

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN SPAIN

April 1st, 2018 to March 31st, 2019

Geotraces related articles

- Álvarez-Vázquez, M.A., González-Prieto, S.J., Prego, R., 2018. Possible impact of environmental policies in the recovery of a Ramsar wetland from trace metal contamination *Science of the Total Environment*, 637-638: 803-812.
- Andreo B, Barberá JA, Mudarra M, Marín AI, Garcia-Orellana J, Rodellas V, Pérez Ramos I (2018) A multi-method approach for groundwater resource assessment in coastal carbonate (karst) aquifers: the case study of Sierra Almijara (southern Spain). *Hydrology Journal* 26 (1), 41 – 56.
- Castrillejo, M., Casacuberta, N., Christl, M., Vockenhuber, C., Synal, H.-A., García-Ibáñez, M.I., Lherminier, P., Sarthou, G., Garcia-Orellana, J., Masqué, P., 2018. Tracing water masses with $^{129}\text{I}/^{236}\text{U}$ in the subpolar North Atlantic along the GEOTRACES GA01 section. *Biogeosciences Discuss.* <https://doi.org/10.5194/bg-2018-228>.
- Ceballos-Romero, E., De Soto, F., Le Moigne, F. A. C., García-Tenorio, R., & Villa-Alfageme, M. (2018). ^{234}Th -Derived Particle Fluxes and Seasonal Variability: When Is the SS Assumption Reliable? Insights From a Novel Approach for Carbon Flux Simulation. *Geophysical Research Letters*, 45(24). <https://doi.org/10.1029/2018GL079968>
- Cho, H.-M., Kim, G., Kwon, E.Y., Moosdorf, N., Garcia-Orellana, J., Santos, I.R., 2018. Radium tracing nutrient inputs through submarine groundwater discharge in the global ocean. *Sci. Rep.* <https://doi.org/10.1038/s41598-018-20806-2>.
- De Soto, F., Ceballos-Romero, E., & Villa-Alfageme, M. (2018). A microscopic simulation of particle flux in ocean waters: Application to radioactive pair disequilibrium. *Geochimica et Cosmochimica Acta*, 239. <https://doi.org/10.1016/j.gca.2018.07.031>.
- Gdaniec, S., Roy-Barman, M., Foliot, L., Thil, F., Dapoigny, A., Burckel, P., Garcia-Orellana, J., Masqué, P., Mört, C.-M., Andersson, P.S., 2018. Thorium and protactinium isotopes as tracers of marine particle fluxes and deep water circulation in the Mediterranean Sea. *Mar. Chem.* <https://doi.org/10.1016/j.marchem.2017.12.002>.
- González, A.G., Cadena-Aizaga, M.S., Sarthou, G., González-Dávila, M., Santana-Casiano, J.M., 2018. Iron complexation by phenolic ligands in seawater. *Chemical Geology*. <https://doi.org/10.1016/j.chemgeo.2018.10.017>
- González-Ortegón E., Laiz I., Sánchez-Quiles D., Cobelo A., Tovar-Sánchez A.
- Trace metal characterization and fluxes from the Guadiana, Tinto-Odiel and Guadalquivir estuaries to the Gulf of Cadiz. *Science of the Total Environment*, 650, 2454–2466, 2019
- Herce-Sesa, B.; López-López, J.A.; Moreno C. Ionic liquid solvent bar micro-extraction of CdCl_n(n 2)- species for ultratrace Cd determination in seawater. *Chemosphere* (2018) 193, 306-312
- Herce-Sesa, B.; López-López, J.A.; Moreno C. Selective ionic liquid solvent bar micro-extraction for estimation of ultra-trace silver fractions in marine waters. *Science of the Total Environment*. (2019) 650, 27-33
- Herce-Sesa, B.; López-López, J.A.; Moreno C. Multi-elemental ionic liquid-based solvent bar micro-extraction of priority and emerging trace metallic pollutants (Cd, Ag, Pd) in

natural waters. *Journal of Hazardous Materials.* (2018) In press. 10.1016/j.jhazmat.2018.02.024

