

Satellite Ground Validation Using Temporal Stability

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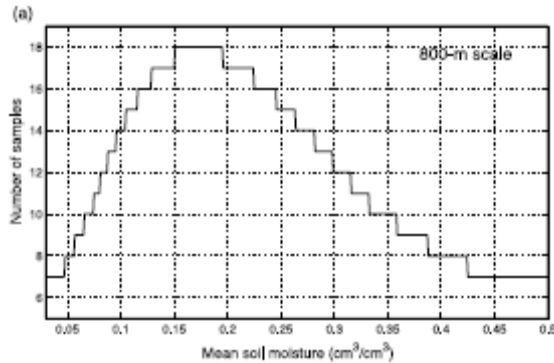
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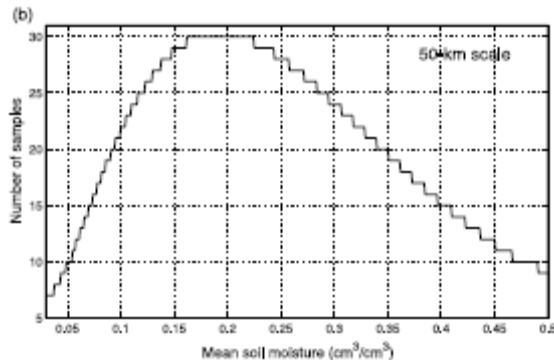
Ground Sampling

How many stations are necessary to accurately sample?



800 m sampling grid = 18 sampling points

50 km sampling grid = 30 sampling points



95% C.I. for +/- 3% VSM

From Famiglietti et al., 2008

BUT there is a quicker and easier way.

History of Temporal Stability

Mathematically described by Vachaud et al. 1985, however,

A farmer's addage:

“the dry part's dry, the wet part's wet.”



Common Sense



Using historical knowledge of the field, a farmer will make an irrigation decision based on soil moisture based on a few sampling points...**so should we.**



