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Developments in plasma mass spectrometry in geoanalysis

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Recent developments in plasma-based analytical instrumentation using mass spectrometry have opened many new opportunities and vistas in geochemical and environmental research. Major breakthroughs include measurement of ultra trace element concentrations below the ppb-ppq, accurate determination of isotopic ratios at precisions of 10 ppm or better, precise isotopic ratio measurements using in-situ laser ablation sampling techniques and isotopic and trace element abundance measurements at the nanometer scale. Precision and accuracy of trace element abundance measurements have greatly improved by the development of new sampling and sample preparation strategies and by application of isotope dilution, especially in GC and LC coupled speciation studies.

This presentation will highlight these new instrumental developments and state-of-the-art laboratory methodologies that have broadened the scope of geo and environmental chemistry - indeed expanded our understanding of primary and secondary geological processes specifically in biogeochemistry, hydrology, marine and continental sedimentary cycles using unique marker elements and a broad vista of sophisticated stable isotopic systems (such as Li, B, Mg, Si, Ca, Cu, Fe, Zn).

Several keystone applications will be cited such as rates and patterns of surface and groundwater transport, water/rock interactions and radiogenic isotopic variations reflecting source regions for tracing flow patterns and aquifer chemical processes.