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Working Session
Soil conservation and habilitation to improve water management in urban areas

There is an urgent need to improve the water cycle balance in cities. Urbanization leads to sealed surfaces that are poorly covered with vegetation; consequently the amount of water that can infiltrate soils is limited compared to rural area (Lazzarin et al., 2005). Thus, run-off peaks during major rain events lead to high water volumes released in urban areas that require adapted strategies to avoid flooding. Among them, green roofs (GR) are now suggested to be one of the potential solutions for water management as this technique could provide pervious surfaces that contribute to storm water management (Mentens et al., 2006). In this framework, GR could be used as a control device which can store and release the rainwater with a delay. These hydrologic performances depend especially on the substrates properties (*i.e.* thickness, characteristics and proportion of its organic and mineral components) (Berndtsson, 2010). Up to now, it has been demonstrated that the averaged water storage capacity was about 40 to 80% of the total annual rainfall volume (Carter and Jackson, 2007; Moran and Smith, 2005).
Apart from that, a significant evolution with time of the poral architecture of the substrates can be expected that would lead to changes in their hydraulic properties (Kutilek, 2004). This topic was yet poorly addressed by the GR scientific community. Mentens et al. mentioned, in their review (Mentens et al., 2006), the lack of influence of the age of green roofs on their hydrological performance. On the contrary, a study on a 5-years-old substrate showed that the water holding capacity has increased compared to a new one (Getter et al., 2007) and could be linked with the abundance and connectivity of the micropores and macropores. Evidences of the evolution with time of the composition (lower pH, higher organic carbon and total nitrogen contents) and structure (settling down) of different green roof substrates were also highlighted by Schrader and Boening (2006).
Our work aimed at highlighting the relations between the evolution over time of a GR substrate and its hydrodynamic behaviour. It was based on *in situ* experimental GR plots installed in Tomblaine (north-east of France, under temperate climate). A sampling strategy was defined at different time steps considering the influences of soil cover (presence/absence of vegetation) and depth. Physical properties (bulk density, solid density, porosity, water retention curve, particles size distribution) and composition (concentrations in C_{org} and N_{tot}) were measured on all samples. Moreover, experiments were conducted on a laboratory setup (500 × 400 × 400 - H×h×l, in [mm]) to evaluate the hydrologic performances.
Major results were obtained that showed evidences of an early pedogenesis: fine particles leaching from the surface, increase in C_{org} and N_{tot} in the upper layer, evolution of the poral architecture. It also appeared that this evolution could lead to a decrease of the water storage capacity of GR. Thus, such architectural green spaces as green roofs should also be considered as living soils, that can be classified as Isolatic Technosols (Andic, Drainic, Folic, Transportic) (IUSS, 2014).

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