

WG 171 – 1st year report

WG 171

Towards best practices for Measuring and Archiving Stable Isotopes in Seawater (MASIS)

Chairs: Gilles Reverdin (F)

Antje Voelker (PT)



Changes in member composition since start of WG

- left:

Len Wassenaar

change in job [and country] no longer fitting with MASIS aims

- added after kick-off meeting:

Wei Jun Cai (USA)

$\delta^{13}\text{C}$ -DIC expertise; member of intercomparison exercise

Keiji Horikawa (Japan)

adding to experts bridging modern and paleoceanography applications

Yeseul Kim (Korea)

analytical expertise and counterbalancing currently busy teaching schedule of WG
member Eun-Young Kwon

total of: 10 full members and 13 associate members

declaration of interest to join as associate member from scientist based in Peru, but process currently stalled (need for specific invitation letter)

ToR 1: Assess the existing best practices and standard measurement procedures, including new techniques such as CRDS, and identify reference materials

- identified differences in $\delta^{13}\text{C}$ -DIC measured by laser spectroscopy in three 'major' groups by sharing water samples and reference materials, as well as investigating higher uncertainties than expected.
- Memory effects when measuring water isotopes in seawater are a serious contributor to the error budget, and approaches to minimize their effect have been proposed.
- Issues with some sampling bottles are also been investigated.

ToR 2: Assess which data and metadata are stored, what is their validation/ qualification status, and how and where they can be recovered. Establish a unified standard of data distribution that allows an effective quality control to be shared between producers and scientific users.

- A few new data producers have been identified and contacted.
- We are attempting to act before major cruises associated with GO-SHIP and GEOTRACES to identify missing data collection opportunities, and have been promoting to GO-SHIP the collection of water isotopes (an ERC been submitted for GO-SHIP sampling in southern Ocean).

Indirectly related to MASIS, WG Member Alyssa Atwood has led the PAGES CoralHydro 2k Seawater $\delta^{18}\text{O}$ Database compilation and data validation and in MASIS we will build on the expertise gained there:

Atwood et al. (2025), The PAGES CoralHydro2k Seawater $\delta^{18}\text{O}$ Database: A FAIR-aligned compilation of seawater $\delta^{18}\text{O}$ data to uncover 'hidden' insights from the global ocean, Earth Syst. Sci. Data Discuss., 2025, 1–34, 10.5194/essd-2025-467, 2025.

ToR 3: Organise intercalibration exercises. Subdivide large volumes of deep and surface seawater from different cruises into subsamples to be distributed to a large set of laboratories using different measurement techniques, and in different oceanic regions.

- Great interest in this exercise by WG members and scientists outside the WG.
- Additional intercomparison samples have been collected on:
 - 1) Southern Ocean/Weddell Sea cruise; samples already shared with intercomparison exercise members [exercise running in parallel to MASIS for the Southern Ocean data compilation of WG member A. Haumann].
 - 2) GEOTRACES cruise to Sea of Ochotsk with WG member K. Horikawa as chief scientist; samples to be distributed in fall 2025
 - 3) ongoing SO315 cruise to Peru and Chile Margin; samples to be distributed in early 2026
 - 4) planned for 2026: GO-SHIP A16S and P16S cruises and NOC PAP Sustained Observatory cruise. Possibility to share samples collected in Indian Ocean by NIO being explored.
- Duplicated samples of $\delta^{13}\text{C}$ -DIC have been shared between two members (two cruises) to better qualify uncertainties, and check error estimates.

ToR 4: Assess methods (Quality Control/Quality Assessment) to evaluate the accuracy of already available data, such as comparing different data subsets in the same region, using derived properties such as d-excess, or the $\delta^{13}\text{C}$ -DIC relationship, and estimating the internal consistency of the global or regional databases.

- Two methods to assess the accuracy of available data have been implemented for seawater isotopes: one focused on data sets in the austral ocean and nearby seas, using a modeling water mass approach; the other (Reverdin et al. (2025; doi: 0.5194/os-21-567-2025)) used the statistical comparison of nearby surface samples from Atlantic Ocean and Southwest Indian Ocean, i.e., in limited parts of the world ocean. This method raises the issue of what should be considered 'nearby' and in particular the effect of the seasonal cycle.
- For $\delta^{13}\text{C}$ -DIC, only the last method has been used, typically done only at depth/at subsurface, but testing it also ongoing with surface data. Another approach to globally treat data for all cruises has been developed and tested in the North Atlantic (H. Gao et al., 2025, ESSD 2025-517)

ToR 5: Report on the results/outcome/perspectives at international conferences and in publications and actively promote capacity building through four workshops and exchange visits in order to widely disseminate the new international standards co-constructed in MASIS for producing and reporting high quality seawater isotope measurements (ToR 1-4).

- Online kick-off meeting on March 11th, 2025; recording shared with members who could not attend; outcomes include additional sample collection options for ToR 3; signing up of members to specific ToR and deliverables; registration of WG specific webpage: <http://www.seawater-isotopes.org/> [to be filled within the next months]
- Poster session on 30th July at Asia Oceania Geosciences Society (AOGS) annual meeting in Singapore; session, proposed by Liping Zhou and Antje Voelker, was integrated into the general oceanography related session.

ToR 5: continued

- One day capacity building workshop in Bengaluru (India) on August 30th prior to the 15th International Conference on Paleoceanography ICP; first in-person meeting of WG members from India, Australia and Portugal.



The ECR gave feedback on the workshop topics/lectures that they would like to have as recorded lectures for the Ocean Global Teachers Academy (OGTA).

- Ocean Science Meeting 2026: Poster session CC14G Stable Isotopes in the Marine Environment: Applications, Modeling, and Best Practices and 2 days MASIS workshop in February 21st and 22nd, 2026.