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Stabilization of nitrogen during peatification

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The chemical nature of nitrogen in peat and coal has long been of interest as a study of the processes responsible for refractory organic matter formation. In contrast to soils, peat develops in relatively homogenous environments with low inter- and intra-special fluxes. Thus, they represent systems in which sediment depth can be related to humification processes. As peat develops where the water table is close to the soil surface, aerobic processes are replaced by anaerobic processes with increasing depths. Also, microbial activity is decreasing with peat depth. Incubating soil after addition of ammonium under sterilized conditions at pH = 7 we observed formation of pyrrole-type N, although only 8% of the added N was recovered in organic forms. Under biotic conditions, on the other hand about 25% of the added N was incorporated in organic forms, 80% of which were attributable to peptides, amino acids and amino sugars. In order to test, if reduced microbial activity in peat fosters abiotic N-immobilization in peat, material derived from the "Großer Bolchov", located 50 to 60 km southwest of Berlin, Germany, was chemically characterized as a function of peat depths by means of solid-state ^{13}C and ^{15}N NMR spectroscopy. This peat developed approximately 11250 years ago and expends to a depths of 7.5 m.

The solid-state ^{13}C NMR spectra showed a pronounced decrease of O-alkyl C concomitantly with a relative accumulation of long chain alkyl C until a depth of 4 m. At this depth the clear shift towards a higher O-alkyl C content correlates with a change in source material from plant debris to algal remains. With respect to the organic N, a relative enrichment of amino acid N, determined with acid hydrolysis, was observed. Solid-state ^{15}N NMR spectroscopy confirmed the predominance of peptide N even for

the deepest, thus oldest layer. Signals of heterocyclic N were not intense enough for discrimination from the noise. These results confirm that even in the deepest layer abiotic chemical immobilizaiton had no major impact on organic nitrogen stabilization. It seems that only in environments where temperature and pressure dominates over microbial activity heteroaromatic N can be detected.