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- López-López, J.A.; Borrego-Corchiado, C.; Mánuel-Vez, M.; Espada-Bellido, E. A simple and economical spectrofluorimetric alternative for Al routine analysis in seafood. *Talanta* (2018) 182, 210-217
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- Montiel D, Dimova N, Andreo B, Prieto J, Garcia-Orellana J, Rodellas V (2018). Assessing submarine groundwater discharge (SGD) and nitrate fluxes in highly heterogeneous coastal karst aquifers: challenges and solutions. *Journal of Hydrology* 557, 222 – 242.
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- Pirkwieser, P.; López-López, J.A.; Kandioller, W.; Keppler, B.; Moreno, C.; Jirsa, F. Solvent Bar Micro-Extraction of Heavy Metals from Natural Water Samples Using 3-Hydroxy-2-Naphthoate-Based Ionic Liquids. *Molecules*, (2018) 23, 3011-3015.
- Periáñez, R., Suh, K.-S., Min, B.-I., & Villa-Alfageme, M. (2018). The behaviour of ^{236}U in the North Atlantic Ocean assessed from numerical modelling: A new evaluation of the input function into the Arctic. *Science of the Total Environment*, 626. <https://doi.org/10.1016/j.scitotenv.2018.01.058>
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- Villa-Alfageme, M., Chamizo, E., Kenna, T., M, López-Lora, M., Casacuberta, N., Chang, C., Masqué, P., Christl, M. (2018). Distribution of ^{236}U in the U.S. GEOTRACES Eastern Pacific Zonal Transect and its use as a water mass tracer. Accepted *Chemical Geology*.
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Books and Chapters

- Santana-Casiano, J.M., González-Dávila, M., Fraile-Nuez, E., 2018. Chapter 4 - The Emissions of the Tagoro Submarine Volcano (Canary Islands, Atlantic Ocean): Effects on the Physical and Chemical Properties of the Seawater. In G. Aiello (Ed.), *Volcanoes*.
- Prego, R. *Las tierras raras*. Editorial Catarata, 141 pp. ISBN 978-84-9097-632-6.

