δ^{13}C values of carbon forms in vertical *Sphagnum* peat profiles in different climatic zones

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Peatlands accumulate one third of the world's soil carbon. During climatic warming, higher emanations of greenhouse gases, accompanying thinning of peat deposits, may lead to further temperature increases. The formation of CO_2 and CH_4 during peat decomposition depends on organic matter quality. We studied the relationship between C cycling in peatlands and climate using peat cores collected in the Czech Republic (Central Europe) and northern Sweden (Northern Europe). The mean annual temperatures were 7.2 and 4.0 °C, respectively. Preliminary data indicated that bulk C can become both isotopically lighter and heavier downcore, but it is not known which C species are responsible for these isotope shifts. Therefore we sequentially extracted and quantified the following organic C forms in peat: soluble fats, oils and waxes; soluble carbohydrates; soluble phenolics; total hot-water solubles; holocellulose; α-cellulose; hemicellulose; lignin; and acid-soluble carbohydrates. Seven most abundant C forms were analysed also isotopically. Sofar, δ^{13}C data were obtained for two sites with a positive downcore δ^{13}C shift in bulk peat. At Velke Darko (the warmer site, Czech Republic), three types of vertical δ^{13}C trends were observed: throughout the profile, δ^{13}C of lipids was the lowest in the system, fluctuating around –30 per mil. At a depth of 30 cm, δ^{13}C of lipids was 8 per mil lower than that of cellulose. δ^{13}C of all forms of cellulose, carbohydrates and phenolics overlapped, increasing smothly downcore from –27 to –22 per mil. δ^{13}C of lignin, also increasing downcore, was off-set relative to cellulose by 2 per mil to more negative values, but never became as low as δ^{13}C of lipids. At Stor Amyran, a site located near the Polar Circle (Sweden), δ^{13}C of both lipids and lignin were more negative compared to Velke Darko. At the same time, δ^{13}C of cellulose at Stor Amyran was higher than δ^{13}C of cellulose at Velke Darko. The northern site showed less steep increase in δ^{13}C of bulk peat with increasing depth. We propose that this pattern is a result of slower peat decomposition at the northern site.

Fluid inclusions in archean ultrahigh-temperature metamorphic BIF of the Ukrainian Shield (East European craton, Russia)

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Fluid inclusions have been studied in high-grade BIF of the Ukrainian Shield. The fluid inclusions comprise CO_2-rich and less abundant nitrogen–methane, salt-bearing aqueous and pure aqueous varieties. Two generations of CO_2-rich inclusions are distinguished. First generation (FL I) inclusions are represented by primary inclusions of high density (1.142 g /cm^3) with very low Th min: -46.6 ºC. The melting temperatures (Tm) of these inclusions vary from 56.7°C to -59.8°C. Some depression of Tm in comparison with –56.6 °C for pure carbon dioxide is caused by an admixture of additional components, as is supported by the Raman spectroscopy that detected methane. Most density inclusions are grouped in the cores of quartz grains. Second generation (FL II) inclusions are represented by pseudosecondary CO^2-rich inclusions with Th min of –29.3 °C (density 1.073 g/cm^3). Their melting temperature varies from -56.6 to -58.2°C. These are located along healed cracks most usually in the periphery of quartz grains. Different generations of the CO_2-rich fluid inclusions indicate the multistage metamorphism in the region. N_2-CH_4 inclusions are primary or rarer pseudosecondary. They are clustered as separate groups in cores of quartz grains and less frequently at grain margins. Their Th vary from -128.4 to -154.5°C. Such low Th values can testify to some admixture of methane in nitrogen (3-35 mol % CH4). The primary N_2-CH_4 inclusions are often associated with high-density CO_2-rich inclusions of the first generation. The high-density inclusions FL1 were revealed in BIF, which often contains clino- and orthopyroxenes with exsolution textures. Using the reintegrated compositions of the primary clinopyroxene and pigeonite and the Lindsley [1] geothermometer it was found the ultrahigh temperature ($\geq$ 930°C) of the peak metamorphism. The peak metamorphic pressure of the BIF was estimated as 9-10 kbar at depth 36-40 km using isochore of the CO_2-rich inclusions with highest density and calculated temperature.

[1] Lindsley (1983) *American Mineralogist* **68,** 477-493.