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Accurate and Precise Zinc Isotope Ratio Measurements in Urban Aerosols

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We developed an analytical method and constrained procedural boundary conditions that enable accurate and precise Zn isotope ratio measurements in urban aerosols. We also demonstrate the potential of this new isotope system for air pollutant source tracing. The procedural blank is around 5 ng and significantly lower than published methods due to a tailored ion chromatographic separation. Accurate mass bias correction using external correction with Cu is limited to Zn sample content of approximately 50 ng due to the combined effect of blank contribution of Cu and Zn from the ion exchange procedure and the need to maintain a Cu/Zn ratio of approximately 1. Mass bias is corrected for by applying the common analyte internal standardization method approach. Comparison with other mass bias correction methods demonstrates the accuracy of the method. The average precision of 66Zn determinations in aerosols is around 0.05 per mil per atomic mass unit. The method was tested on aerosols collected in Sao Paulo City, Brazil. The measurements reveal significant variations in 66Zn ranging between -0.96 and -0.37 per mil in coarse and between -1.04 and 0.02 per mil in fine particular matter. This variability suggests that Zn isotopic compositions distinguish atmospheric sources. The isotopic light signature suggests traffic as the main source.