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Local cartography of persistent organic pollutants (dioxins, PCB) concentrations in soils of three French departments. How to define background concentrations?

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As part of the Regional Health Plan for the Rhône-Alpes area (France), a cartography of soil contamination by persistent organic pollutants (dioxins/furans (PCDD/PCDF) and polychlorinated biphenyls (PCB)) was undertaken in order to define the background concentrations of soils located away from point source pollution.

In the natural environment, PCDD/PCDF and PCB comes from air pollution and accumulate in the upper part of the soils. To define the background concentration of persistent organic pollutants from diffuse atmospheric origin in soils, sampling was carried out within the first 5 centimeters of soils that have been very little anthropized and untilled for more than 15 years. In such soils mixing and dilution of the pollutants is very limited. 170 samples were collected following a systematic plan of grid type (mesh of 8 x 8 km) in an area of 14 000km², avoiding soil of high altitude and from urban area. Beyond their total concentration, the ratio of the congeners of PCBs (7 indicators and 12 dioxin-like) and of the 17 dioxins/furans was also used for interpretation.

As expected, the concentrations in pollutants are globally lower in the rural zones than in the more industrialized ones. However, the pollutants are relatively enriched in valleys, confirming that the meteorological conditions and the local topography play a significant role in the repartition of the diffuse atmospheric pollution.

For the vast majority of samples, even some of those presenting the highest total concentration, the ratio of the various congeners argues for an ancient origin of the contamination. All studies at the French or European level of the atmospheric concentration of organic pollutants indicate a progressive decrease

in emissions of these contaminants for about 20 years. However, the soils have been receptors since a long time and such pollutants have accumulated. The congeners ratio give evolved signature of pollution indicating, on one hand, it is mainly due to past activities but, on the other hand, indicate that it will persist because of its high stability.

These results show the importance of knowing the spatial distribution of the concentrations of PCDD/PCDF and PCB and taking into account the signature of their congeners when defining the reference value of background concentration which are applied to distinguish a recent point source pollution.