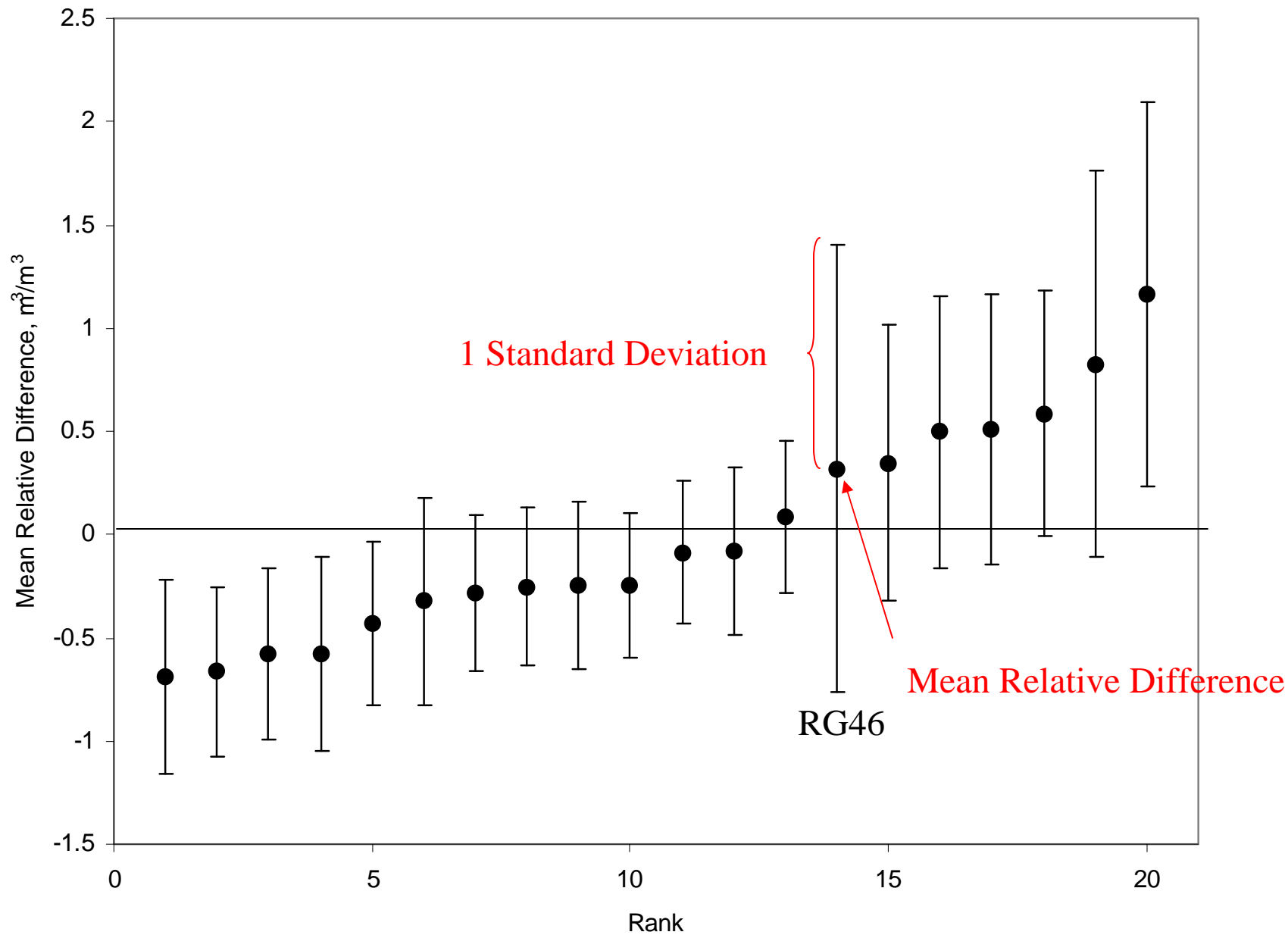
Definition of Temporal Stability

$$\bar{\delta}_i = \frac{1}{t} \sum_{j=1}^t \frac{S_{i,j} - \bar{S}_j}{\bar{S}_j}$$

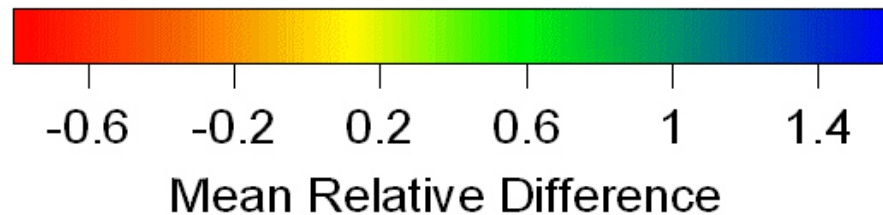