Meetings

- Yinghe Fu, Sylvain Triquet, Jean-Francois Doussin, Chiara Giorio, Francois Dulac, Franck Maisonneuve, Pascal Zapf, Anais Feron, Antonio Tovar-Sánchez, Matthieu Bressac and Cécile Guieu. Trace metals and nutrients fluxes and solubility during the PEACETIME cruise of May-June 2017 in the western and central Mediterranean. European Geosciences Union (EGU). Vienna, Austria, 08 – 13 April 2018 (Poster communication).
- A. Nicosia, D. Picard, P. Villani, R. Dupuy, B. D'Anna, M.D. Mallet, S. Mas, M. Peltola, M. Bloss, E. Freney, P. Amato, F. Belosi, G. Santachiara, M. Rinaldi, D. Lefevre, A. Tovar-Sánchez, K. Desboeufs, C. Guieu, K. Sellegrí. Ice nucleating properties of primary marine aerosols observed from an Artic and a Mediterranean field campaign. European Geosciences Union (EGU). Vienna, Austria, 08 – 13 April 2018 (Oral communication).
- Tovar-Sánchez A., Buonocore C., Roque D., Blasco J.. The Marine Strategy Framework Directive: Unattainable Goal for Trace Meats. XIX Iberian Marine Chemistry Seminary-SIQUIMAR, Vigo: 20-22 Junio, 2018, Spain (Oral communication).
- Tovar-Sánchez A., Baldó F., Barbero L., Barbosa A., Casas-Ruiz M., González-Ortegón E., Ramajo L., Rodríguez-Romero A., Ruiz Gutiérrez G., Sanchez-Quiles D., Viguri J.R.. The role of penguins recycling metals in the southern ocean. XIX Iberian Marine Chemistry Seminary-SIQUIMAR, Vigo: 20-22 Junio, 2018, Spain (Poster communication).
- Nona S. R. Agawin, Aurora Aguilar, Victor Fernández Juárez, Alejandro Segura, Antonio Tovar-Sánchez. Response of Posidonia oceanica and their associated microbial N2 fixers to phosphorus (P) and iron (Fe) loading. VI International Symposium of Marine Sciences, Vigo: 20-22 Junio, 2018, Spain (Oral communication).
- I. Laiz, A. Teles-Machado, S. Plecha, A. Cobelo, D. Sánchez-Quiles, D. Roque-Atienza, E. González-Ortegón, A. Peliz and A. Tovar-Sánchez. Transport of trace metals within the Gulf of Cadiz and the Mediterranean Sea. VI International Symposium of Marine Sciences, Vigo: 20-22 Junio, 2018, Spain (Oral communication).
- David Sánchez-Quiles, Francisco Delgadillo-Hinojosa, María L. Lares, Antonio Tovar-Sánchez, Miguel A. Huerta-Díaz, Eunise V. Torres-Delgado, Erica Gutiérrez-Mejía, Sergio Sañudo-Wilhelmy. The remote origin of dissolved lead in the water column of the Gulf of Mexico. XIX Iberian Marine Chemistry Seminary-SIQUIMAR, Vigo: 20-22 Junio, 2018, Spain (Poster communication).
- E. González-Ortegón, V. Amaral, F. Baldó, Ricardo F. Sánchez-Leal, María J. Bellanco, María P. Jiménez, J. Forja, César Vilas, A. Tovar-Sánchez. Sources and coastal distribution of dissolved organic matter in the Gulf of Cadiz. VI International Symposium of Marine Sciences, Vigo: 20-22 Junio, 2018, Spain (Poster communication).
- Enrique González-Ortegón, David Sánchez-Quiles, Irene Laiz, Antonio Cobelo, Melquiades Casas-Ruiz, Luis Barbero, Antonio Tovar-Sánchez. Metal distribution in the

