

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN CROATIA

April 1st, 2020 to April 30, 2021

New GEOTRACES or GEOTRACES relevant scientific results

The Croatian GEOTRACES activities were mainly related to: 1) application of improved electrochemical methods (in combination with ICPMS) for trace metals speciation and determination (mostly Zn, Cd, Pb, Cu, Fe, Ni, Co and its interaction with organic matter and sulfur species) in natural waters, including monitoring of the coastal and open waters of the Adriatic Sea; 2) mercury speciation and determination by CV- AAS in natural waters, including monitoring of the coastal and open waters of the Adriatic Sea; 3) development of new methods for ex- and in-situ determination of natural and anthropogenic radionuclides in the seawater (focus is on $^{89,90}\text{Sr}$ and ^{210}Pb); 4) update work on the automated system for voltammetric determination of trace metals in natural waters (e.g. seawater) named "Voltammetric AutoAnalyser (VoltAA)"; 5) development of electroanalytical method for determination and characterization of polysulfides in anoxic seawater conditions; 6) characterization of atmospheric precipitation (rain, aerosols - PM_{2.5}) regarding presence of major cations and anions, organic matter, sulfur species and trace metals; 7) measurements of activity concentration of ^7Be and ^{210}Pb in atmospheric precipitation (rain, aerosols - PM_{2.5}) in order to monitor dynamics of particle transport, meteorological information, origin of air mass transfer and seasonal variation of aerosol deposition; 8) geochemical research in different environmental systems; 9) study of trace elements as indicators of environmental changes in marine lakes; 10) work on software for treatment and analysis of UV-Vis spectra (ASFit - UV/Vis CDOM spectra analysis) and fluorescence; 11) work on update of New "butterfly"-type water samplers (4.5 L and 12 L) - rope or rosette mounting.

New projects and/or funding

Current projects supported by the Croatian Ministry of Science, Education and Sport and Croatian Science Foundation (CSF):

- 2018-2022: MARine lake (Rogoznica) as a model for EcoSystem functioning in a changing environment (PI. I. Ciglencčki-Jušić)
- 2018-2022: Geochemistry and Records of Redox Indicators in Different Environmental Conditions: Towards a better understanding of redox conditions in the past (PI: E. Bura-Nakić)
- 2020-2024, CSF project: Marine (micro)plastic litter and pollutant metals interaction: a possible pathway from marine environment to human (METALPATH) (PI Vlado Cuculić)
- 2020-2024: SNSF/CSF: Understanding copper speciation and redox transformations in seawater

Other projects:

2020-2023: HAMAG-BICRO: "Application of artificial intelligence in advanced predictive technologies for online water quality control".

2020-2023: INTERREG CRO-ITA: InnovaMare - "Model of innovation ecosystem in the field of underwater robotics and sensors for control and monitoring purposes with a mission focused on the sustainability of the Adriatic Sea".

2020-2022: INTERREG ADRION : "SEAVIEWS - Sector Adaptive Virtual Early Warning System for marine pollution".

2020-2022: Partnership between scientists and fishermens - a network of town Ploče: Assessment of the physico-chemical and biological quality status of the fishery zone"

2020-2022: SKLEC China Open Research Fund: "Eco-environmental impacts of submarine groundwater discharge-derived nutrients, carbon and metal in oligotrophic karstic estuary of the Krka River (Adriatic Sea, Croatia)".

2020-2021: Providing a service of systematic testing of the state of transitional and coastal waters in the Adriatic Sea (Croatia).

New GEOTRACES or GEOTRACES-relevant publications (published or in press)

- Lucija Knežević, Dario Omanović, Niko Bačić, Jelena Mandić and Elvira Bura-Nakić, Redox speciation of vanadium in estuarine waters using improved methodology based on anion exchange chromatography coupled to HR ICP-MS system, *Molecules*, 26 (2021) 2436.
- Saša Marcinek, Arnaud Chapoulie, Pascal Salaün, Scott Smith, Dario Omanović. Revised application of copper ion selective electrode (Cu-ISE) in marine waters: a new meta-calibration approach. *Talanta*, 226 (2021) 122170.
- Jasmin Pađan, Saša Marcinek, Ana-Marija Cindrić, Chiara Santinelli, Simona Retelletti Brogi, Olivier Radakovitch, Cédric Garnier and Dario Omanovic, Organic copper speciation by anodic stripping voltammetry (ASV) in estuarine waters with high dissolved organic matter, *Frontiers in Chemistry*, 8 (2021) 628749.
- Saša Marcinek, Chiara Santinelli, Ana-Marija Cindrić, Valtere Evangelista, Margherita Gonnelli, Nicolas Layglon, Stéphane Mounier, Véronique Lenoble and Dario Omanović. Dissolved organic matter dynamics in the pristine Krka River estuary (Croatia), *Marine Chemistry*, 225C (2020) 103848
- Bačić N, Mikac N, Lučić M, Sondi I. (2021) Occurrence and Distribution of Technology-Critical Elements in Recent Freshwater and Marine Pristine Lake Sediments in Croatia: A Case Study, *Archives of Environmental Contamination and Toxicology*, (), 1-15 DOI 10.1007/s00244-021-00863-x
- MF Turk, M Ivanić, J Dautović, N Bačić, N Mikac (2020) Simultaneous analysis of butyltins and total tin in sediments as a tool for the assessment of tributyltin behaviour, long-term persistence and historical contamination in the coastal environment. *Chemosphere* 258, 127307.
- D Berto, M Formalewicz, G Giorgi, F Rampazzo, C Gion, B Trabucco, M Giani, M. Lipizer, S Matijević, H. Keberi, C Zeri, O. Bajt, N Mikac D Jaoksimović, AF Aravantinou, M Poje, M Cara, L Manfra (2020) Challenges in harmonized assessment of heavy metals in the Adriatic and Ionian seas. *Frontiers in Marine Science* 7, 717, doi: 10.3389/fmars.2020.00717.
- Ciglencečki, I., Vilibić, I., Dautović, J., Vojvodić, V., Čosović, B., Zemunik, P., Dunić, N., