Further analysis of the distribution of PAHs in the background territory and in the zone with increased transport load confirmed the correctness of the allocation of this group: regardless of the level of anthropogenic load, it is in the soil-root system that the flows of PAHs are maximally ordered. This border turns out to be weakly permeable for heavy PAHs, and the CC for the total amounts of PAHs is relatively small.

The second group of borders is maximally permeable for a large set of individual PAHs; the CC values are generally higher than in the first group. Most of the borders here are the "root–stem" at points in the zone of direct influence of the roads. Obviously, this is precisely what determines the diversity of the association of migrating PAHs (Table 1): there is contact with air polluted by vehicles. However, it was not possible to detect "heredity" in the intensity of PAHs migration at the observation points. Table 2 shows the numbers of points that are characterized by a complete absence of PAHs transition, minor CC or pronounced transition. Most likely, more factors affect the conditions of PAHs entry and accumulation in the aerial part than in the case of migration in the soil–plant system. At a minimum, it should be noted the probability of introducing PAHs with air flows and the processes of PAHs degradation due to the photolysis. As a result, the distribution of PAHs in the ground parts of plants may be more "blurred".

Table 2. PAH transition activity characteristics
(taking into account the probability of determination error of 30%)

Transition border	**Numbers of points where the transition is…**		
	absent (КК<0.7)	**possible (КК=0.7-1.3)**	**mannifested (КК>1.3)**
Soil – root	8, 9, 13, 14, 20, 28, 30, 33	2, 3, 5, 6, 10, 15, 18, 19, 22, 23, 24, 26, 29	1, 4, 7, 11, 12, 16, 17, 21, 25, 27, 31, 32 CC_{max} = 2.74; $CC_{average}$ =1.72
Root – stem	1, 10	3, 4, 6, 7, 12, 13, 15, 16, 17, 18, 20, 21, 23, 24, 26, 27, 28, 29, 31, 32, 33	2, 5, 8, 9, 11, 14, 19, 22, 25, 30 CC_{max} = 3.51; $CC_{average}$ =2.15

When comparing the activity of polyarene migration in the soil – root and root – stem systems (Table 1), it is impossible to distinguish “unambiguously active” zones of the campus, where both PAH transitions would be equally intense. Of all the points examined, only on the points 11 and 25 significant CCs were noted for both systems (1.5 - 1.9 in both cases: significant, but not maximum CCs). In all other cases, the activity of PAHs migration from soils to the roots and from roots to the aerial parts of plants is different (Fig. 1).

Maps show significantly different conditions for PAH migration in the background and transport-loaded zones. This may be due to the fact that intense pollution has already led to the accumulation of significant amounts of PAHs in all the environmental components. Soils, unlike plants with their seasonality of life processes (especially for annual plants, as in our case), are more prone to PAH deposition. Therefore, the processes of migration and accumulation of PAHs in the soil-root system look more streamlined, and the very ability to take new “portions” of PAHs in vegetation is higher - and due to the greater “capacity” (smaller amounts of PAHs are initially accumulated and there are opportunities to skip larger masses of PAHs across the border), and due to large sources of input (both from the soil through the root systems, and from the atmosphere due to transport).

