

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN SPAIN

May 1st, 2022 to April 30th, 2023

New GEOTRACES or GEOTRACES relevant scientific results

- Polyphenols exudated by marine microorganisms can complex Fe(III), modifying the Fe(II) oxidation rates as well as promoting the reduction of Fe(III) to Fe(II) in seawater. Fe(III) is reduced to Fe(II) by gallic acid in a process that depends on the pH and composition of solution, being faster as pH decreases.
- Cu-binding ligands were determined in the Central Arctic waters. The importance of the Transpolar Drift (TPD) on the lateral transport of binding ligands from the Siberian Shelves toward the Central Arctic was evaluated.
- Cu-binding ligands were determined in Fram Strait and Greenland Shelf. The Transpolar Drift (TPD) and different coastal processes determine the concentration of ligands observed above the Greenland Shelf. The area was identified as a key region for the export of Cu-binding ligands from the Central Arctic to the Nordic Seas and North Atlantic Ocean.
- It has been estimated that the Chinstrap penguin population is recycling 521 tonnes iron yr⁻¹ in the Antarctic water

New projects and/or funding

- FeRIA, Fe Response In an Acidified ocean. (PID2021-123997NB-I00). IP: J. Magdalena Santana-Casiano, Aridane G. González
- Multi-CO₂ast, Multidisciplinary Analysis of Blue Carbon Sinks in Coastal Waters (TED2021-130892B-I00). IP: Aridane G. González, J. Magdalena Santana-Casiano.
- Liquid micro-extraction based systems improving sampling of metals in the ocean surface micro-layer. Funded by the Regional government of Andalucía (Spain). IP: José A. López-López.
- *Contribution of Water Masses of Deception Island to biogeochemical inventories of the Southern Ocean: current budgets and future trends(DICHOSO)*. PID2021-125783OB-I00
Pis: Antonio Tovar Sánchez & Emma Huertas Cabilla

Outreach activities conducted (please list any outreach/educational material available that could be shared through the GEOTRACES web site) (We are particularly interested in recordings from webinars from GEOTRACES research)

- Macaronight 2022. Metales traza en el océano: por qué y cómo estudiarlos. David González-Santana.

Other GEOTRACES activities

- Divulcation in <http://eacfe-quima.blogspot.com/>

New GEOTRACES or GEOTRACES-relevant publications

- Pérez-Almeida, N., González, A.G., Santana-Casiano, J. M., González-Dávila, M. 2022. Ocean acidification effect on the Iron-Gallic Acid redox interaction in seawater. *Frontiers in Marine Science*, 9, <https://www.frontiersin.org/articles/10.3389/fmars.2022.837363/full>
- González, A. G., Bianco, A., Boutorh, J., Cheize, M., Mailhot, G., Delort, A. M., Planquette, H., Chaumerliac, N., Deguillaume, L., Sarthou, G. 2022. Influence of strong iron-binding ligands on cloud water oxidant capacity. *Science of the Total Environment*, 829, 154642. <https://doi.org/10.1016/j.scitotenv.2022.154642>
- González-Santana, D., Lough, A. J., Planquette, H., Sarthou, G., Tagliabue, A., & Lohan, M. C. 2023. The unaccounted dissolved iron (II) sink: Insights from dFe (II) concentrations in the deep Atlantic Ocean. *Science of the Total Environment*, 862, 161179, <https://doi.org/10.1016/j.scitotenv.2022.161179>
- Belbachir, I., Lopez-Lopez, J.A.*, Herce-Sesa, B., Moreno, C. (2022) A liquid micro-extraction based one-step method for the chemical fractionation of copper in seawater. *Journal of Hazardous Materials*, 430, 128505, DOI: 10.1016/j.jhazmat.2022.128505
- Juan J. Pinto , Carolina Mendiguchía , José A. López-López * , Mabel Martín-Barata, Macarena Silva and Carlos Moreno (2023) Improvement of Advanced Sample Preparation Systems for the Determination of Trace Ni in Seawater by Electro-Membranes, 13, 152, DOI: doi.org/10.3390/membranes13020152
- Jirsa F, López-López JA. In press. Ionic Liquids for Metal Extraction from Aqueous Matrices, in *Ionic Liquids for Environmental Issues*. Ed: Isabel Marrucho. Royal Society of Chemistry (Book Chapter).
- Giering, S. L. C. et al. Vertical imbalance in organic carbon budgets is indicative of a missing vertical transfer during a phytoplankton bloom near South Georgia (COMICS). *Deep Sea Res. Part II Top. Stud. Oceanogr.* 105277 (2023). [10.1016/j.dsr2.2023.105277](https://doi.org/10.1016/j.dsr2.2023.105277)
- Lérica-Toro, V. et al. 129I in sediment cores from the Celtic Sea by AMS through a microwave digestion process. *Nucl. Instruments Methods Phys. Res. Sect. B Beam Interact. with Mater. Atoms* 529, 61–67 (2022). [10.1016/j.nimb.2022.08.016](https://doi.org/10.1016/j.nimb.2022.08.016)
- Luis M. Laglera, Hema Uskaikar, Christine Klaas, S. Wajih A. Naqvi, Dieter A. Wolf-Gladrow, Antonio Tovar-Sánchez. Dissolved and particulate iron redox speciation during the LOHAFEX fertilization experiment. *Marine Pollution Bulletin* 184:114161. 2022. doi: 10.1016/j.marpolbul.2022.114161.
- Armando Félix-Bermúdez, Francisco Delgadillo-Hinojosa, María L. Lares, Eunise V. Torres-Delgado, Miguel A. Huerta-Díaz, Antonio Tovar-Sánchez and Víctor F. Camacho-Ibar. Spatial variability of dissolved nickel is enhanced by mesoscale dynamics in the Gulf of Mexico. *Frontiers in Marine Science*, doi: 10.3389/fmars.2022.1036331.
- Oleg Belyaev, Erica Sparaventi, Gabriel Navarro, Araceli Rodríguez-Romero, **Antonio Tovar-Sánchez**. The contribution of penguin guano to the Southern Ocean iron pool. **Nature Communications** **14**. Article number: 1781 (2023). <https://doi.org/10.1038/s41467-023-37132-5>

