# PERSISTENT ORGANOCHLORINE RESIDUES IN DANUBE SEDIMENTS: APPLICATION OF ARTIFICIAL NEURAL NETWORKS

Maja Brborić, Borivoj Stepanov, Jelena Radonić, Sanja Radović, Maja Turk Sekulić

Lipophilic organochlorine pollutants such as polychlorinated biphenyls (PCBs) and organochlorine pesticides (OCPs), are ubiquitous in environmental matrices and represent contaminants that have been proven as highly carcinogenic, toxic and mutagenic, inducing stable genetic alterations with the ability to control irreversible cell division, resulting in the appearance and growth of tumors and cancers.

- **During 2012 monitoring of Danube River sediments (Serbia) was conducted.**

- **10 sampling sites– Apatin (D1), Labudnjača (D2), Neštin (D3), Begeč (D4), Ratno Ostrvo (D5), Šangaj (D6), Knićanin (D7), Belegiš (D8), Ritopek (D9), Dubravica (D10).**

- **The concentrations and distribution of / PCBs ans 13 OCPs were investigated in bottom sediment samples.**

- **The concentration levels were in the range of 36.55 to 0.27 µg/kg for PCBs and 17.20 to 0.82 µg/kg for OCPs.**

- **The most frequently detected PCB congeners were with six and seven chlorine atoms collected at three sites near Novi Sad. The compositional profile of OCPs indicates the dominance of ΣDDTtot in almost all localities.**
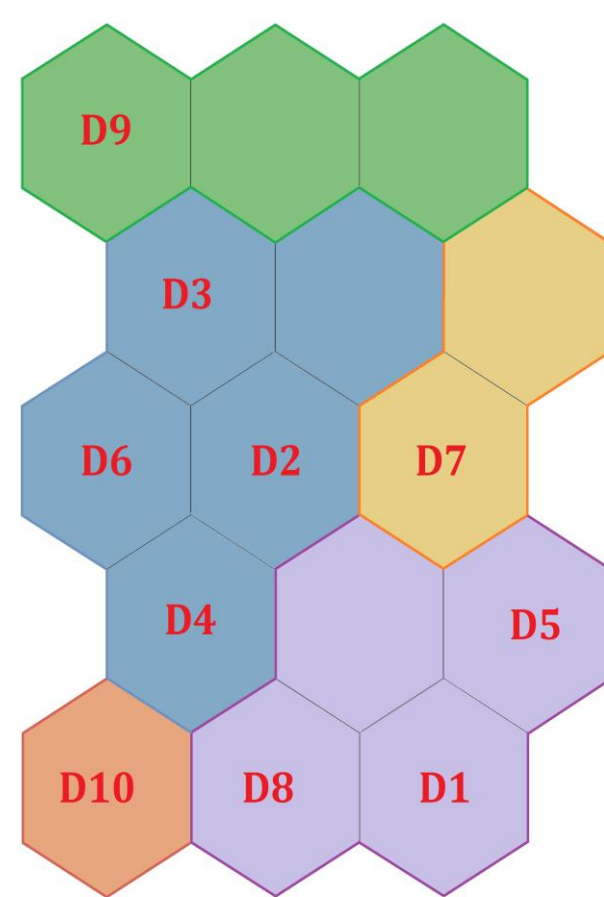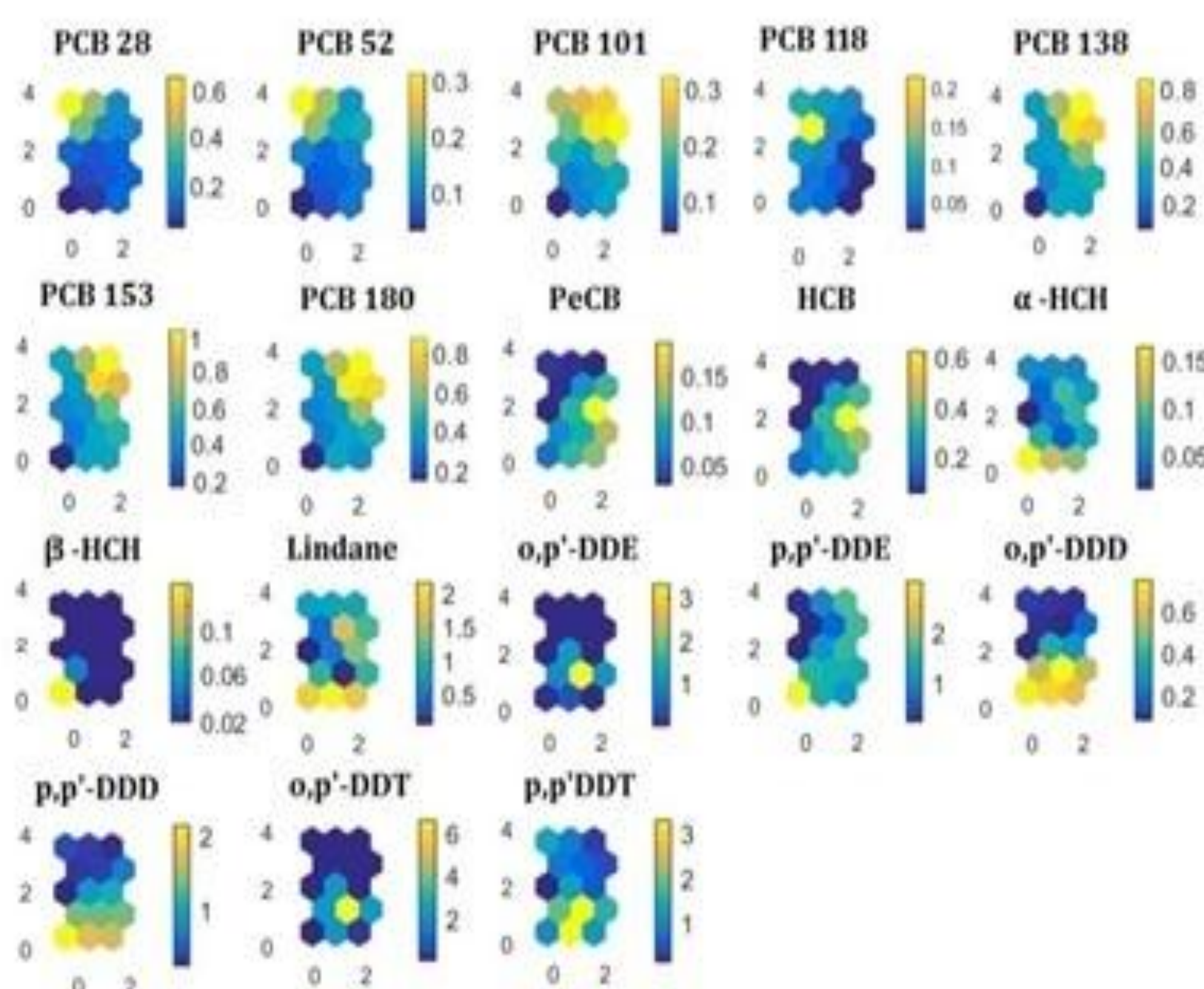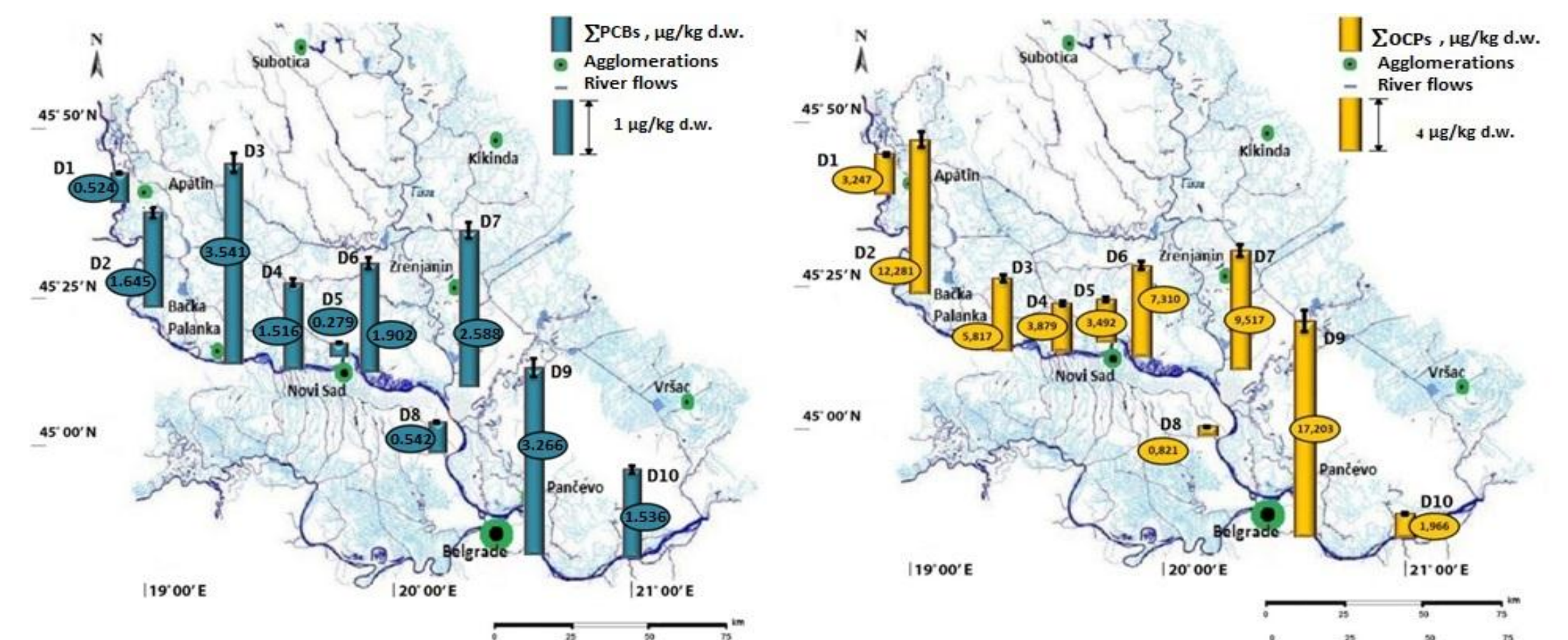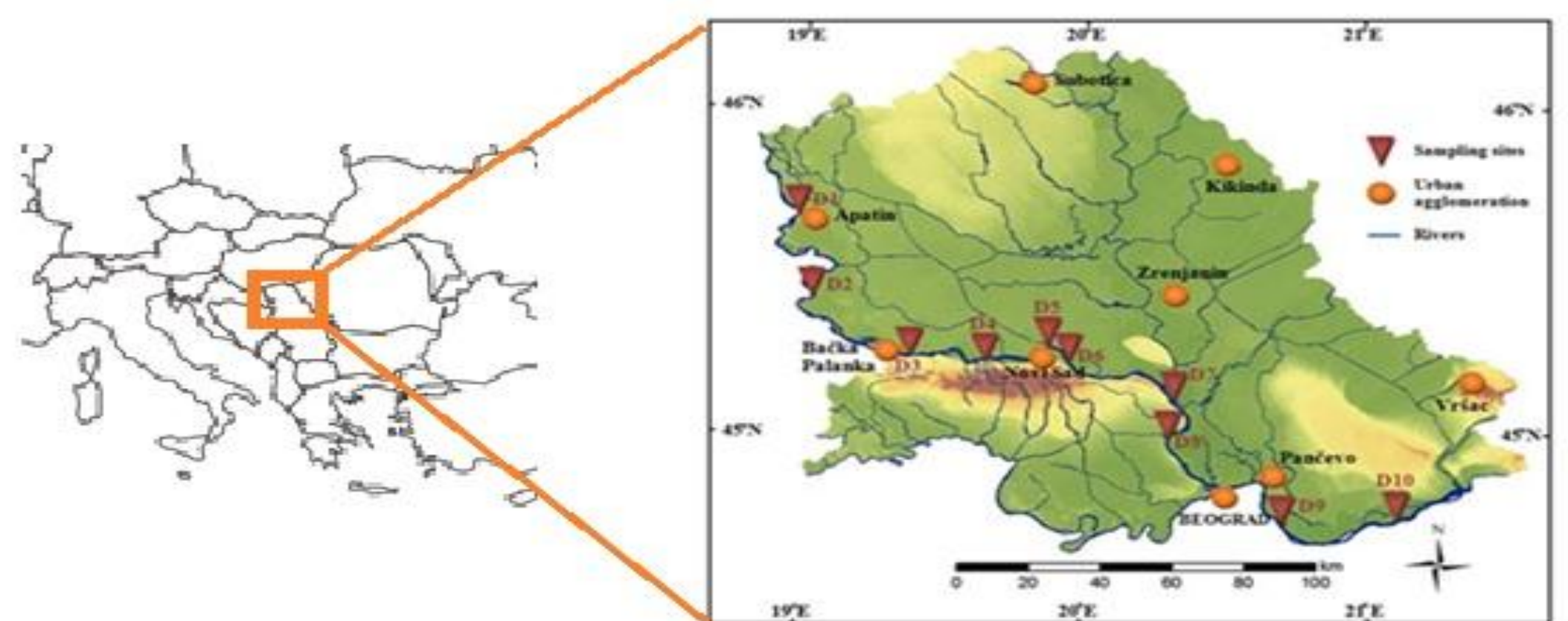
k-means algoritam

For the purpose of clearer visualization of the obtained results and simpler interpretation of complex multidimensional data sets, a class of artificial neural networks with unsupervised learning was applied – Kohonen's self–organizing maps (KSOM).

Similar color areas within the panel indicate positive correlations between variables, while opposite colors in the same area imply negative ones. In this way, the relationships between all variables in the model can be examined simultaneously or in specific sets.

The localities with the highest load are separated by green clusters (D9), yellow and blue clusters indicate localities with moderate load (D2, D3, D4, D6, D7), while purple and red clusters group localities with the lowest load (D1, D5, D8, D10).

The quantified total concentrations of the tested lipophilic persistent organochlorine pollutants in the sediment samples were relatively low.

Exceedances of maximum permitted concentrations were detected exclusively for DDT and its metabolites DDD and DDE.

The results of the Kohonen neural networks, confirmed the possibility of applying divergent methods to identify and interpret the origin of lipophilic organochlorine pollutants in aquatic sediment and the ability to define matrices obtained from monitoring data.

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