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THE RAINFALL, THE BEST ALLY OF POLLEN ALLERGY SUFFERERS: BELOW CLOUD SCAVENGING OF NINE POLLEN TYPES

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The poor air quality produces a negative impact on human health and the environment. It is caused by several pollutants, among which are particulate matter (PM), which includes bioaerosols (pollen, fungal spore, bacteria) and non-biological particles or gases such as SO_2 or O_3 (Oduber et al., 2019). It has to be emphasized that pollen concentration causes a clear impact on human health: pollen allergy. So, the study of the pollen behavior during rain is vital, inasmuch as rain is one of the main aerosol sinks. Thus, the main aim of this study is to analyze the evolution of the concentration of nine types of pollen during rain events.

A sampling campaign was carried out between January 2015 and December 2018 in León (Spain). A Laser Precipitation Monitor (LPM) of Thies Clima was used to register raindrops between 0.125 and 8 mm in 22 channels, on one-minute basis. The hourly pollen concentration between 10 and 100 µm was measured with a volumetric Hirst type sampler. The below cloud scavenging during rain events has been analyzed through the scavenging efficiency (*ΔC%*) for nine types of pollen: *Betula*, *Castanea*, Cupressaceae, Oleaceae, *Pinus*, *Plantago*, Poaceae, *Quercus* and Urticaceae.
The *ΔC%* was estimated as Eq. 1 to evaluate the change in pollen concentration (a positive value is considered effective scavenging) between the times t_1 and t_2:

$$\Delta C\% = -\left(\frac{C_2 - C_1}{C_1}\right) \cdot 100 \qquad \text{Eq. 1}$$

The rain events should meet some selection criteria: i) hourly accumulated precipitation higher than 0.1 mm, ii) temperature and wind speed variations below ±3 °C and ±2 m s^{-1}, respectively, between 2 h before and after rain.
A global analysis of all events, 122 along sampling campaign, was carried out. A 71% of the total events presented effective scavenging.
The sum of pollen concentration showed a clear scavenging (*ΔC%*=35%). All types of pollen presented an effective scavenging between before and after rain (Figure 1), but there were differences between types. Thus, *Castanea* and Cupressaceae presented the higher *ΔC%* values and Urticaceae the lower one.

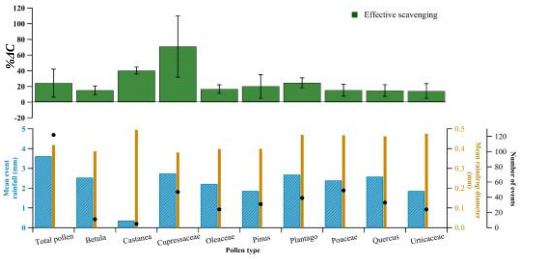

Fig. 1. *ΔC%* according to the different pollen types. Black dots indicate the number of rain events, striped boxes indicate the mean rainfall (mm) and vertical lines indicate the mean raindrop diameter (mm).

In conclusion, the rain causes a clear scavenging of pollen and this washing effect depends on the type of pollen. This kind of studies constitutes a valuable tool for the pollen forecast. Future studies will focus on the research of the root causes of the different scavenging efficiency values obtained for the different types of pollen.

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Oduber et al. (2019) Links between recent trends in airborne pollen concentration, meteorological parameters and air pollutants. *Agric. For. Meteorol.*, 264, 16–26.