

PAHs and PCBs fluxes at the air-water interface in a high altitude mountain lake: Muzelle, France

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Sources of persistent organic pollutants like polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) are mainly anthropogenic. Once in the atmospheric compartment these pollutants are carried on long range depending on meteorological conditions. These pollutants are thus transferred to remote areas like mountain's aquatic environment by dry (aerosol) or wet (rain, snow) depositions (Daly and Wania, 2004).

In this work, air-water transfers of 15 US-EPA PAHs and of the 6 indicator PCBs were studied in a high altitude mountain lake. The lake Muzelle is located in the French Alps (Ecrins National Park) at 2100m height, at more than 80 kms of any potential pollution source. Passive samplers were deployed in atmospheric and aquatic compartments during summer 2014. Silicone rubber was used to quantify the dissolved PAHs and PCBs in the lake water. A lab-made wet-dry deposition sampler allowed to distinctly collect PAHs and PCBs in wet and dry atmospheric deposits. Meteorological parameters (wind speed and direction, rainfall volume, air temperature) and surface water temperature were continuously recorded during the sampling period.

The lake water concentration were 1 ± 0.2 ng/L and 50 ± 10 pg/L, for sum of 15 dissolved PAHs and 6 dissolved PCBs respectively. These values are in agreement with other studies of high altitude european lakes (Fernández *et al.*, 2005; Vilanova *et al.*, 2001a, 2001b). Low molecular weight compounds were the most abundant for both PAHs and PCBs (e.g. Fluorene, Phenanthrene, PCB 28 and 52). Wet deposits accounted for 97% of bulk atmospheric PAHs deposits against 3% for dry deposits, with a total flux of 4.2 ± 0.8 ng/m²/j. A similar repartition was observed for PCBs (86% for wet deposits and 14% for dry deposits) with a total flux of 0.4 ± 0.1 ng/m²/j. Volatilization and adsorption fluxes will be calculated on the air-water system of the lake in order to better understand transfers of pollutants during summer, in this remote area.

Keywords: PAHs, PCBs, remote alpine lake, air-water transfers.

Daly, G.L., and Wania, F. (2004). Organic Contaminants in Mountains. *Environ. Sci. Technol.* 39, 385–398.

Fernández, P., Carrera, G., and Grimalt, J. (2005). Persistent organic pollutants in remote freshwater ecosystems. *Aquat. Sci.* 67, 263–273.

Vilanova, R., Fernández, P., Martínez, C., and Grimalt, J.O. (2001a). Organochlorine Pollutants in Remote Mountain Lake Waters. *J. Env. Qual* 30, 1286–1295.

Vilanova, R.M., Fernández, P., Martínez, C., and Grimalt, J.O. (2001b). Polycyclic aromatic hydrocarbons in remote mountain lake waters. *Water Res.* 35, 3916–3926.