National Soil Moisture Network Workshop

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Boulder, CO

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Purpose of the workshop is to discuss the continued development of a coordinated national network focused on soil moisture, the progress made to-date, approaches to continue and improve coordination of the network and integration of soil moisture data.

It is about time!

Been worrying about soil moisture since 1988 when Suki Manabe asked me in a interview for a postdoc if "the drought caused the heatwave or did the heatwave cause the drought?"

He asked me the same question again just two years ago.

Had to synthesize my own soil moisture data.

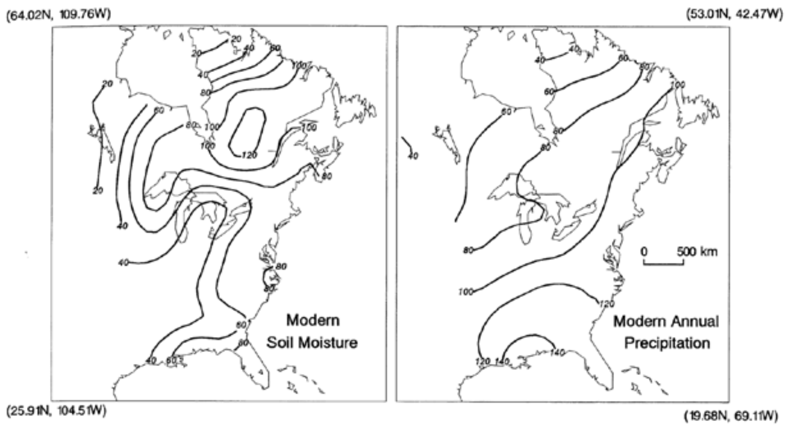

FIG. 3. Map of modern soil moisture (mm water) estimated as a function of precipitation, evapotranspiration, and temperature. High soil moisture values are indicative of moister conditions and low values indicative of drier conditions. Map of observed 30-yr mean annual precipitation (cm/yr). Isopleths are based on gridded areal averages of the data.

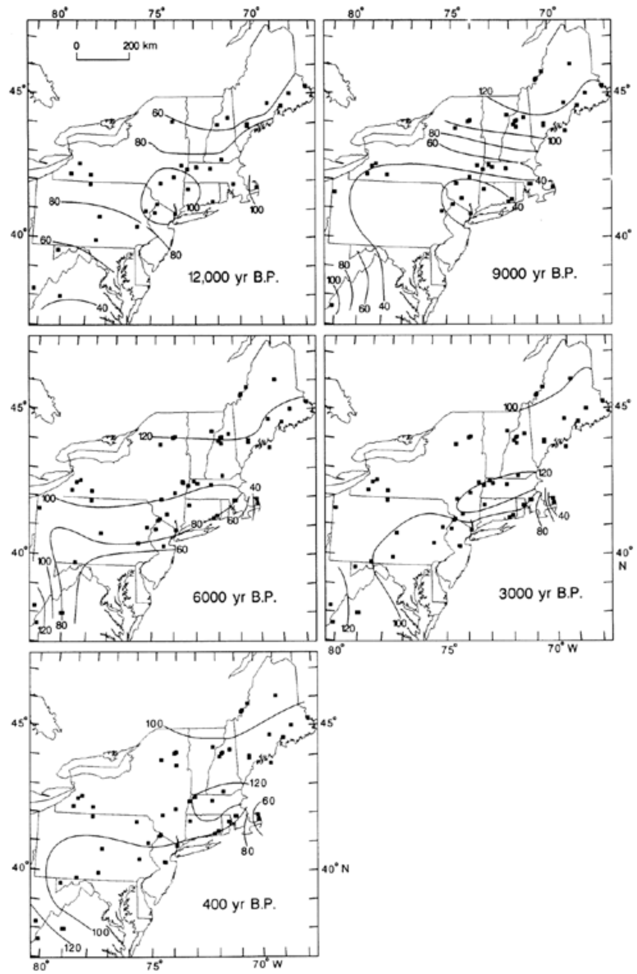

FIG. 6. Maps showing isopleths of the reconstructed soil moisture values (mm) for 12,000, 9000, 6000, 3000, 400 yr B.P., respectively. The isopleths on the maps represent smoothed interpretations of the data based on site reconstructions.

Webb, R.S., Anderson, K.H., and Webb, T. III., 1993. Pollen response surface estimates of late Quaternary changes in moisture balance of the northeastern United States, *Quaternary Research* 40, 213-227.

So I could reconstruct it.

Then I went global.

Glad some smart people are finally working on it so welcome to Boulder, Colorado and good luck with your meeting!

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SPECIFYING LAND SURFACE CHARACTERISTICS IN GENERAL CIRCULATION MODELS: SOIL PROFILE DATA SET AND DERIVED WATER-HOLDING CAPACITIES

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Abstract. A standardized global data set of soil horizon thicknesses and textures (particle size distributions) has been compiled from the Food and Agriculture Organization of the United Nations/United Nations Educational, Scientific, and Cultural Organization (FAO/UNESCO) Soil Map of the World, Vols. 2-10 [1971-1981]. This data set was developed for use by the improved land-surface hydrology parameterization designed by Abramopoulos et al. [1988] for the Goddard Institute for Space Studies General Circulation Model II (GISS GCM). The data set specifies the top and bottom depths and the percent abundance of sand, silt, and clay of individual soil horizons in each of the 106 soil types cataloged for nine continental divisions. When combined with the World Soil Data File [Zobler, 1986], the result is a 1°x1° global data set of variations in physical properties throughout the soil profile. These properties are important in the determination of water storage in individual soil horizons and exchange of water with the lower atmosphere within global climate models. We have used these data sets, in conjunction with the Matthews [1983] global vegetation data set and texture-based estimates of available soil moisture, to calculate the global distributions of soil profile thickness, potential storage of water in the soil profile, potential storage of water in the root zone, and potential storage of water derived from soil texture. Comparisons with the water-holding capacities used in the GISS Model II show that our derived values for potential storage of water are consistently larger than those previously used in the GISS GCM. Preliminary analyses suggest that incorporation of this data set into the GISS GCM has improved the model's performance by including more realistic variability in land surface properties.

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INTRODUCTION

As land-surface parameterizations in general circulation models (GCMs) become more sophisticated, more detailed types of soil data are needed. Realistic models of water movement in the soil profile (e.g., Darcy's Law) [Abramopoulos et al., 1988] require information on variability of physical properties, including differences in the texture of soil horizons and the thickness of these different horizons. In the global application of land-surface parameterizations, the addition of geographic variability in the physical properties of soils, at least among the different continents, provides a more accurate description of land-surface characteristics that influence water movement in the soil profile.

Until recently, most GCMs used a simple bucket model parameterization with a 15 cm maximum water-holding capacity to simulate the storage and transfer of water at the land surface [Manabe, 1969]. Some models, such as the modified bucket parameterization used in the GISS General Circulation Model II (hereafter referred to as GISS Model II), include more than one layer within the bucket and allowed the size of the bucket to vary geographically as a function of vegetation type [Hansen et al., 1983]. The bucket-model approach, however, is not appropriate when calculating water storage and movement throughout the complete soil profile as a function of hydraulic conductivity and matric potential [Abramopoulos et al., 1988]. Furthermore, in a bucket model, infiltration is crudely estimated as a function of empirically determined parameters, which may unrealistically partition water at the soil surface into water lost as runoff versus water that enters the soil. The next generation of surface parameterizations that are currently being incorporated into many GCMs include physically based equations for