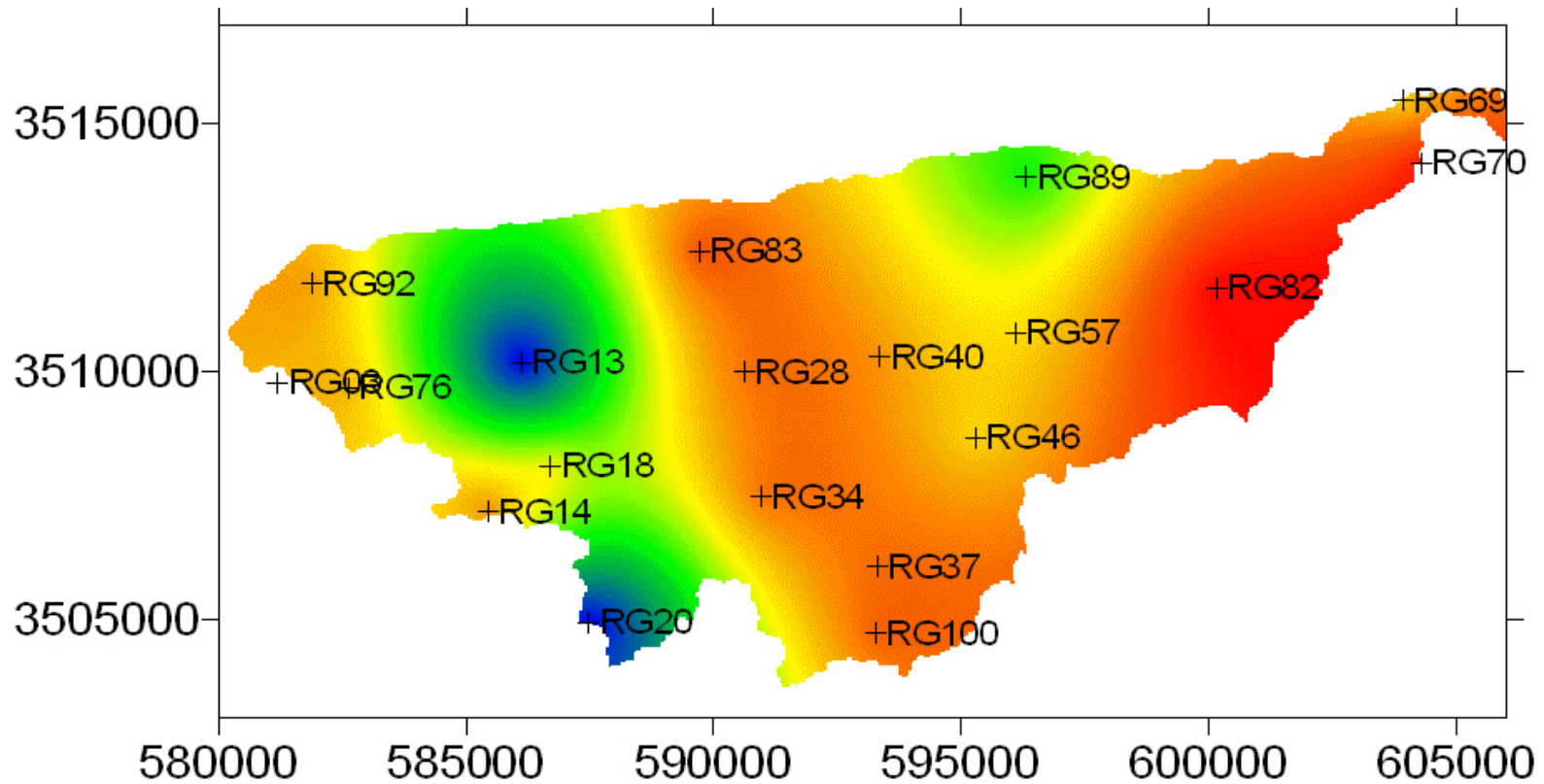
Where $S_{i,j}$ is the soil moisture at a location i , at time j . \bar{S}_j is the average soil moisture across all locations at time j .

