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Building the foundation for environmental nanogeochemistry: a survey of natural nanoparticle systems and standards across laboratories

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Advances in nanometrology have facilitated improved analysis of particle-by-particle properties and their distributions amongst different sizes and colloidal types in natural systems, providing unprecedented potential for characterizing their diversity and environmental functions. *Environmental Nanogeochemistry* applies these techniques to characterize the range of natural nanoparticle systems (NNS) and their distributions in terms of integrated multi-elemental, multi-particle, and multi-component fingerprints, as well as their corresponding functionality and impacts of disturbances thereupon.

Given the large number of natural processes known to produce nanoparticles in diverse aquatic systems, a broad range of differentiable natural nanoparticle systems (NNS) is expected. Advancements in environmental nanogeochemistry will therefore require a massive effort to characterize and compare the broad range of NNS and their dynamics, in turn requiring comparable analyses across laboratories and internationally, with collaboration between geochemists, nanoscientists, data scientists, and analytical chemists. There is also a need to compare and combine the results of particle-by-particle and complementary analyses using techniques such as spICP-TOFMS and AF4-ICPMS. Representative NNS standards are therefore desirable for intra- and inter-laboratory comparisons of sample treatments, analysis, data analysis, and various analytical methods.

After briefly introducing environmental nanogeochemistry, this presentation will discuss the development and comparison of NNS standards across laboratories, and the results of spICP-TOFMS and AF4-ICPMS analysis for both these standards and a range of NNS.