- main estuaries of the Gulf of Cadiz. VI International Symposium of Marine Sciences, Vigo: 20-22 Junio, 2018, Spain (Poster communication).
- Enrique González-Ortegón, Antonio Tovar-Sánchez, Cesar Vilas and Francisco Baldó. Trace Metal Bioaccumulation in the Guadalquivir Estuary. VI International Symposium of Marine Sciences, Vigo: 20-22 Junio, 2018, Spain (Poster communication).
 - Aaron Alorda Kleinglass, Jordi García Orellana, Marc Cerdà i Domenèch, Antonio Tovar-Sánchez, Valentí Rodellas I Vila, Giada Trezzi and Marc Diego Feliu. Driven metal fluxes in Portmán Bay after 25 years of mining activities. ICTASS 2018. 20th International Conference on Traditional Archery and Sport Sciences London, United Kingdom. September 27 - 28, 2018.
 - Aaron Alorda Kleinglass, Jordi García Orellana, Marc Cerdà i Domènech, Antonio Tovar-Sánchez, Valentí Rodellas, Giada Trezzi, Marc Diego Feliu. Driven metal fluxes in Portmán Bay after 25 years of mining activities. 7th international Ra-Rn workshop, 2-6 July, 2018 Delmenhorst, Germany. Oral communication.
 - Franck Fu, Karine Desboeufs, Sylvain Triquet, Jean-Francois Doussin, Chiara Giorio, Francois Dulac, Franck Maisonneuve, Pascal Zapf, Anais Feron, Antonio Tovar-Sánchez, Matthieu Bressac and Cécile Guieu. Trace metals and nutrients fluxes and solubility during the Mediterranean PEACETIME cruise. IMBeR Open Science Conference, 17-21 June 2019, Brest, France.
 - Cesario, R., Brito, P, Prego, R., Caetano, M. Rare Earth Elements in the Mira River-Estuary sediments. XIX Seminario Ibérico de Química Marina (SIQUIMAR). Vigo (Spain), 20-22 June 2018. (<http://isms.gal/siquimar/>). Oral communication.
 - Prego, R., Rodríguez-Jimenez, A. Contaminación por elementos traza en la ría gallega de Muros. Influencia de la minería de W-Sn. XIX Seminario Ibérico de Química Marina (SIQUIMAR). Vigo (Spain), 20-22 June 2018. (<http://isms.gal/siquimar/>). Oral communication
 - Prego, R., Doval, M.D., Padín, A., Mohamed, S., Álvarez-Fernández, M.J., Pérez, F.F. Evolución intra-anual del máximo de remineralización costero frente a la ría de Vigo. Resultados preliminares. XIX Seminario Ibérico de Química Marina (SIQUIMAR). Vigo (Spain), 20-22 June 2018. (<http://isms.gal/siquimar/>). Poster communication.
 - Mil-Homens, M., Prego, R., Caetano, M. Are Pb sediment contents in the Ria of Vigo documenting the ceramic's factory closure and the unlead fuel use? XIX Seminario Ibérico de Química Marina (SIQUIMAR). Vigo (Spain), 20-22 June 2018. (<http://isms.gal/siquimar/>). Poster communication.
 - Prego, R., Álvarez-Vázquez, M.A., Caetano, M. & De Uña-Álvarez, M.. River-ria fluxes of trace elements: pristine versus anthropogenic contributions. III International Congress on Water: Water, society and territory. Ourense (Spain), Facultade de Historia (UVigo), 25-27 October 2018. <https://www.uvigo.gal/eventos/es/congreso-internacional-da-auga/>
 - Álvarez-Vázquez, M.A., Prego, R. & De Uña-Álvarez, E. Urban changes in the land-to-ocean fluvial transport of trace elements, a synthesis from Galician small rivers. III International Congress on Water: Water, society and territory. Ourense (Spain), Facultade de Historia (UVigo), 25-27 October 2018. <https://www.uvigo.gal/eventos/es/congreso-internacional-da-auga/>
 - Villa-Alfageme, M., et al. Influence of Particle Sinking Velocities on Carbon Flux Attenuation and Export Efficiency. Ocean Science Meeting. 2018. Portland, USA.

- Kenna, T., et al. Distributions, inventories, and isotopic compositions of anthropogenic radionuclides measured on GEOTRACES cruises in the Atlantic and Pacific Ocean basins. Ocean Science Meeting. 2018. Portland, USA.
- Ceballos-Romero, E., et al. Novel approach to simulate time-dependent POC export. Sampling windows of success for the accuracy of ^{234}Th -derived POC fluxes. Ocean Science Meeting. 2018. Portland, USA.
- Chairwoman and Session organiser. Topic area: Biogeochemistry and Nutrients. A Multidisciplinary Approach to the Biological Carbon Pump: Understanding its Efficiency and Predicting its Future. Ocean Science Meeting 2018.
- López-López, J.A., Mendiguchía, C.; Asensio, E.; Pinto, J.J.; Moreno, C.; Soula, M.; Ferreiro, M.; Regueiro, L.; Agraso, M.M.; Vélez, J.. Sustainability indicators for pond and raft aquaculture. VI International Symposium on Marine Sciences. Vigo (España), 20-22 de junio de 2018. Oral communication.
- Herce-Sesa, B.; López-López, J.A.; Moreno C. Micro-extracción de contaminantes metálicos prioritarios y emergentes (Cd, Ag, Pd) en aguas marinas mediante barras de disolvente con líquidos iónicos. I Congreso Internacional de Jóvenes Investigadores del Mar. Cádiz (España), 3-5 de octubre de 2018. Oral communication.
- Herce-Sesa, B.; López-López, J.A.; Moreno C. Estimation of ultra-trace silver fractions in marine waters by selective ionic liquid solvent bar micro-extraction. Sample Treatment 2018. Caparica (Portugal), 3-6 de diciembre de 2018. Oral communication.

