

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN SPAIN

May 1st, 2017 to March 30th, 2018

GEOTRACES related articles

- Cho H-M, Kim G, Kwon E-Y, Moosdorf N, Garcia-Orellana J, Santos I R (2018) Submarine groundwater discharge as a major source of nutrients to the global ocean. *Scientific Reports* 8 (1); 2439.76
- 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.
- Gdaniec S, Roy-Barman M, Foliot L, Thil F, Dapoigny A, Burckel P, Garcia-Orellana J, Masqué P, Mörtz CM, Andersson PS (2018). Thorium and Protactinium isotopes as tracers of marine particle fluxes and deep water circulation in the Mediterranean Sea. *Marine Chemistry* 199, 12 – 23.
- Krall L, Trezzi G, Garcia-Orellana J, Rodellas V, Mörtz CM, Andersson P. (2017). Submarine groundwater discharge at Forsmark, Gulf of Bothnia, provided by Ra isotopes. *Marine Chemistry* 196, 162 – 172.
- 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 Almirajara (southern Spain). *Hydrology Journal* 26 (1), 41 – 56
- Cerdà-Domènech M, Rodellas V, Folch A, Garcia-Orellana J (2017). Constraining the temporal variation of Ra isotopes and Rn in the groundwater endmember: Implications on the derived SGD estimates. *Science of the Total Environment* 595, 849 – 857
- Castrillejo M, Casacuberta N, Christl M, Garcia-Orellana J, Vockenhuber C, Synal H-A, Masqué P (2017). Anthropogenic ²³⁶U and ¹²⁹I in the Mediterranean Sea: first comprehensive distribution and constrain of their sources. *Science of the Total Environment* 593-594, 745 – 759.
- Trezzi G., Garcia-Orellana J, Rodellas V, Masqué P, Garcia-Solsona E, Andersson P. (2017) Assessing the role of submarine groundwater discharge as a source of Sr to the Mediterranean Sea. *Geochimica et Cosmochimica Acta* 200, 42 – 54.
- Rodellas V., Garcia-Orellana J., Trezzi G., Masqué P., Stieglitz T.C., Bokuniewicz H., Cochran K.J. and Berdalet E. (2017) Using the radium quartet to distinguish sources of submarine groundwater discharge: fresh groundwater vs seawater recirculation through sediments. *Geochimica et Cosmochimica Acta* 196, 58 – 73.
- Santana-Gonzalez, C., Santana-Casiano, J. M., González-Dávila, M., Fraile-Nuez, E. Emissions of Fe(II) and its kinetic of oxidation at Tagoro submarine volcano, El Hierro.
- *Marine Chemistry*, 195, 129-137, 2017. <http://dx.doi.org/10.1016/j.marchem.2017.02.001>

