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PM10-TEQ - Approach to a Health-Oriented Descriptor of Particulate Air Pollution

Ambient air particulate pollution is commonly defined as the total mass concentration of airborne particles with an aerodynamic diameter of less than 10 µm (PM10), or less than 2.5 µm (PM2.5), respectively. As precise as it may be, this metric suffers from its inability to distinguish particles of different toxicity, such as mineral dust, salt from sea spray, secondary atmospheric particles, or combustion soot. Since all captured particles are collected in the same bin, it is very difficult to reasonably link air pollution data to observed health effects. The present study uses the "Toxicity Equivalent Sum" (TEQ sum) approach known from the class of PAH molecules. Each component is assigned a toxicity index, a number which increases with the assumed (or known) toxicity of the substance. In order to estimate the total toxicity of a PM sample, the contribution of each particle class is weighted by its toxicity index before calculating the sum. Using this approach, "PM10-TEQ", the toxicity of a PM10 sample consisting entirely of sodium chloride is close to zero, while the toxicity of a PM10 diesel soot sample reaches (an arbitrary) 100%.

Currently the approach is based on few classes of particle material, and on a limited number of toxicity criteria such as solubility, bio-availability and "toxicity". Further research is planned into refining these parameters; at the same time, the number of particle classes is to remain limited so as to facilitate differentiated measurement of the PM10 constituents with a reasonable extent of equipment