Humic acids of bog profiles – Bog condition matters

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The data has been reported concerning the physical and chemical parameters of humic acids (HAs) isolated from two cores of ridge-hollow complex in West Siberia. One of the cores was formed at the Ridge while the second at the Hollow. The Ridge and Hollow are considered to be ombrotrophic, but they significantly differ in hydrological conditions, vegetation cover, structure of peat deposits. Sampling was carried out for the entire depth of the peat column with an interval of 10 cm, which made it possible for us to trace the process of transformation of the structural features of HAs over a very long time period. HA were analyzed with respect to elemental (C, H, N, O) analysis, analyzed using Fourier transform infrared spectroscopy (FT-IR) and UV–Vis spectroscopy (E4/E6 ratio).

Figure 1. Van Krevelen graph (H/C vs O/C atomic ratio) of humic acids elemental composition change isolated from peat samples from ridge-hollow bog complex (Ridge core and Hollow core) in Western Siberia; DD – decomposition degree of peat

The Van Krevelen diagram (Fig. 1) demonstrates that, the HAs of peats of both peat columns form three separate groups, each of which is characterized by clear boundaries of changes in the H/C and O/C ratios. The first group corresponds to the HA of high-moor peats, the second group - the HA of transitional peats, and the third - the HA of lowland peats. However, the multidirectionality of the processes of HA formation and transformation in each core is evident. On the Ridge, where the acrotelm zone is clearly expressed the HAs of the raised peats are the most oxidized compared to those of low-mire peats. which showed a greater degree of aromatic condensation in the deeper layers than the surface ones. At the same time, we see an active dehydrogenation process in HAs of low-mire peats. In the Hollow, where the humification processes is fraught with high humidity, the situation has the opposite tendency. Here, the HAs of low-mire peats are more oxidized in comparison with the HAs of the raised peats. Elemental analysis data are supported by both UV-spectroscopic (E4 / E6) and IR spectroscopic data. In general, our data showed that the conditions (particularly high watering) of the bog environment can be one of the main drivers of the humification processes and transformation of HA in peat sections.