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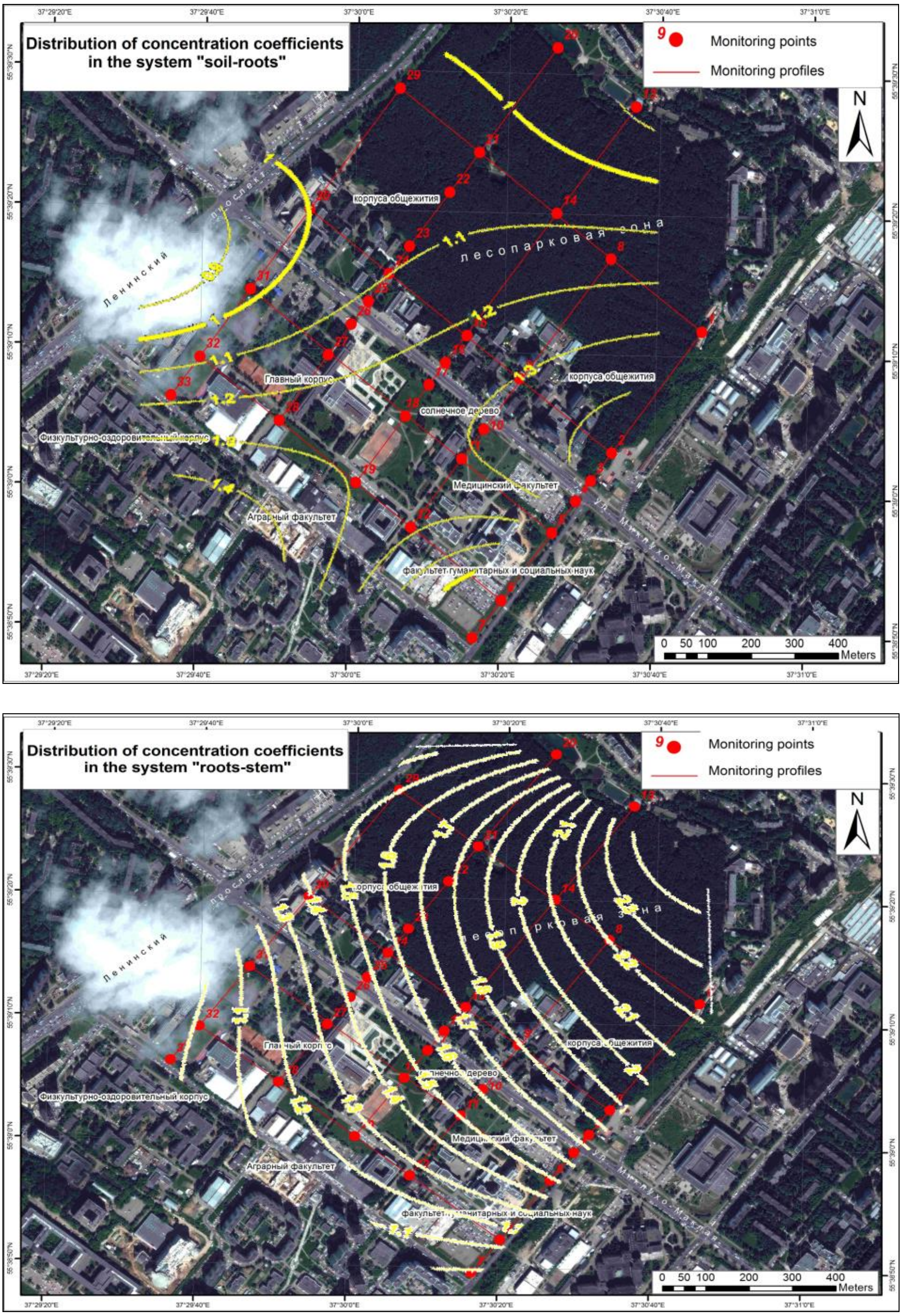

Fig. 1. CC of PAHs in the systems "soil-root" (upper) and "root-stem" (lower)

An analysis of the relationship between log Kow and CC for the “soil – root” and “root – stem” systems (Fig. 2) shows differences in the state of soil – plant systems due to the uneven technogenic loads.

