About disagreement between inter-comparisons of isotopic ratio measurements for CO_2

H. Mukai, H. Iwami, J. Tatematsu, Y. Kajita and F. Endo (NIES), C. Allison and R. Francey (CSIRO), TACOS members, NARCIS members

Several inter-comparison works for isotope ratio measurements are being conducted in the various ways. They included the comparisons by using pure CO_2 references (GS-19, 20, NARCIS-I, II), air (CLASSIC, Cylinder, Sausage, and Melon) and diluted sample (J-RAS). Despite that traceability in the laboratory is maintained, the results from these inter-comparisons are sometimes inconsistent.

By using two kinds of pure CO_2 reference materials (NARCIS-I and II), the scales for isotope ratio in several laboratories were compared. NARCIS-II is an unique reference CO2 to confirm the offset value originating form NBS-19-CO2 preparation in each laboratory. This comparison showed that there were small offsets and cross contamination effects in scales of both carbon and oxygen isotope ratios. Observed offset in delta ^{18}O is estimated to be about 0.1 per mil, which was relatively larger than cross contamination effect (about 0.06). On the other hand, cross contamination effect (about 0.1 per mil) was found to be larger than offset (0.04 per mil) for delta ^{13}C measurement.

Such differences in scales between pure CO_2 are compared to the results from inter-comparison using air samples (Sausage and Melon (between NIES & CSIRO)). In the case of C isotope ratio, both Sausage and Melon comparisons showed the similar results. However, the difference observed by such comparison was not consistent with the results from the comparison using pure CO_2. Therefore, the systematic difference in used scales between pure CO_2 and air standard seemed exist. In the case of oxygen isotope ratio, some other factors seemed to affect the discrepancy between these comparisons, because Sausage and Melon did not show the same results. For example, if we use small glass container, some deviation in oxygen isotope may occur in the glass container during preservation. Experiment for preservability is being carried out to confirm such phenomena by using NARCIS reference gas.

Further activities of various inter-comparisons and development of suitable reference materials will be able to provide more accurate scale for isotope ratio measurement.