- Samperio-Ramos, G., Santana-Casiano, J.M., González-Dávila, M. Variability in the production of organic ligands, by *Synechococcus* PCC 7002, under different iron scenarios. *Journal of Oceanography*. 2017. <https://doi.org/10.1007/s10872-017-0457-6>.
- Samperio-Ramos, G., Santana-Casiano, J.M., González-Dávila, M., Ferreira, S., Coimbra, M.A. Variability in the organic ligands released by *Emiliania huxleyi* under simulated ocean acidification conditions. *AIMS Environmental Science*, 4(6), 788-808, 2017. <http://dx.doi.org/10.3934/environsci.2017.6.788>
- Samperio-Ramos, G., González-Dávila, M., Santana-Casiano, J. M. Impact on the Fe redox cycling of organic ligands released by *Synechococcus* PCC 7002, under different iron fertilization scenarios. Modeling approach. *Journal of Marine Systems*. 2018. <https://doi.org/10.1016/j.jmarsys.2018.01.009>.
- González-Ortegón E., Baldó F., Sánchez-Leal R.F., Bellanco M.J., Jiménez M.P., Forja J., Vilas C., Tovar-Sanchez A. Sources and coastal distribution of dissolved organic matter in the Gulf of Cadiz. *Science of the Total Environment* 630, 1583–1595, 2018.
- Laglera L. M., Tovar-Sánchez A., Iversen M.H., Gonzalez H.E., Naik H., Mangesh G., Assmy P., Klaas C., Mazzocchi G., Montresor M., Naqvi S.W.A., Smetacek V., Wolf-Gladrow D.A. Iron partitioning during LOHAFEX: Copepod grazing as a major driver for iron recycling in the Southern Ocean. *Marine Chemistry*, 196, 148-161. DOI: 10.1016/j.marchem.2017.08.011, 2017.
- Scarlett Trimborn, Tina Brenneis, Clara J. M. Hoppe, Luis M. Laglera, Louiza Norman, Juan Santos-Echeandía, Christian Völkner, Dieter Wolf-Gladrow, Christel S. Hassler. Iron sources alter the response of Southern Ocean phytoplankton to ocean acidification. *Marine Ecology Progress Series* 578: 35-50. 2017.
- João Canário, Juan Santos-Echeandia, Ana Padeiro, Eduardo Amaro, Volker Strass, Dieter Wolf-Gladrow, Christine Klaas, Sharyn Ossebaar, Boris Koch, Luis M. Laglera. Mercury and methylmercury in the West Southern Ocean: Results from Eddy Pump - ANTXXVIII/3 cruise. *Deep Sea Research Part II: Topical Studies in Oceanography*. 138, 74-85. 2017.
- Wee Cheah, Mariana A Soppa, Sonja Wiegmann, Sharyn Ossebaar, Luis M. Laglera, Volker Strass, Juan Santos-Echeandía, Mario Hoppema, Dieter Wolf-Gladrow, Astrid Bracher. Importance of deep mixing and silicic acid in regulating phytoplankton biomass and community in the iron limited Antarctic Polar Front region in summer. *Deep Sea Research Part II: Topical Studies in Oceanography*. 138, 52-62. 2017.
- V. Puigcorbé, M. Roca-Martí, P. Masqué, C.R. Benitez-Nelson, M. Rutgers v. d. Loeff, L. M. Laglera, A. Bracher, W. Cheah, V. Strass, M. Hoppema, J. Santos-Echeandía, B.P.V. Hunt, E.A. Pakhomov, C. Klaas. Particulate organic carbon export across the Antarctic Circumpolar Current at 10°E: Differences north and south of the Antarctic Polar Front. *Deep Sea Research Part II: Topical Studies in Oceanography*. 138, 86-101. 2017.
- Bernárdez, P., Prego, R., Filgueiras, A.V., Ospina-Álvarez, N., Santos-Echeandía, J., Álvarez-Vázquez, M.A., Caetano, M., 2017. Lithogenic sources, composition and intra-annual variability

of suspended particulate matter supplied from rivers to the Northern Galician Rias (Bay of Biscay). *Journal of Sea Research* 130, pp. 73-84.

- Hoppe, C.J.M., Klaas, C., Ossebaar, S., Soppa, M.A., Cheah, W., Rost, B., Laglera L.M., Santos-Echeandía J., Wolf-Gladrow, D.A., Bracher, A., Hoppema, M., Strass, V., and Trimborn. Controls of primary production in two phytoplankton blooms in the Antarctic Circumpolar Current. *Deep Sea Research Part II: Topical Studies in Oceanography*. 138, 63-73. 2017.
- Damien J. Cabanes, Louiza Norman, Juan Santos-Echeandía, Morten H. Iversen, Scarlett Trimborn, Luis M. Laglera, Christel S. Hassler. First evaluation of the role of salp fecal pellets on iron biogeochemistry. *Frontiers in Marine Science*. 3, article number 289, 2017.
- Brito, P., Prego, R., Mil-Homens, M., Caçador, I., Caetano, M., 2018. Sources and distribution of yttrium and rare earth elements in surface sediments from Tagus estuary, Portugal. *Science of the Total Environment*, 621: 317-325.
- Almécija, C., Cobelo-García, A., Wepener, V., Prego, R., 2017. Platinum group elements in stream sediments of mining zones: the Hex River (Bushveld Igneous Complex, South Africa). *Journal of African Earth Sciences*, 129: 934-943.
- Álvarez-Vázquez, M.A., Caetano, M., Álvarez-Iglesias, P., Pedrosa-García, M.C., Calvo, S., De Uña-Álvarez, E., Quintana, B., Vale, C., Prego, R., 2017. Natural and Anthropocene fluxes of trace elements in estuarine sediments of Galician Rias. *Estuarine, coastal and Shelf Science*, 198: 329-342.
- Ivarez-Vázquez, M.A., Prego, R., Caetano, M., De Uña-Álvarez, E., Doval, M., Calvo, S., Vale, C., 2017. Contributions of trace elements to the sea by small uncontaminated rivers: effects of a water reservoir and a wastewater treatment plant. *Chemosphere*, 178: 173-186.
- Cobelo-García, A., Morán, P., Almécija, C., Caballero, P., 2017. Historical record of trace elements (1983–2007) in scales from Atlantic salmon (*Salmo salar*): Study of past metal contamination from a copper mine (Ulla River, NW Iberian Peninsula). *Chemosphere*, 188, pp. 18-24.
- Cobelo-García, A., Filella, M., 2017. Electroanalytical techniques for the quantification of technology-critical elements in environmental science. *Current Opinion in Electrochemistry*, 3, pp. 78-90.
- Monteiro, C.E., Cobelo-Garcia, A., Caetano, M., Correia dos Santos, M.M., 2017. Improved voltammetric method for simultaneous determination of Pt and Rh using second derivative signal transformation – application to environmental samples. *Talanta*, 175, pp. 1-8.

