

PCBs in Rain Water, Streams and a Reservoir in a Small Catchment of NW Spain

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Polychlorinated biphenyls (PCBs) constitute a significant environmental concern due to its persistence, tendency to bio-accumulate, acknowledged toxicity and ubiquity. In the present study, a small water catchment (~ 100 km²) inclusive of a two-tailed water supply reservoir (Abegondo-Cecebre) has been monitored between 2009 and 2014. Sampling stations include: a) one precipitation gauge used to collect monthly-integrated bulk precipitation (25 samples); b) seven streams (95 samples); c) five surface and one bottom points within the reservoir (104 samples); d) five points for sediment sampling in two surveys (spring and summer; 10 samples). All the water samples as well as the leachates of sediment washing have been analyzed for their concentration in 6 marker PCB (congeners 28, 52, 101, 138, 153 and 180) and 12 dioxin-like PCB (congeners 77, 81, 105, 114, 118, 123, 126, 156, 157, 167, 169 and 189) compounds. The average concentration of PCB_{tot} in the bulk precipitation during the sampling period is ~ 406 pg/L although a very significant decrease has occurred since the end of 2011 (~ 800 pg/L) to the end of 2014 (~ 60 pg/L). Likewise, the mean concentration of PCB_{tot} in the stream water samples is 174 pg/L and a similar reduction in the concentration of PCB_{tot} is also acknowledged for the same period of time (~ 250 pg/L before the end of 2011 and ~ 30 pg/L after then). Reservoir surface water has a PCB_{tot} concentration of ~ 234 pg/L which, according to its sampling time (2010-2011) is consistent with the measured stream waters. However, deep reservoir water reveals an average concentration which is higher than the corresponding top water (~ 330 pg/L) but significantly smaller than the water-leached sediments (~ 860 pg/L). The available data suggest that up to a 30% of PCBs associated with precipitation becomes sequestered by the soil/sediment system while no significant change takes place during the transfer of water from the stream to the reservoir system, at least in surface. However, deep reservoir water is enriched in PCBs what is likely due to exchange reactions with the already enriched reservoir sediments. Significant differences are also observed between the PCB_{tot} concentrations of the sediment samples taken in spring (lower) and summer (higher) as well as in connection with the different organic carbon and metal content present in the two tails of the reservoir.