1. Title

Validation of Soil Carbon Sequestration

2. Type

Commission Symposium: Comm. 1.5-Pedometrics

3. Organizer(s) & Convener

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4. Rationale

Interest in soil carbon is increasing globally for several reasons. The ability of soils to sequester biologic carbon can play a role to mitigate emissions of greenhouse gases. Changes in land management can create a change in soil organic carbon that can be estimated or measured to prove quantitative incremental gains over space and time. In some regions this can open the door to environmental markets of carbon offsets. Climate change concerns have also brought the potential of long term losses of soil

carbon resulting in increasing soil erosion and reduction of soil quality. Soil quality and biodiversity are other areas of interest that often arrive at soil organic carbon as a proxy indicator due to some availability of data or modeling capacity. The Millennium Assessment and Convention on Biologic Diversity are two examples of global initiatives and several countries have soil quality policies or programs that require estimates of soil carbon state and changes. Finally there is an interest in agriculture sustainability and resource positive practices for food production. Many of the large global food retailers are requiring supply chain documentation and quantification of inputs, outputs and practices. Again soil carbon arises as an indicator of soil well-being and proof of sustainable practices. For all these reasons that have grown in the past decade or two, soil carbon state and changes at all scales and complexities has become a growing area of interest.

There remains considerable debate and disagreement about the most effective and scientifically valid way (or ways) to measure and validate changes in soil carbon in time and over space. This is particularly true for changes assumed to have been achieved through the adoption of beneficial agricultural management practices intended to promote sequestration of carbon. There have been numerous, and often conflicting, meetings of experts over the last few years to propose definitive criteria and methods for assessing and validating changes in soil organic carbon in space and time. Many of these meetings have been sponsored and hosted by organizations not closely associated with soil science and pedometrics. It behooves the discipline of soil science, and the sub-discipline of pedometrics to contribute to the discussion and identification of the most appropriate methods to use to measure and validate changes in soil organic carbon in response to natural and human-induced change.

5. Objectives

The objective of the proposed symposium is to provide a forum for open and vigorous presentation and discussion of approaches and methods for validating change in soil organic carbon in response to changes in both natural and managed environments. The symposium will describe and review all major technologies and approaches that have been advanced for measuring and validating change in soil organic carbon in time and space. This review should form the basis for identifying methods for validating change in soil organic carbon that can achieve broad support and acceptance from the soil science and pedometrics communities.

6. Description

Detecting and quantifying change in soil organic carbon in space and time presents numerous challenges. Agreed standards are needed for all relevant methods including methods of sampling in space and time, methods of laboratory analysis and methods based on remote sensing, simulation modeling and carbon accounting.

Detection of changes in soil carbon is confounded by the small magnitude of changes over relatively short periods (< 10 years), significant spatial variability in soil carbon in both horizontal and vertical directions, temporal variability of soil carbon across seasons and variation arising from different methods of field sampling, laboratory analysis and simulation modeling.

This symposium will provide an opportunity to document, compare and contrast the various alternative methods for estimating or measuring change in soil organic carbon. The anticipated range of methods to be presented should include direct field sampling, predictive or digital soil mapping, remotely sensed detection, simulation modeling and carbon accounting based on analysis of available data and maps. Authors are encouraged to mention cost-benefit characteristics of sampling, scaling and modeling developments.