Books and Chapters

- González, A.G., Pokrovsky, O.S., Santana-Casiano, J.M., González-Dávila, M., 2017. Bioadsorption of Heavy Metals. In: *Prospects and Challenges in Algal Biotechnology*. Tripathi B.,

Kumar D. (eds.). Springer, Singapore. Pages 233-255. (CL). https://doi.org/10.1007/978-981-10-1950-0_8

- Rico, M., González, A.G., Santana-Casiano, J.M., González-Dávila, M., Pérez-Almeida, N., Suárez de Tangil, M., 2017. Production of Primary and Secondary Metabolites Using Algae. In: Prospects and Challenges in Algal Biotechnology. Tripathi B., Kumar D. (eds.). Springer, Singapore. Pages 311-326. (CL). https://doi.org/10.1007/978-981-10-1950-0_12

Meetings

- 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).
- E. González-Ortegón, D. Sánchez-Quiles, I. Laiz, A. Cobelo, M. Casas-Ruiz, L. Barbero, A. Tovar-Sánchez. Metal distribution in the main estuaries of the Gulf of Cadiz. VI International Symposium of Marine Sciences, Vigo: 20-22 June, 2018, Spain (Poster communication).
- Tovar-Sánchez, C. Buonocore, D. Roque, J. Blasco. The Marine Strategy Framework Directive: Unattainable Goal for Trace Metals. The XIX Iberian Marine Chemistry Seminary (SIQUIMAR). Vigo: 20-22 June, 2018, Spain (Poster communication).
- D. Sánchez-Quiles; F. Delgadillo-Hinojosa; M. Lucila-Lares; A. Tovar-Sánchez; M. Ángel Huerta-Díaz; E. Vanesa Torres-Delgado; E. Gutiérrez-Mejía; S. Sañudo-Wilhelmy. The remote origin of dissolved lead in the water column of the Gulf of Mexico. The Iberian Marine Chemistry Seminary (SIQUIMAR). Vigo (Spain), 20-22th June 2018.
- Luis M. Laglera. New analytical developments in cathodic polarography for the determination and characterization of trace metal complexation by natural ligands in seawater. 5^o Encontro Brasileiro sobre Especiación Química. EspeQBrasil 2017. Águas de Lindóia/Sao Paulo, Brasil, 2017. Invited talk
- G. González, J. M. Santana Casiano, N. Pérez-Almeida, M. González-Dávila. The effect of Cu on the Fe redox cycle: The role of reactive oxygen species. **Goldschmidt**. Paris, 13-18 August, 2017.
- J.M. Santana-Casiano, M. González-Dávila, C. Santana-González, E. Fraile-Nuez. Changes in the redox and acid-base properties of the seawater due to the hydrothermal emissions of the Tagoro submarine volcano. **Goldschmidt**. Paris, 13-18 August, 2017.
- J. M. Santana-Casiano, M. González-Dávila, D. González-Santana, A. G. González, S. Gladyshev A. Sokov. Ocean Acidification and Water Masses Carbonate Buffer Capacity along the 59.5°N in the Irminger Sea. **Ocean Science Meeting**. Portland, Oregon, 11-16 February 2018
- Carolina Santana-González, Juana Magdalena Santana-Casiano, and Melchor González-Dávila. TdFe(II) emissions in the degassing phase of Tagoro submarine volcano and its correlation with the decrease of pH. **EGU General Assembly**. Vienna, Austria, 8-13 April 2018

