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Multi-shot mass spectrometry for improved precision in large noble gas samples

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I present a new approach to making noble gas measurements of large samples using a noble gas mass spectrometer. This technique is meant to bridge the gap between traditional noble gas mass spectrometry of very small samples that require measurement in a single aliquot at static vacuum and the technique of measuring very large samples using a stable isotope IRMS [e.g., 1]. I treat the samples in the same way as reference standards, using multiple aliquots of sample gases in tandem with reference standards tuned to achieve similar signal intensities for the large isotope. I demonstrate significantly improved precision and reproducibility compared to the single aliquot technique and discuss the practical applications of this method for problems such as reconstruction the Ar isotope evolution of Earth's atmosphere.

[1] Seltzer, A.M, Krantz, J.A., Ng, J., Danskin, W.R., Bekaert, D.V., Barry, P.H., Kimbrough, D.L., Kulongoski, J.T., and Severinghaus, J.P.: The triple argon isotope composition of groundwater on ten-thousand-year timescales, Chemical Geology, 583, 120458, https://doi.org/10.1016/j.chemgeo.2021.120458, 2021.