



## **HONO (nitrous acid) emissions from acidic northern soils**

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The photolysis of HONO (nitrous acid) is an important source of OH radical, the key oxidizing agent in the atmosphere, contributing also to removal of atmospheric methane (CH<sub>4</sub>), the second most important greenhouse gas after carbon dioxide (CO<sub>2</sub>). The emissions of HONO from soils have been recently reported in few studies. Soil HONO emissions are regarded as missing sources of HONO when considering the chemical reactions in the atmosphere. The soil-derived HONO has been connected to soil nitrite (NO<sub>2</sub><sup>-</sup>) and also directly to the activity of ammonia oxidizing bacteria, which has been studied with one pure culture.

Our hypothesis was that boreal acidic soils with high nitrification activity could be also sources of HONO and the emissions of HONO are connected with nitrification. We selected a range of dominant northern acidic soils and showed in microcosm experiments that soils which have the highest nitrous oxide (N<sub>2</sub>O) and nitric oxide (NO) emissions (drained peatlands) also have the highest HONO production rates. The emissions of HONO are thus linked to nitrogen cycle and also NO and N<sub>2</sub>O emissions. Natural peatlands and boreal coniferous forests on mineral soils had the lowest HONO emissions. It is known that in natural peatlands with high water table and in boreal coniferous forest soils, low nitrification activity (microbial production of nitrite and nitrate) limits their N<sub>2</sub>O production. Low availability of nitrite in these soils is the likely reason also for their low HONO production rates. We also studied the origin of HONO in one peat soil with acetylene and other nitrification inhibitors and we found that HONO production is not closely connected to ammonium oxidation (nitrification). Acetylene blocked NO emissions but did not affect HONO or N<sub>2</sub>O emissions, thus there is another source behind HONO emission from these soils than ammonium oxidation. It is still an open question if this process is microbial or chemical origin.