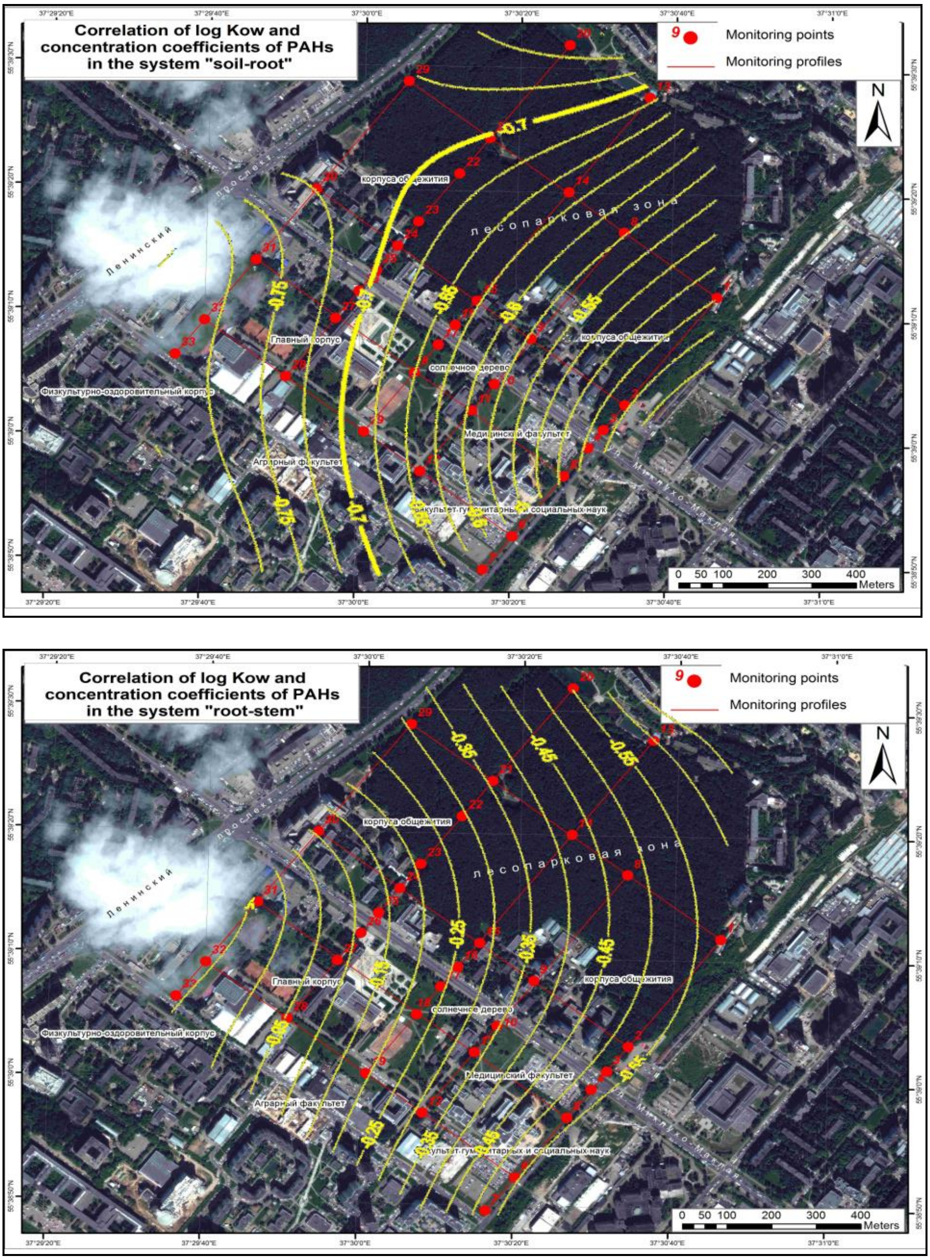

Fig. 2. Correlations between log K_{ow} and CC of PAHs in the "soil-root" (upper) and "root-stem" (lower) systems

As can be seen, in contrast to clearly defined negative relationships for the soil – root system, in the case of the root – stem system, the correlations of log Kow with CC are not so obvious. In some cases, these are insignificant positive connections (vols. 2, 3, 14, 15, 18, 19); but for most points, negative or close to missing points. Such a variety can testify to the significant role of PAHs aerogenic supply to the plant organism. In addition, for points with a positive correlation (14 is the background; 2, 3, 15, 18, 9 are the technogenic load below the maximums), we can assume the natural generation of PAHs.

4 Conclusion

Roots play the role of "filters", creating natural barriers to the separation of PAHs, both in the background and transport-pressured zones. Anthropogenic load plays an unconditional role in the processes of PAH fractionation and determines the initial PAH masses that "claim" to be transferred. However, the composition of associations that penetrate the "soil – root" border and the transition intensity themselves are generally similar: 2-3 ring PAHs migrate relatively easily. QCS for larger molecules may be an order of magnitude smaller or even beyond the scope of significance.

CC in the background zone is clearly higher compared to the CC of polyarenes in the transport loaded zone A possible explanation is that “saturation” of the “host environment” has been achieved and more active PAH transitions do not occur even under conditions of much higher levels of soil contamination compared to the background.

In root – stem systems, patterns are not so obvious in the background territory. You can select the maximum CC coefficients at point 14 (except for BbFlu and heavy PAHs), followed by point 22. In the transport-loaded zone, uniform transitions of the entire PAH Association are characteristic; peaks are at point 23 (An) and 11 (BbFlu).

The obvious dependence of PAH accumulation processes in the root system when received from soils with a log K_{ow} coefficient was confirmed. However, the spatial distribution of the correlation index of this coefficient with the activity of PAHs uptake by roots and subsequent transport to the aerial part indicate that the anthropogenic load has a significant impact on these processes. The correlations are less pronounced in areas with a strong influence of transport pollution. Obviously, the state of the oppressed microbiota in the rhizosphere is also manifested here – it ceases to prevent the entry of PAHs into plant organisms and there is a more active absorption of PAHs by them.

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