# Using an Energy Model to Describe the Contribution of Organic Carbon to Soil Water Holding Capacity. (S01-olness093539-Oral)

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## Abstract:

A model of the water holding characteristics of soil is needed to develop a systematic method for valuing organic C in soil. Water is held in soil between two energy limits: hygroscopic water (-1500 kPa) and capillary rise (about -33 kPa). The General Energy Model for Limited Systems (GEMLS) was used to describe the effects of clay, silt and organic matter on the available water limits. The US national soil inventory database (more than 100,000 entries) was segmented into narrow ranges of organic C content and silt content. The data from each subset were plotted as a function of soil clay content. Because of an apparent matrix transition effect, two complementary GEMLS functions were used to describe the -33 kPa and -1500 kPa water content as a function of soil clay, silt and organic C contents. The model used six parameters (two function coefficients, two energy coefficients and two critical clay contents) and required an initial manual fit of the models to the data subsets (about 100 +/- 20 observations). Criteria for acceptance were uniform and homogenous distribution of the model residuals, absence of a detectable trend in the residual distribution, zero error sum and maximal R**2. The energy coefficient was correlated with silt content. After the initial manual fit, the data were subjected to analysis using SAS PROC MODEL using a variable energy coefficient. Subsequent analyses indicated a complex relationship between the energy coefficient and the soil organic C content. A 1% increase in soil organic carbon effects a 1% to greater than 2% increase in soil available water content depending on the soil texture.

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