1. Abstract

- Land surface and hydrology models use physical soil and meteorological variables to determine soil moisture.
- Soil moisture data is used for agriculture growing seasons and weather predictions.
- Abundant soil data are widely available for the U.S., but are inconsistent and sparse in regions such as East Africa.
- Insufficient amounts of soil data in East Africa previously made soil moisture modeling difficult and may have resulted in inaccurate results.

This study:
- We compare different land model experiment results between the original soil parameter standards (e.g., STATSGO/FAO) versus the latest high resolution soil parameter datasets (e.g., ISRIC).
- Information from this study may ultimately help those living in drought regions.

2. Background

Soil moisture (SM) - Volume of water in soil pore spaces per total soil volume; varies from surface to root zone.

- Soil parameters that affect soil moisture:
  - Soil type
  - Precipitation
  - Soil porosity
  - Soil wilting point

- Soil porosity – percent of void space that can hold water or air
- Wilting point – the soil moisture percent at which plants cannot extract water from pores

3. Data & Methods

**Soil Datasets**
- STATSGO/FAO: Global coverage with 50 km spatial resolution, US coverage with 1 km resolution
- ISRIC (International Soil Reference and Information Centre): Global coverage with 250m spatial resolution, Soil textures divided into clay, silt, and sand percentages
- USCRN: In situ SM measurements at US points

**Soil Data**
- Texture
- Porosity
- Wilting point (Noah MP)
- Rainfall
- Evapotranspiration

**Global soil moisture conditions**

**Computer software used:** QGIS, gnuplot, GrADS

4. East Africa Results

- Model results: case studies
  - Distinct differences in soil type (note: clay, clay loam)
  - Similar soil distribution with difference textures
  - FAO has a standard porosity value per soil type
  - ISRIC calculates porosity based on clay, silt, sand %
  - Modeled soil moisture show different results between FAO and ISRIC data
  - Top soil layer (5 cm) fluctuates more than root zone moisture (~1 m)
  - ISRIC texture, porosity & wilting point were changed to see the affects parameters have on the model

5. Southwest U.S. Results

- Overall modeled SM for ISRIC and FAO data have similar shaped curves, however differences in SM can vary up to 10% (vol SM)
- US points with in situ SM data often fall in between the modeled STATSGO and ISRIC datasets; except when observed SM is below 10%

Differences in soil textures between FAO and ISRIC data is due:
- FAO is a harmonized global soil map made of many difference soil surveys. ISRIC uses in situ measurements and extrapolated soil data through systematic “machine learning”

6. Discussion & Conclusions

- Differences in soil textures between FAO and ISRIC data is due:
  - FAO is a harmonized global soil map made of many difference soil surveys. ISRIC uses in situ measurements and extrapolated soil data through systematic “machine learning”

- Final thoughts: There are large differences between the two model outputs. ISRIC appears to follow physical observations more closely than STATSGO/FAO

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