GEOTRACES related projects

- Title: *Mesoscale and Sub-mesoscale processes in the Strait of Gibraltar: The Trafalgar-Alborán connection*. MEGAN.
IP: Carlos M. García Jiménez (UCA)
Founded by: MINECO CTM2013-49048-C2-1-R.

Period: 1/1/2014 - 31/12/2017

- Title: *Effect of the ocean acidification and warming in the biogeochemical cycle of Fe in the North Atlantic*.
IP: J. Magdalena Santana Casiano, Melchor González Dávila
Founded by: Ministerio de Economía y Competitividad. CTM2014-53342-P
Period: 2015-2017
- Title: *Effects of ocean acidification, temperature and organic matter on Fe(II) persistence in the Atlantic Ocean*.
IP: J. Magdalena Santana Casiano, Melchor González Dávila
Founded by: Ministerio de Economía y Competitividad. CTM2017-83476-P
Period: 2018-2020

PhD Thesis

- Miguel Ángel Álvarez Vázquez (Dr. Ricardo Prego, director; Dra. De Uña-Álvarez codirectora). Natural and anthropogenic changes and sedimentary imprint of biogeochemical discharges in the river-ria system. Univ. de Vigo (Campus del Mar), 13 de julio de 2017. Sobresaliente cum Laude.
- Guillermo Samperio Ramos. Biogeochemical Cycle of Fe in acidified marine environments. 2017. QUIMA-IOGAG, Universidad de Las Palmas de Gran Canaria
- Maxi Castrillejo. Sources and distribution of artificial radionuclides in the oceans: from Fukushima to the Mediterranean Sea. Universitat Autònoma de Barcelona. Facultat / Escuela: Facultat de Ciències. September 22, 2017

MS Thesis

- Cira Buonocore. Master in Chemical oceanography. Title: Dissolved metal concentration in the Spanish coasts. Detection limits and effects, an open question. Cádiz, 11 December -2017
- Marcia Isabel Cadena Aizaga. The role of humic acids on the iron speciation and the competitive effect with copper in seawater. 2017. QUIMA-IOGAG Universidad de Las Palmas de Gran Canaria

Teaching

- Master's Degree in Oceanography. Chemical Reactivity of the Oceans
Professor: Dr. Antonio Tovar-Sánchez
Facultad de Ciencias del Mar, University of Cádiz and University of Las Palmas de Gran Canaria (Spain). Academic years: 2017-18

Other activities

- GEOTRACES summer school 2019: CEIMAR, UCA and ICMAN (CSIC) agree to host a new edition of the GEOTRACES Summer school in Cádiz.

Cruises

- PACETIME – Mediterranean Sea. On board of the R/V Pourquoi pas? (France) this campaign was carried out in May-June 2017. Water samples (depth water profiles) were collected at 15 stations along the Mediterranean Sea (IP: Cecile Guieu). (Figure 22)
- VULCANA1015. Vulcanología Canaria Submarina. Organized by Instituto Español de Oceanografía. From March 28th to April 9th, 2017 in the South of La Palma and in the area of the submarine volcano of El Hierro.
- XIXIMI-06. – Gulf of Mexico. On board of the R/V Justo Sierra (Mexico) this campaign was carried out from August 18 to September 7th 2017. Water samples (depth water profiles) were collected at 43 stations along the Gulf of Mexico (IP: Francisco Delgadillo-Hinojosa). (Figure 23)

