**Introduction**

- Topography is an important factor in soil formation, thus exerting dominant control on the spatial patterns of soil properties such as soil depth over watersheds.
- Soil formation is a function of topography, parent material, organisms, climate and time.
- For example, soils are deeper and finer in texture over valleys or flat land compared to the shallower and coarser texture over ridges or steep slopes of watersheds.
- To improve representation of the effect of topographic heterogeneity in land surface processes, recently, a new topography-based subgrid structure has been developed for the ACME land model.
- Recent study, evaluating the new subgrid structure over topographically heterogeneous regions showed improved capability to capture spatial variability of climate and land cover (Tesfa and Leung, 2017).
- In this study, the new subgrid structure is evaluated for its capability to capture spatial pattern of various soil properties using globally available datasets such as depth to bedrock and soil texture.

**Results**

- Generally, results demonstrated the subgrid representation yields much lower values of standard deviation values of clay, sand and depth to bedrock compared to those of the grid representation.
- The results suggest that the subgrid representation improved the capability to capture subgrid variability of fractions of clay and sand and depth to bedrock.

**Methods and Data**

- Deriving the topography-based subgrid units and evaluating their capability to capture soil properties:
  - For each quadrilateral polygon (NE30 grids) elevation data are extracted from the 90 meter DEM. An elevation-area profile relationship is derived using the elevation data from the 90 meter DEM.
  - The elevation-area profile is discretized into a fixed number of distinct subgrid elevation classes based on values corresponding to the 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, 85th, 90th, and 95th percentiles of elevation.
  - A local elevation classification method using the elevation-area profile is applied to each atmospheric cell to derive the subgrid units. Subgrid with elevation range less than 100 m is merged to its neighbor. The method utilizes ArcGIS and Python tools.
  - Soil properties are mapped to the NE30 grids and subgrid units. Standard deviation values of the soil properties at grid and subgrid unit levels are compared.

**Summary and Conclusions**

- Generally, results demonstrated the subgrid representation yields much lower values of standard deviation values of clay, sand and depth to bedrock compared to those of the grid representation.
- The results suggest that the subgrid representation improved the capability to capture subgrid variability of fractions of clay and sand and depth to bedrock.

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