

Comparing high-throughput automation and gravimetric separation chemistry methods for $^{87}\text{Sr}/^{86}\text{Sr}$ isotope chemistry and analysis

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Strontium isotopes have steadily become more important to fields outside geology, with a recent expansion into archaeological, environmental and food traceability studies. These fields share a common need for the analysis of hundreds of samples, and in some cases, fast turn-around times (e.g. 1-2 days). The sample preparation requirements and level of accuracy and precision needed in geological samples is not necessarily the same for these new study areas, relaxing constraints on analytical uncertainty to favour throughput. However, to date the same processes – namely manual gravity-driven separation chemistry – have been used.

In this study, we will compare and contrast three different chemical separation procedures for groundwater samples

- Standard gravimetric separation chemistry using “Sr specific” resin
- Low-pressure automated separation using an ESI prepFAST-MC™ equipped with a DGA (Eichrom) resin column
- High pressure automated separation using a Thermo Fisher Inuvion equipped with a proprietary CS-16 column

We will additionally compare analytical results obtained from multi-collector ICP-MS (Nu Sapphire) with that from a triple-quadrupole ICP-MS (Agilent 8900 ICP-QQQ), both outfitted with collision-reaction cell capabilities. We will then compare the level of accuracy and precision obtained between the two different mass spectrometer systems and provide first-order recommendations on when each instrument may be appropriate for a given application (typical uncertainty threshold). Lastly, we will highlight the method(s) that result in the highest throughput, without compromising on data quality.