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Significance of emission sources identification for understanding the atmospheric load of *Alternaria* spores and Alt a 1 allergen.

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Alternaria genus contains more than 300 ubiquitous fungal species, and thus its spores can be found in both outdoor and indoor environments. Many species of this genus are catalogued as plant pathogens that affect different crops, causing important losses in the agricultural sector. Moreover, *Alternaria* spores have also been described as a significant source of allergens, with Alt a 1 glycoprotein being the major allergen. This allergen reacts with over 90% of IgE serum in patients sensitized to *Alternaria* and can be present in the air even low airborne spore concentrations. Traditionally, forecasting models for risk periods associated with environmental exposition to this fungus have been based only on aerobiological spore counts combined with some meteorological factors such as temperature and precipitation. However, other parameters such as land use and prevailing winds also significantly influence the airborne allergen load. For that reason, the aim of this study is to identify the major emission sources of *Alternaria* spores and Alt a 1 allergen to improve the forecasting models of environmental exposure to this aeroallergen. This study was carried out in León (Spain) over a five-year period (2016-2020). Airborne spores were sampled using a Hirst-type volumetric sampler, following the methodology proposed by CEN legislation EN 16868:2019. The samples were analysed under a light microscope at 400x magnification using two longitudinal transects in the effective collecting area. Furthermore, the allergenic fraction was collected by a cyclone low-volume sampler and the major allergen Alt a 1 was quantified by ELISA on daily samples The land use data within a 30 km radius of monitoring station were obtained from Castilla y León crops and natural maps, which use satellite imagery from the Copernicus programme with a spatial resolution of 10 m. Additionally, wind parameters, in combination with spore and allergen concentration, were analyzed using conditional probability functions plots. The results show that areas covered by cereal crops or pastures act as the major sources of *Alternaria* conidia and Alt a 1 allergen. However, there are discrepancies between the airborne transport of spores and allergen since the highest mean spore concentration values occurs with wind speed from 1 to 2 m s^{-1}; whereas wind speed between 2 and 4 m s^{-1} favor the highest Alt a 1 allergen concentrations. This may indicate a greater contribution of long-medium transport of allergen than spores, highlighting the need to perform aerobiological spore counts in combination with allergen quantification for a better assessment of atmospheric allergenic load. Finally, this also underscores the importance of considering the land cover and the location of emission sources, as well as the main atmospheric transport routes, to improve the risk forecasting models for environmental exposure to this aeroallergen.