



Spatial and temporal variation in carbon accumulation in a Northeast Siberian arctic polygon mire over the last millennium

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Polygon mires cover extensive areas in the continuous permafrost zone of arctic lowlands and coastal plains in Russia, Canada and Alaska and are the most important carbon stores in the Arctic. Their developmental differentiation and its effect on carbon accumulation are, however, hardly studied.

We studied ecosystem functioning of polygon mires in the Lower Indigirka Region (NE Siberia, Russia). Detailed mapping of vegetation and abiotic site parameters revealed the spatial diversity and interrelations, whereas high resolution micro- and macrofossil analyses of four peat cores within one polygon enabled a hitherto unequalled detailed reconstruction of the development of the polygon centre and ridges. The long term carbon accumulation rates (LORCA) of the cores were assessed by determining dry bulk density and C content and by AMS radiocarbon dating. LORCA of the polygon centre is $11.9 \text{ g C m}^{-2} \text{ yr}^{-1}$ and that of the ridges ranges from 9.6 to $9.8 \text{ g C m}^{-2} \text{ yr}^{-1}$. These values are similar to the mean carbon accumulation rate of $12.0 \text{ g C m}^{-2} \text{ yr}^{-1}$ for polygon mires of the former Soviet Union as estimated by Botch et al. (1995). The latter overview, however, did not include data of the NE Siberian

Peatland Province.

To highlight the changes in carbon accumulation over time, we assumed a constant pollen influx of upland pollen and used the calibrated ^{14}C dates, upland pollen sum and C contents to calculate the accumulation time and the carbon retention rates (historic apparent rate of carbon accumulation) for every half depth cm. We found distinct but not simultaneous vegetation shifts at the polygon ridges and centre. Also the carbon retention rates changed regularly but only rarely simultaneously within the whole polygon mire. They varied much more frequently as compared to the vegetation and ranged from $2 \text{ g C m}^{-2} \text{ yr}^{-1}$ up to $40 \text{ g C m}^{-2} \text{ yr}^{-1}$.

Our results indicate that carbon accumulation rates in polygon mires are extremely variable through time and over the microrelief which has to be considered when extrapolating measured or reconstructed carbon accumulation rates.

Literature: Botch, M.S., Kobak, K.I., Vinson, T.S., Kolchugina, T.P. (1995) Carbon pools and accumulation in peatlands of the former Soviet Union. *Global Biochemical Cycles*, **9**,37-46.