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Altitude carbon isotopic effect in peat-forming plants (*Sphagnum Sp.*, *Politrychum Sp.*).

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Materials and methods

Samples of the recent peat (the uppermost 0-15 cm layer of the total organic mass including all leaving plants, collected in 2000) and recently growing plants (green alive elements of *Sphagnum Sp.* and *Politrychum Sp.* separately, growing in 2003) have been collected at the northern hillside of Karkonosze Mts. (south western Poland), along a transect from Śmielec Pass (1395m asl) to Jagniatków village (620 m asl). Sampling points were at different altitudes: 739, 834, 915, 1052, 1092, 1240, 1266, 1393m a.s.l. (see the sampling points shown on the map by Jedrysek et al. 2002, Skrzypek and Jędrysek 2004). Temperature and humidity sensors "HABO Oneset" have been located at the sampling points under trees (24 hour shadow). Automatic measurements of temperature and humidity with 1-hour interval, since 12 April till 15 October 2003 have been carried out. For isotope preparation, samples were defrosted and dried under vacuum. Afterwards, the plant material (*Sphagnum Sp*, *Politrychum Sp.* or recent peat) was combusted with CuO wire in a sealed quartz tube, under vacuum at 900°C. The CO_2 gas was cryogenically purified and then introduced to the mass spectrometer (Finnigan-Mat CH7 with a modified inlet and detection systems). The $\delta^{13}C$ values are quoted relative to the Pee Dee Belemnite international standard.

Results and discussion

Relatively good correlations in the combined systems of *Sphagnum Sp*, *Politrychum Sp.* and recent peat have been observed when eliminate the same two sampling points (1240, 1092 m asl) from each correlation system. Namely, the R^2 correlation factors in *Sphagnum Sp.* - *Politrychum Sp.*, *Sphagnum Sp.* - peat and *Politrychum Sp.* - peat are 0.93, 0.95 and 0.91 (Fig. 1, 2, 3). We can not find any clear factor, but anthropogenic

pollution (Jędrysek et al. 2002), responsible for the outstanding isotope ratios in the sampling points 1240 and 1092 m asl.

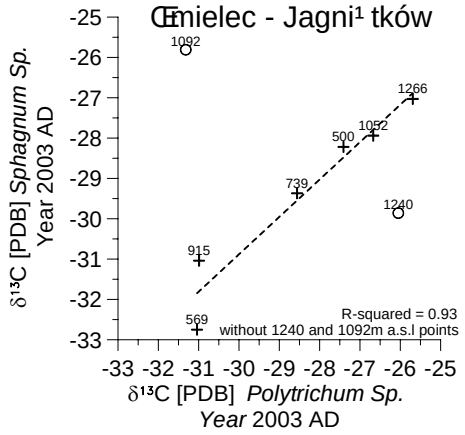

Figure 1. $\delta^{13}C$ *Polytrichum Sp.* and *Shagnum Sp.* correlation.

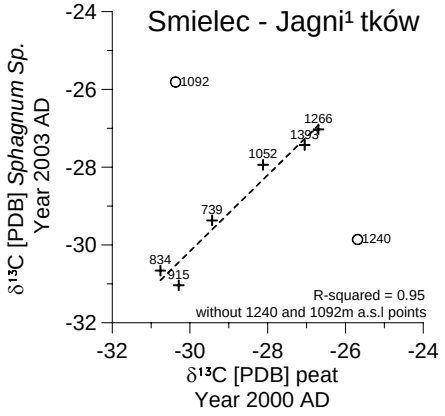

Figure 2. $\delta^{13}C$ recent peat and *Shagnum Sp.* correlation.

The high R^2 values in all the remaining points suggest that probably the same major factor(s) control(s) carbon isotopic composition in peat-forming plants. Moreover, this evidences that the primary carbon isotopic composition is not significantly modified during diagenetic processes in peat – *i.e.* peat keeps the original isotope record of plants. This is in agreement with other our results (Skrzypek and Jędrysek 2001).

