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Biomonitoring of particulate matter composition using *Tillandsia usneoides*: limitations related to the fate of nutrient and analogue elements in leaves

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Tracking for particulate matter (PM) contamination is a tedious task that requires sophisticated samplers powered by electricity. Biomonitoring strategies have been developed to assess PM contamination. Among them, epiphyte plants are widely utilised due to their reliance on atmospheric inputs for nutrition. However, robust assessment of the effectiveness of such strategies remains limited. This study aimed to assess whether *Tillandsia usneoides*, commonly used epiphyte plants, can accurately characterize PM contamination across four sites in a former French mining district over one year. Comparisons were made between *(i)* PM_{10} samplers capturing PM with an aerodynamic diameter < 10 µm, and *(ii) T. usneoides,* which was assumed to accumulate all deposited particles (both wet and dry). The finding revealed that atmospheric composition measured by PM_{10} samplers and *T. usneoides* was consistent for 14 of the 27 analysed elements, including metals and metalloid such as Cr, As or Pb. However, elements related to (micro)nutrients or those chemically similar to nutrients (Na, Rb, Sr) showed no significant or positive correlation. While epiphyte plants offer a cost-effective and efficient tool for (bio)monitoring PM composition, results involving elements playing a role in plant metabolism should be interpreted with caution. Further research should better elucidate the mechanisms governing the behaviour of inorganic elements in leaves, such as PM properties, epiphyte microstructure, metabolic responses, and abiotic factors.