Improvement of the nanoparticle size limit of detection for SP-ICP-MS using a desolvating nebuliser and peak detection algorithm optimisation to distinguish small particles from ionic background with the HR-ICP-MS Attom.

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A Engineered nanoparticles are regularly being used in in a multitude of industrial products. The release of these substances into the environment and the questions raised about a potential harm for the human health require the development of methodologies to characterise those materials over the range of anticipated sizes and concentrations present in-situ. SP-ICP-MS has been proven in recent years to be a useful tool for particle counting, sizing and quantification. The HR-ICP-MS Attom allows the acquisition of data with a dwell time down to 10 µs, (with no settling time). The combination of fast signal acquisition capacity and high sensitivity make the Attom a promising instrument for this technique. In this work, the capability of this instrument demonstrates the further improved limit of detection achievable with the use of a desolvating nebuliser.

Due to its high ion transmission efficiency, the AttoM already reaches low limits of detection for SP-ICP-MS in conventional nebuliser and spraychamber introduction mode (6 nm for Au, Ag, CeO). In this work, the use of a desolvating nebuliser improves these limits of detection further (4 nm for Au, Ag, CeO).

The detection of smaller nanoparticles is degraded by the presence of ionic background signals and the noise on the background signal becomes a significant parameter to consider. The ability to measure at dwell times less than the signal duration of the particle and then subsequent processing of the signal data allows for more accurate distinction of particles from background signals. This work will describe the use of advanced processing methods to reduce false positive detection and improve signal to background noise. Data from a silver nanoparticle dispersion experiment in a lake ecosystem will be used to show the effectiveness of desolvation and the processing methods.