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NEWS RELEASE
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Calcium Helps Evaluate Soil's Ability to Retain Earth's Carbon

Calcium in rainfall may reveal soil's carbon storage potential

MADISON, WI, JULY 21, 2009 -- Soils play a vital role in dealing with the environmental impacts of rising atmospheric carbon levels, primarily CO_2, from natural and human activities. The Earth's carbon budget is a dynamic process. As carbon is released through fossil-fuel burning and changing land use, scientists are seeking a more accurate understanding of carbon storage and cycling.

The Earth holds carbon in what scientists call pools, reservoirs of carbon stocks stored in and on the earth and oceans as organic and inorganic matter. Simplistically, organic carbon compounds are connected to plants or animals while inorganic carbon compounds are often linked to minerals or rocks. Soil is second only to the oceans as a carbon sink, pools into which more carbon flows in than out. Soil scientists have a better picture of soil organic carbon (SOC) -- soil containing decaying plant and animal matter -- than soil inorganic carbon (SIC). Scientists are now studying SIC, theorizing it may be a key area for forming and holding carbon, preventing it from returning to the atmosphere for eons.

A team of Experiment Station scientists from Clemson University and Virginia Tech analyzed the 12 major soil groups in the continental United States, ranking them for their potential ability to form new SIC based on average annual atmospheric wet deposition (AAAWD) of calcium (Ca) -- that is, the amount of Ca^{2+} (ionic calcium) present in rainfall. The results were first presented at the Soil Science Society of America Annual Meeting in November 2007 in New Orleans, LA and recently have been published in the May-June 2009 issue of the *Soil Science Society of America Journal*.

The study evaluated AAAWD of Ca^{2+} from 1994 to 2003 within the continental United States by soil order, using spatial analysis of Ca^{2+} wet deposition data obtained from the National Atmospheric Deposition Program (NADP) and the State Soil Geographic (STATSGO) Database from the Natural Resources Conservation Service of the U.S. Department of Agriculture. Using geographic information system (GIS) software, spatial data layers were developed and averaged to create a final Ca^{2+} wet deposition map layer. The total Ca^{2+} wet deposition per soil order (in kg) was then calculated by combining the final average Ca^{2+} wet deposition map layer with the generalized soil order data layer.

Results from the study revealed that the total AAAWD of Ca^{2+} within the continental United States was 8.6×108 kg, which would be equivalent to the maximum theoretical formation of 2.6×108 kg of carbon as SIC, barring losses of Ca^{2+} due to competitive processes, such as plant uptake, erosion, and deep leaching. The soil orders receiving the highest area-normalized total AAAWD of Ca^{2+} were Alfisols and Mollisols, non-arid soils that are typically associated with the "bread-basket" regions of the United States.

Research team member Elena Mikhailova, a soil scientist at Clemson who originally conceived the research approach, stated "Formation of new carbonate minerals in soils -- what scientists call pedogenic carbonates -- represent a pathway by which atmospheric CO_2 can be sequestered. Maps of potential SIC formation and storage based on wet Ca^{2+} deposition can aid in understanding terrestrial ecosystem inorganic carbon dynamics and the way it can be manipulated to decrease CO_2 concentrations in the atmosphere."

The research is part of an ongoing project at Clemson to study soil carbon, particularly inorganic carbon stocks, and its role in the global carbon budget. Studies will measure, profile and identify the soil carbon characteristics and regional distribution to understand conditions and develop predictive models for future soil inorganic carbon research.

The full article is available for no charge for 30 days following the date of this summary. View the abstract at http://soil.scijournals.org/cgi/content/abstract/73/3/989.

Soil Science Society of America Journal, http://soil.scijournals.org, is a peer-reviewed international journal published six times a year by the Soil Science Society of America. Its contents focus on research relating to physics; chemistry; biology and biochemistry; fertility and plant nutrition; genesis, morphology, and classification; water management and conservation; forest, range, and wildland soils; nutrient management and soil and plant analysis; mineralogy; and wetland soils.

The Soil Science Society of America (SSSA) is a progressive, international scientific society that fosters the transfer of knowledge and practices to sustain global soils. Based in Madison, WI, and founded in 1936, SSSA is the professional home for 6,000+ members dedicated to advancing the field of soil science. It provides information about soils in relation to crop production, environmental quality, ecosystem sustainability, bioremediation, waste management, recycling, and wise land use.

SSSA supports its members by providing quality research-based publications, educational programs, certifications, and science policy initiatives via a Washington, DC, office. For more information, visit www.soils.org.

SSSA is the founding sponsor of an approximately 5,000-square foot exhibition, Dig It! The Secrets of Soil, which opened July 19, 2008 at the Smithsonian's National Museum of Natural History in Washington, DC.