Soil Moisture Variability From Plot to Footprint Scale
Results From SGP97, SGP99, SMEX02

Evolution of Soil Moisture Distributions at Increasing Scales

**SGP97**
0.8 km

**SGP99**
1.6 km

**SMEX02**
50 km

Famiglietti et al., 2008
Soil Moisture Variability From Plot to Footprint Scale
Results From SGP97, SGP99, SMEX02

Increasing Variability with Increasing Spatial Scale

CV vs. Mean Moisture Content

Famiglietti et al., 2008
Soil Moisture Standard Deviation Across Scales

(a) Standard deviation (cm$^3$/cm$^3$) vs. Extent scale (m).
(b) Log standard deviation (cm$^3$/cm$^3$) vs. Log extent scale (m$^2$).

Famiglietti et al., 2008
SGP97-SMEX03

Soil Moisture Standard Variability Across Scales

Famiglietti et al., 2008
• Confidence interval of the validation data from ground samples can be estimated using the empirical function of soil moisture standard deviation and the Student’s t-distribution.

\[
\bar{X} + t_{0.025, N} \cdot \frac{\sigma}{\sqrt{N}} < \mu < \bar{X} + t_{0.975, N} \cdot \frac{\sigma}{\sqrt{N}}
\]
• Number of ground samples required can be estimated using the empirical function of soil moisture standard deviation and the Student’s t-distribution.

\[
N = \left( t_{0.975, N} \cdot \frac{\sigma}{0.03} \right)^2
\]
CHARACTERIZING VARIABILITY IN MODELS

- Gaussian mixture model (multi-modal) vs. single Gaussian (uni-modal)

Ryu and Famiglietti, 2004
CHARACTERIZING VARIABILITY IN MODELS

- Gaussian mixture model (multi-modal) vs. single Gaussian (unimodal)

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