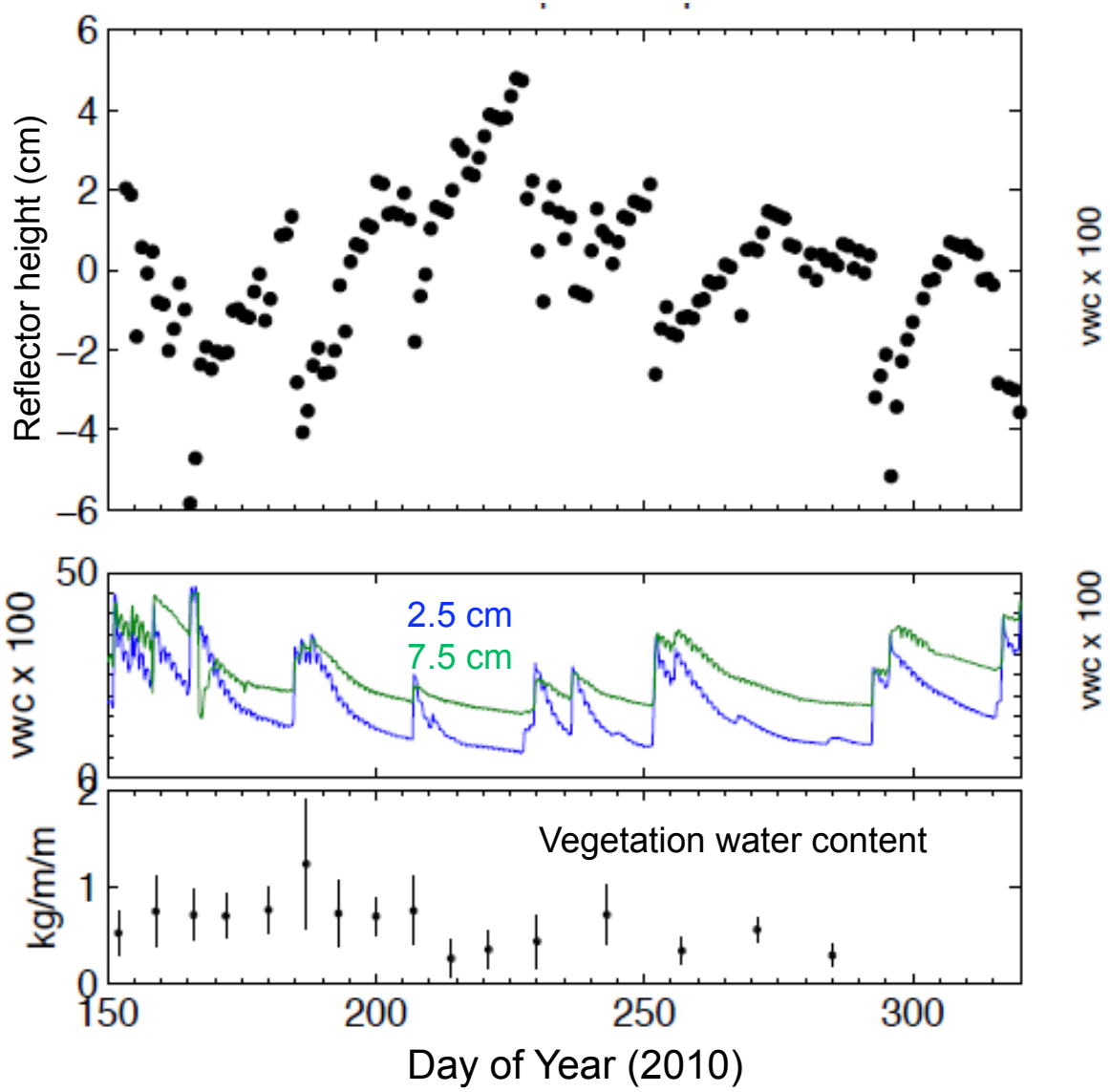
SMAP ISST Site D

GPS phase shift and CS616 soil moisture