Mean Relative Difference or a **scaled bias**

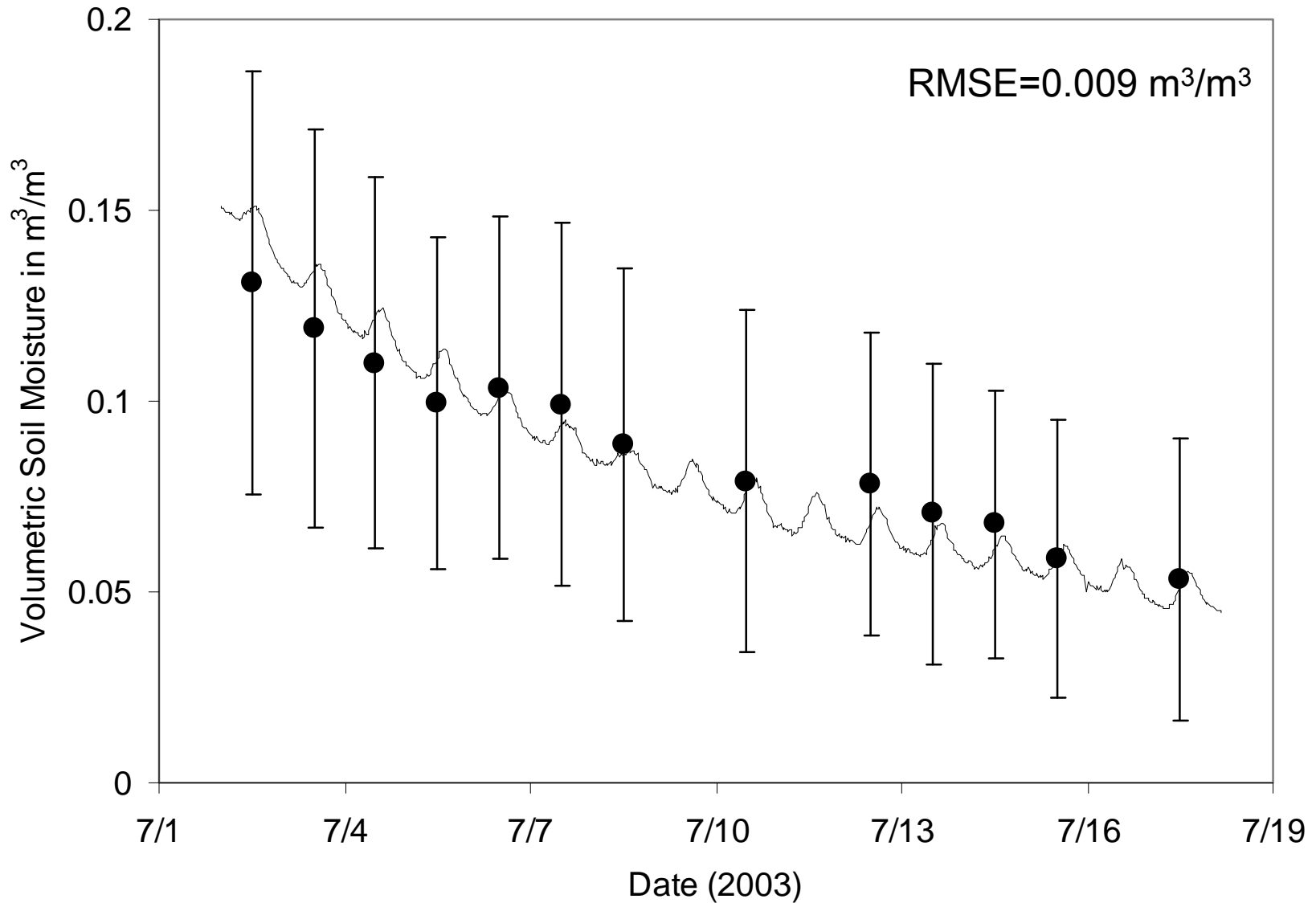
Walnut Gulch Temporal Stability Plot



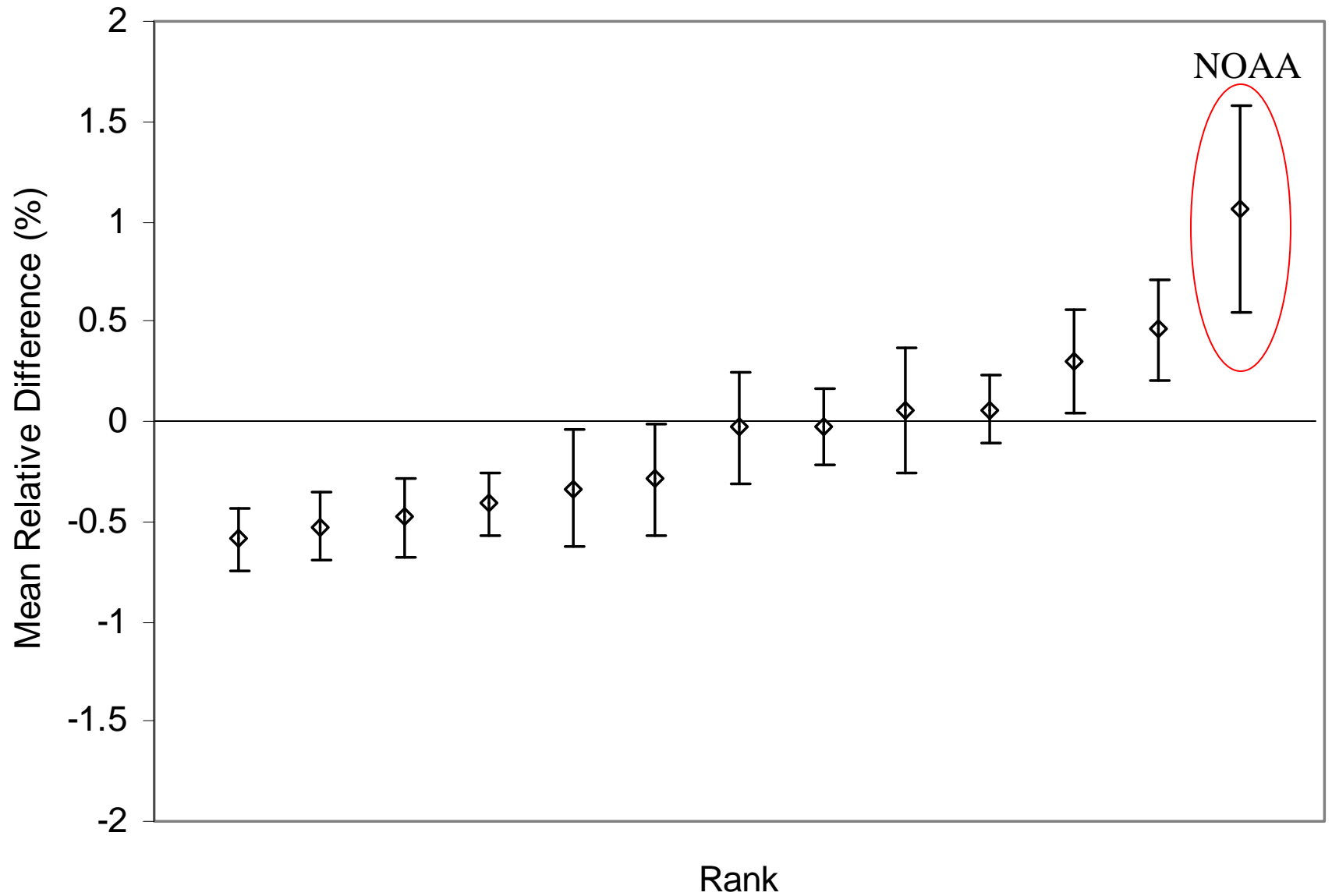
Mean Relative Difference Spatial Distribution