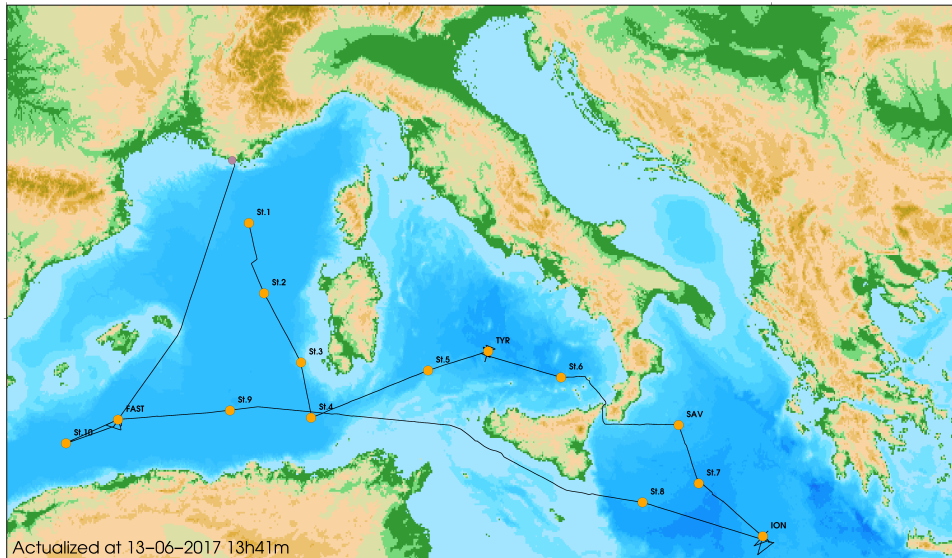


Figure 22. PACETIME stations.

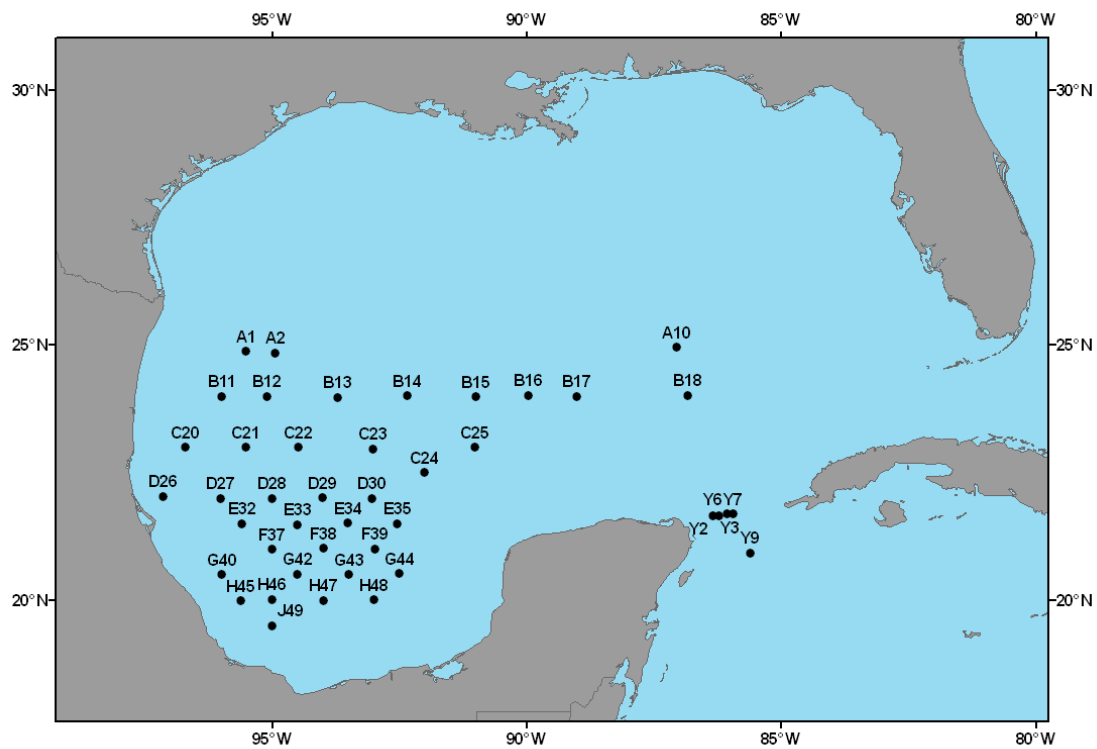


Figure 23. XIXIMI-06 stations.

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