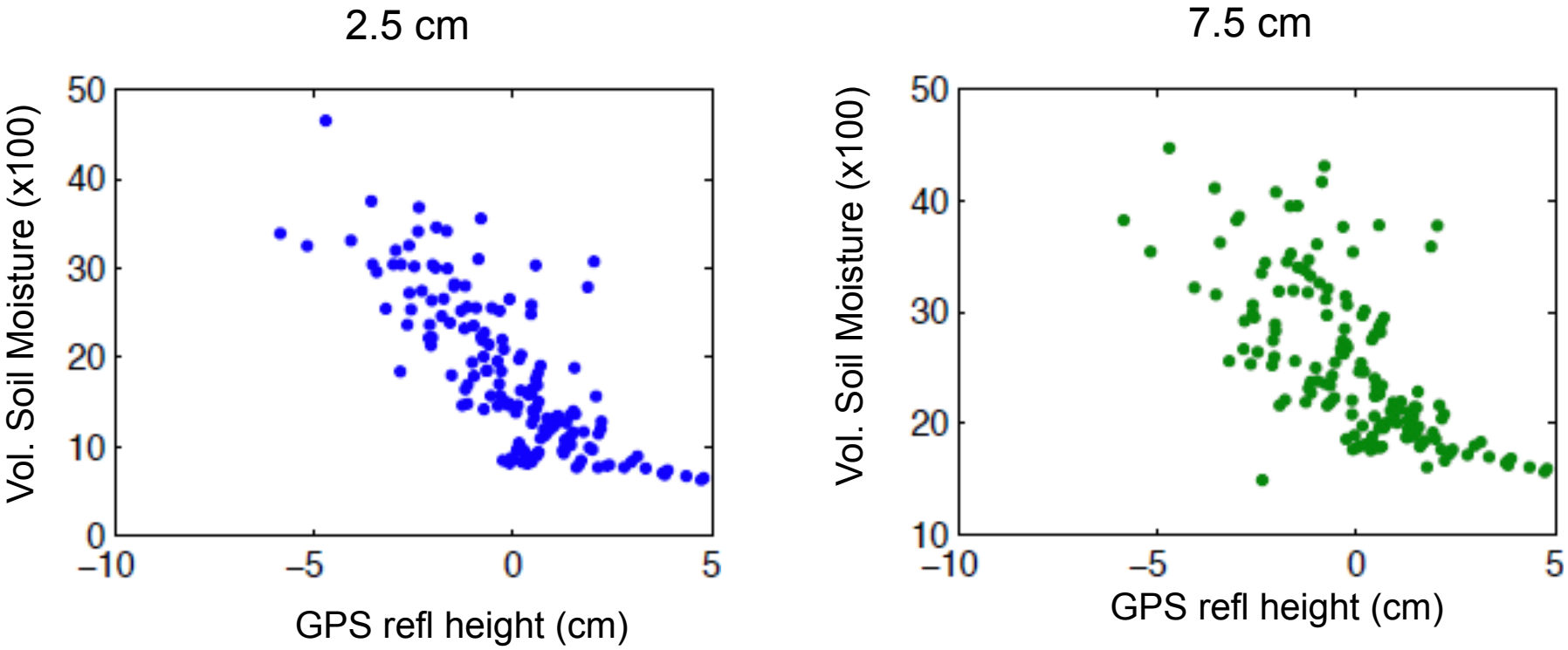
Correlation higher with soil moisture at 2.5 cm