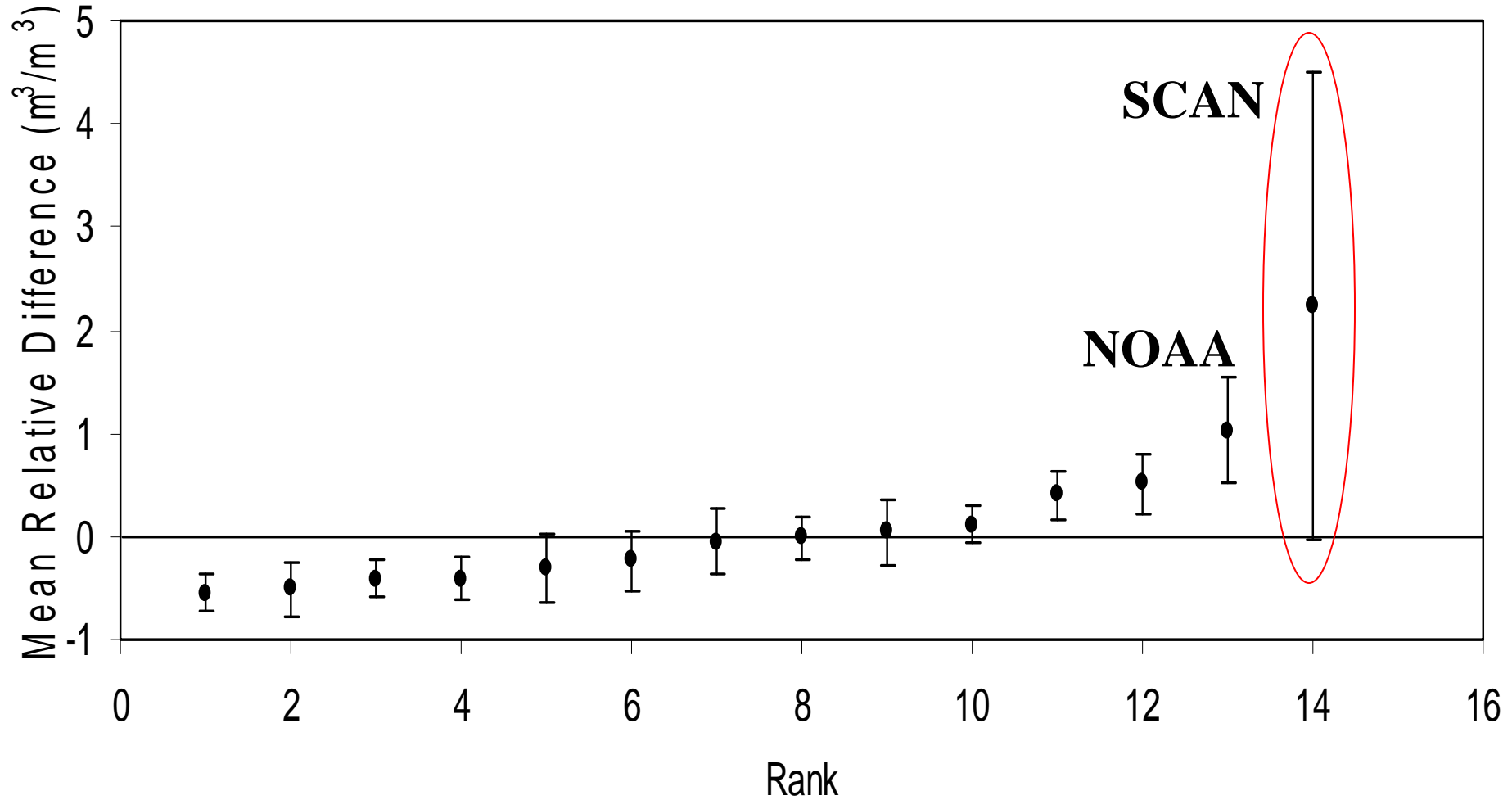
Little Washita-SMEX03 Comparison



Little Washita Mean Relative Difference Plot



Little Washita SMEX03 Comparison



Little Washita Seasonal MRD Plots