Completed GEOTRACES PhD or Master theses

Muñoz-Nevaldo, Carlos (supervisors: Villa-Alfageme, María and Hurtado, Santiago). Master tesis. ²¹⁰Po y ²³⁴Th como trazadores de la eficiencia de exporte del carbono en el océano /

^{210}Po y ^{234}Th as Tracers for carbon export efficiency in the ocean (Universidad de Sevilla, September 2022).

GEOTRACES presentations in international conferences

- Arnone, V., González-Santana, D., González-Dávila, M., González, A. G., Santana-Casiano, J. M. (2023). Influence of coastal processes on the organic complexation of iron and copper in the Macaronesia region. XXI INTERNATIONAL IBERIAN MARINE CHEMISTRY (SIQUIMAR 2022; 6-8 July 2022). Oral.
- Pérez-Almeida, N., González, A. G., Santana-Casiano, M., González-Dávila, M. The role of gallic acid and ocean acidification in the redox chemistry of iron in seawater. XXI INTERNATIONAL IBERIAN MARINE CHEMISTRY (SIQUIMAR 2022; 6-8 July 2022). Oral.
- González A.G., Pérez-Almeida, N., Arnone, V., González Santana, D., González Dávila, M., Santana Casiano, J. M. Characterization of iron-polyphenols complexes in seawater. XXI INTERNATIONAL IBERIAN MARINE CHEMISTRY (SIQUIMAR 2022; 6-8 July 2022). Oral.
- González Santana, D., González Dávila, M., Lohan, M. C., Artigue, L., Tagliabue, A., Santana-Casiano, J.M. Iron (II) oxidation kinetics variability in the Atlantic Ocean and development of an improved theoretical equation. XXI INTERNATIONAL IBERIAN MARINE CHEMISTRY (SIQUIMAR 2022; 6-8 July 2022). Oral.
- J. Magdalena Santana-Casiano, Melchor González-Dávila, Aridane G. González, Norma Pérez-Almeida, Verónica Arnone, Carolina Santana-González, David González-Santana. Fe biogeochemistry in a high CO₂ Ocean. 5th International Symposium on the Ocean in a High CO₂ world. Lima, Perú. 12-16 September 2022. Oral
- Arnone, V., González-Dávila, M., González, A.G., Santana-Casiano, J.M. Iron and copper complexation in the Macaronesian coastal waters. IV Congreso Jóvenes Investigadores de Canarias. II Congreso Internacional de Jóvenes por la Investigación (17-18 November 2022). Poster.
- González-Santana, D., González, A. G., Arnone, V., González-Dávila, M., & Santana-Casiano, J. M. (2023). Subaerial lava as a source of coastal hydrothermal iron (No. EGU23-9006). Copernicus Meetings. Oral.
- Arnone, V., Santana-Casiano, J.M., González-Dávila, M., Sarthou, G., Krisch, S., Lodeiro, P., Achterberg, E.P., González, A.G. Distribution of copper-binding ligands in Fram Strait and influences from the Greenland Shelf. 21st Arctic-Subarctic Ocean Fluxes Workshop (10-12 May 2023). Oral.
- Villa-Alfageme, M., Ceballos-Romero, E., Giering, S. L. C. & de Soto, F. C. Particle Sinking Velocity Influence on the Biological Carbon Pump: Gaps and Uncertainties. in *AGU fall meeting 2022* 12-16 December (2022).

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