Estimates from GPS reflector height
SMAP ISST Site A



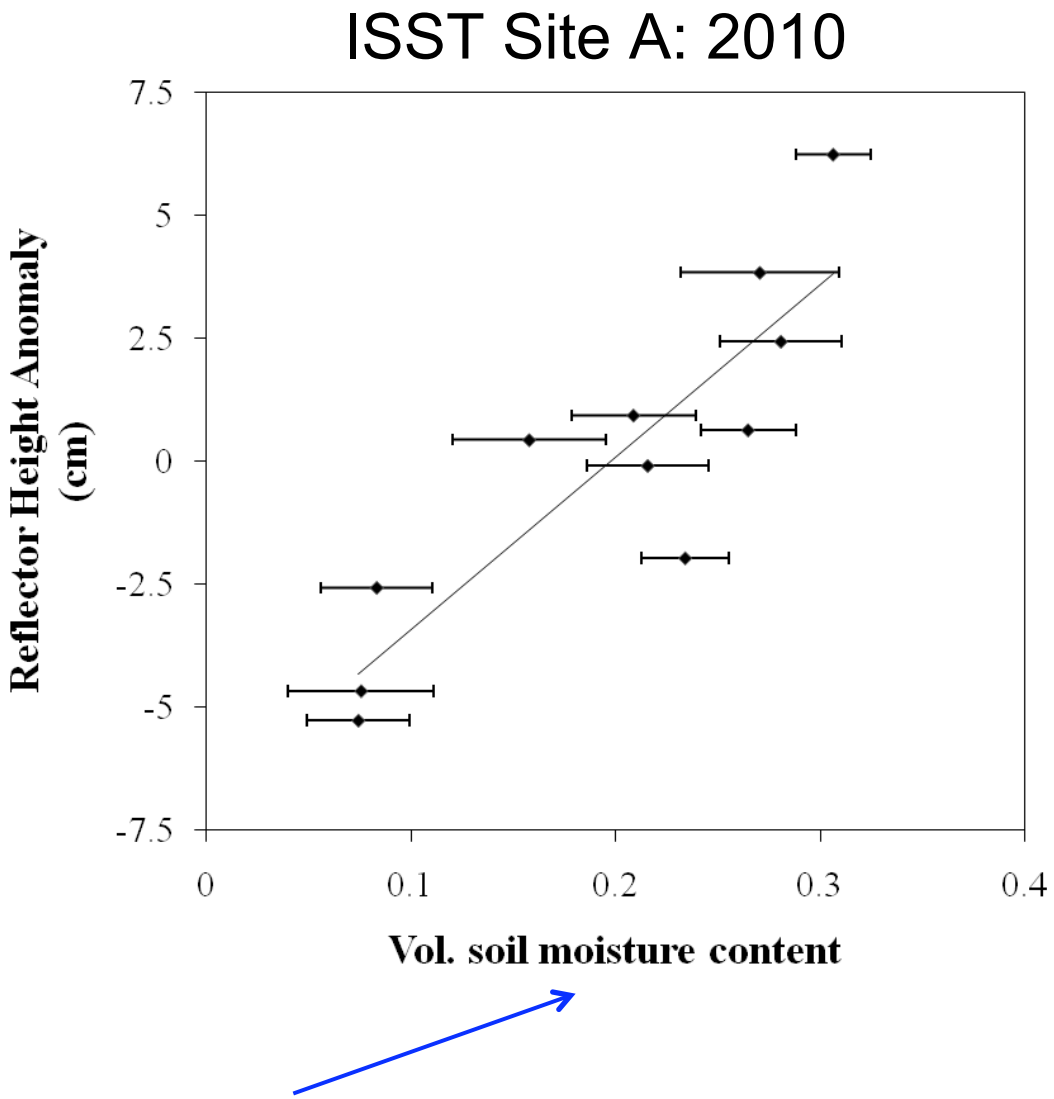
SMAP ISST Site A

GPS reflector height and CS616 soil moisture



Correlation higher with soil moisture at 2.5 cm

Comparison to gravimetric soil moisture



For 2010, GSM from calibrated theta probe

2011 efforts at ISST

Soil moisture

Comparison between GPS sites, including tall antenna

Comparison to in situ probes and other methods

Vegetation

Identify vegetation signal in multipath data

Sensing vegetation: winter wheat site