Rainout, washout and dry deposition contributions to the total deposition flux of heavy metal aerosol onto surfaces of a small urban catchment (Pin Sec, Nantes)

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Pollutants associated to atmospheric particles in urban areas throughout the world have been characterized in many studies. Pollutant sources are either natural (e.g. volcanoes, forest fires) or anthropogenic (traffic, industries, central heating). The nature of surfaces as well as weather conditions and atmospheric turbulence influence the aerosol deposition. Previous studies in Nantes (France) on the Pin Sec catchment allowed the estimation of wet and dry atmospheric deposition fluxes. Thanks to these results further studies can now estimate the origin of atmospheric heavy metals by distinguishing rainout (long range transport) and washout (local scavenging) processes (Bertrand *et al.*,2008). The objective of this communication is to present the rainout, washout and dry deposition contributions to the total deposition flux of heavy metal aerosol (Zn, Cu, Ni, Pb and V) on the Pin Sec catchment.

The experiment was conducted between the 1st of September 2010 and the 31st of August 2011. The dry deposition of heavy metals was estimated by Percot *et al.* (2012) using the dry deposition velocity of the tracer Beryllium 7 measured on urban surfaces by Roupsard *et al.* (2012). Regarding monthly wet deposition, the flux is calculated as the ratio of the mass of pollutants collected in a covered pluviometer. The rainout/washout ratio was determined by the Laguionie *et al.* (2013) method. This method uses monthly integrated data: heavy metal elements concentrations in rainwater and in aerosol particle sampled by Partisol ™, scavenging coefficient Λ (s^{-1}) determined by Laguionie *et al.* (2011) method, reload rate of the local atmosphere in heavy metal elements, and meteorological parameters.

In average, over the 10-month survey period, heavy metals (except for vanadium and lead) are mainly deposited by rainout process, showing evidence of long range sources (Figure 1). The rest of the atmospheric deposition is composed of dry deposition and washout which is the lowest part of deposition (4 % for zinc and nickel to 14 % for lead). These results are in good agreement with results of source emission showing that there is no evidence of emission of pollutants from local activity (traffic, industry,…) (Percot, 2012). Lead behaves differently: dry deposition and washout contributions (respectively 60 % and 26%) suggest the existence of a local source.

The consequences of these results and perspectives will be further discussed at the conference. Further experiments will be lead to better understand the impact of particle size and hygroscopicity on the scavenging coefficient.

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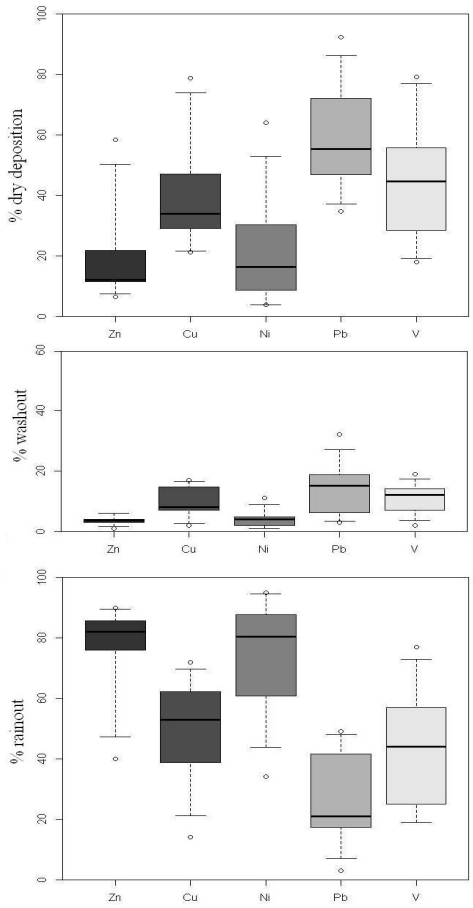

Figure 1. Contribution of heavy metal dry deposition, washout, and rainout to total deposition flux versus time on Pin Sec watershed, Nantes, France.

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