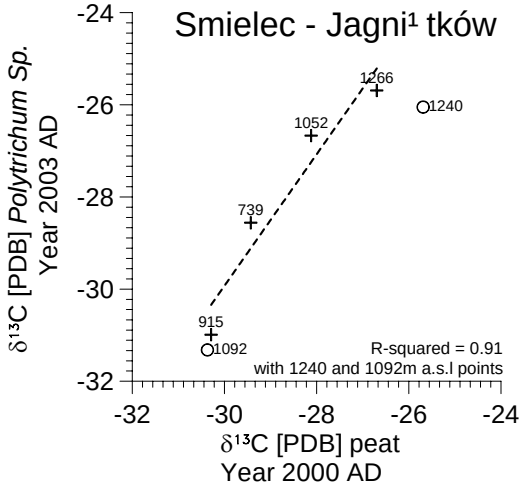

Figure 3. $\delta^{13}C$ peat and *Polytrichum Sp.* correlation.

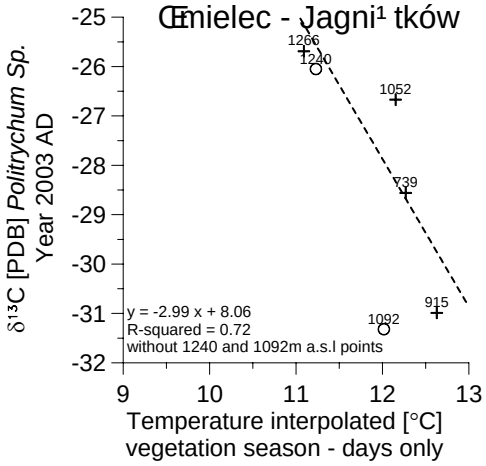

Figure 5. $\delta^{13}C$ (*Polytrichum Sp.*) – temperature of vegetation period correlation (day-light).

The correlation between $\delta^{13}C$ values in *Sphagnum Sp, Politrychum Sp.*, recent peat and average temperature (24 hours and day-light) of vegetation period have been analysed.

The same samples from altitudes 1092 and 1240 m show outstanding behaviour thus have been excluded from correlations. The correlation factors between the day-light temperature of vegetation period (T_{dl}) and $\delta^{13}C$ value is as follows: T_{dl} - $\delta^{13}C$ *Sphagnum Sp.* $R^2 = 0.68$, T_{dl} - $\delta^{13}C$ *Politrychum Sp.* 0.72, and T_{dl} – $\delta^{13}C$ peat equal 0.76 (Fig. 4, 5).

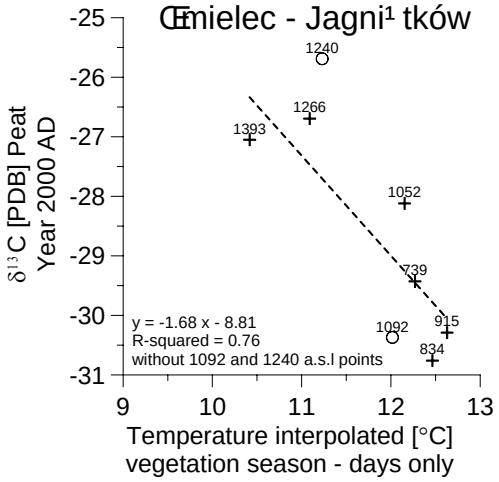

Figure 5. $\delta^{13}C$(peat) – temperature of vegetation period correlation (day-light – see the text).

The fairly good correlations between the temperature of vegetation periods and carbon isotopic composition of *Sphagnum Sp, Politrychum Sp.*, and peat confirm the thesis, presented earlier by the authors (Skrzypek and Jedrysek 2001, Jędrysek et al 2003) temperature is the most important factor controlling carbon isotopic composition of peat-forming plant tissue. It has been calculated that the variation of *Fq* value for peat is -1.68‰/ºC, *i.e.* 1˚C increase in daytime temperature (during vegetation period) results in -1.68‰ change in $\delta^{13}C$ value in peat. It seems that, in contrast to temperature, the humidity show no influence to carbon isotope composition of peat-forming plants. This evidence that humidity plays negligible role in carbon isotope fractionation of peat forming plants, and $\delta^{13}C$ peat profile do not represent any reliable humidity record.

Acknowledgments

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