GEOTRACES related projects

- Effects of ocean acidification, temperature and organic matter on Fe(II) persistence in the Atlantic Ocean. Ministerio de Economía y Competitividad. CTM2017-83476-P (2018-2020)IP: J. Magdalena Santana Casiano, Melchor González Dávila.
- IAEA (United Nations). Anthropogenic ^{236}U , ^{129}I and natural ^{210}Po , ^{234}Th radionuclides as tracers of Oceanography studies in the coordinated Research Project: Behaviour and Effects of Natural and Anthropogenic Radionuclides in the Marine Environment and their use as Tracers for Oceanography Studies. From: 01/06/2017 to: 31/05/2021.
- New capillary based systems for the quantification of trace metals: Joining efficiency, applicability and sustainability (CTM2013-47549-P). Ministry of Economy and Competitiveness. IP: Carlos Moreno Aguilar. Period: 01/01/2014-31/12/2018
- Development of environmental tools for the establishment of protocols to define the loading capacity for sustainable aquaculture (MIMECCA). Fundación Biodiversidad, Ministry for the Ecological Transition. IP: María del Mar Agraso; Period: 01/12/2017-30/11/2018
- Evaluation of environmental implications of aquaculture on protected areas: Minimization of aquaculture effects towards environmental sustainability (ACUINTEG). Fundación Biodiversidad, Ministry for the Ecological Transition; IP: José Antonio López López. Period: 01/12/2017-31/12/2018.

PhD Thesis

- Oxidation of Fe(II) in North Atlantic Ocean in the presence of organic compounds. 2018. Carolina Santana González. QUIMA-IOCAG, Universidad de Las Palmas de Gran Canaria
- Platinum and other Technology-Critical Elements: Bioaccumulation and Behaviour in Coastal Systems Patricia Neira del Río. 29th March 2019. Director: Juan Santos Echeandía, Co-director: Antonio Cobelo-García. Spanish Institute of Oceanography (IEO) and Marine Research Institute (IIM-CSIC).
- PhD student: Elena Ceballos-Romero (2014-2018). Applied Physics Department, University of Sevilla, Spain. Study of the key processes in the export and storage of carbon in the oceans through radioactive pairs: ^{234}Th - ^{238}U and ^{210}Po - ^{210}Pb . Co-supervisors: F. de Soto (U Pablo de Olavide), F. Le Moigne (CNRS - Mediterranean Institute of Oceanography).

Teaching

- Master's Degree in Oceanography. Chemical Reactivity of the Ocean Professor: Dr. Antonio Tovar-Sánchez Facultad de Ciencias del Mar, University of Cádiz and University of Las Palmas de Gran Canaria (Spain). Academic years: 2018-19

Cruises

- COMICS UK project, funded by NERC (IP Richard Sanders). COMICS 2 cruise (IP: Stephanie Henson) sampled Benguela site, Indian Ocean on board RRS Discovery. April 2018. M Villa is in the scientific team. Depth water and particle profiles were collected at 8 stations for ^{210}Po and ^{210}Pb evaluation.

Other activities

- Geotraces summer school will take place from September 23rd to 28th, 2019 in Cádiz, on board the School Ship Intermares A- 41, in collaboration with the Ministry of Defense and the General Secretary of Fisheries of the Ministry of Agriculture, Fisheries and Food of the Government of Spain.
- A Proposal for a Geotraces Spanish National Net – Geotrac-ES has been submitted to the Ministry of Science, Innovation and Universities to coordinate the GEOTRACES activities in Spain.

Contributors to the report

Magdalena Santana-Casiano; Jordi García-Orellana; Juan Santos-Echeandía; Antonio Cobelo-García; Ricardo Prego; María Villa-Alfageme; Jose Antonio López-López; Antonio Tovar-Sánchez.

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