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Inter-laboratory redetermination of the atmospheric 22Ne/20Ne

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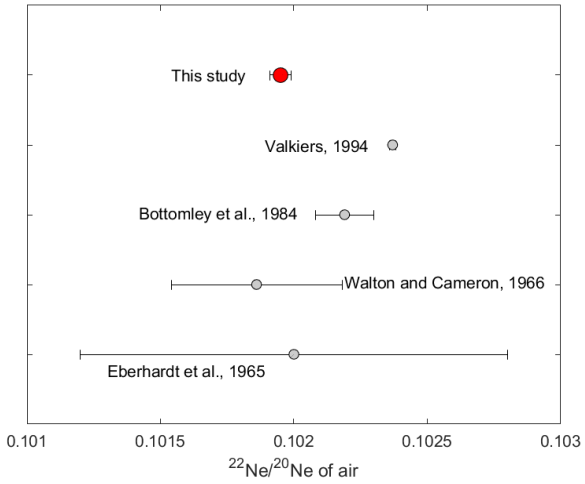

Air-derived noble gases are routinely used to calibrate mass spectrometers for both mass discrimination and sensitivity. Further the isotope composition of atmospheric noble gases is a key constraint on the origin and evolution of Earth's volatiles. Consequently, accurate and precise knowledge of the isotope composition of air-derived noble gases is essential. Neon isotopes are exceptional tracer of Earth history [1] and are highly prized chronometer of Earth surface processes [2]. The widely accepted value of atmospheric $^{22}Ne/^{20}Ne$ (0.1020 ± 0.0008, 1 σ) was established over half a century ago [3]. Recent advances in mass spectrometric techniques have demonstrated repeatability of isotope ratios (±0.1% or better e.g. [4]) that promises significant improvement in determination of standard values.

We present $^{22}Ne/^{20}Ne$ measurements of local air (n=120) from four different laboratories in three continents (SUERC, ATOMKI, University of Tokyo, UC Davis) with instruments where the mass discrimination was determined precisely by an artificially prepared mixture of isotopically pure ^{22}Ne and ^{20}Ne. The $^{22}Ne/^{20}Ne$ of the reference material (0.11891 ± 0.00006) was determined gravimetrically [4]. The weighted mean air $^{22}Ne/^{20}Ne$ from the four laboratories are statistically indistinguishable, yielding a global value of 0.10195 ± 0.00004 (0.04% 1σ) (Figure 1). This new value is consistent with the long-established air $^{22}Ne/^{20}Ne$ [2] yet nearly 20 times more precise (Figure 1).

References

[1] Ballentine, C.J. and O'Nions, R.K. (1991), EPSL 113.
[2] Ma, Y. and Stuart, F.M. (2018), Acta Geochim. 37.
[3] Eberhardt et al., *Z. Naturforsch., (*1965), 20a
[4] Gyore et al., (2019), GCA 263.
[5] Lee et al., (2006), *GCA,* 70(*17*).