Underground microorganisms don't slack off in winter

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It is known that soil microorganisms can maintain some activity during the cold winter months. Scientist at Swedish University of Agricultural Sciences (SLU) and Umea University in Sweden have now shown that the microorganisms in frozen soils are much more viable than previously anticipated and also has large potential for growth.

In northern forest ecosystems, there is a great deal of carbon stored in the ground. The degradation of this carbon supply is a crucial component in computational models used to describe the effects of future climate changes.

In recent years it has been noticed that the winter half of the year can also have a great impact on the carbon balance of forests, as microorganisms (fungi and bacteria) continue to degrade organic carbon despite freezing temperatures and frozen ground. Just how microorganisms go about breaking down organic carbon under such adverse conditions has largely been unknown, which has rendered it difficult to carry out reliable calculations of a forest's carbon balance in wintertime.

"The results of previous studies have been interpreted as meaning that microorganisms in frozen ground cannot grow but merely give off a certain amount of carbon dioxide. A research team at SLU in Umea and at Umea University has now shown that this is not the case. Instead, the capacity of microorganisms to grow in frozen ground is astonishingly similar to that of the summer half of the year, although the growth rate is

lower," says Mats Öquist from SLU, who directed the study.

These findings are being published this week in the prestigious journal *PNAS*, published by the *American Academy of Sciences*.

The study was performed in close collaboration between Mats Öquist, Mats Nilsson, and Stina Harrysson Drotz at SLU, and Jürgen Schleucher and Tobias Sparrman (Umea University).

In previous publications these scientists have established that the activity of microorganisms in frozen ground is mainly regulated by access to unfrozen water, and they have identified what characteristics in the ground govern the availability of water.

These studies have been possible thanks to a method for monitoring unfrozen water using nuclear magnetic resonance spectroscopy (NMR), a method that was developed by the team. In combination with the latest findings about the capacity of microorganisms to exploit organic materials and grow in frozen ground, this research makes it possible to develop more reliable computational models of the carbon balance of the northern hemisphere.

More information: www.teknat.umu.se/english/news//.cid144211

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