Arctic soil reveals climate change clues

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Frozen arctic soil contains nearly twice the greenhouse-gas-producing organic material as was previously estimated, according to recently published research by University of Alaska Fairbanks scientists.

School of Natural Resources & Agricultural Sciences professor Chien-Lu Ping published his latest findings in the *Nature Geoscience* and *Scientific American* Web sites. Wielding jackhammers, Ping and a team of scientists dug down more than one meter into the permafrost to take soil samples from more than 100 sites throughout Alaska. Previous research had sampled to about 40 centimeters deep.

After analyzing the samples, the research team discovered a previously undocumented layer of organic matter on top of and in the upper part of permafrost, ranging from 60 to 120 centimeters deep. This deep layer of organic matter first accumulates on the tundra surface and is buried during the churning freeze and thaw cycles that characterize the turbulent arctic landscape.

The resulting patterned ground plays a key role in the dynamics of carbon storage and release, Ping found. When temperatures warm and the arctic soil churns, less carbon from the surface gets to the deeper part of the soil. The carbon already stored in the deeper part of the soil is released into the atmosphere as carbon dioxide, methane and other gases.

Ping predicted that a two- to three-degree rise in air temperatures could cause the arctic tundra to switch from a carbon sink--an area that absorbs more carbon dioxide than it produces--to a carbon source--an area that

produces more carbon dioxide than it absorbs. The more organic material stored in the tundra, the greater the potential effect of future releases, Ping stated.

"The distribution of the Arctic carbon pool with regard to the surface, active layer and permafrost has not been evaluated before, but is very relevant in assessing changes that will occur across the Arctic system," Ping wrote in his study. "Where soil organic carbon is located in the soil profile is especially relevant and useful to climate warming assessments that need to evaluate effects on separate soil processes that vary with temperature and depth throughout the whole annual cycle of seasons."

Source: University of Alaska Fairbanks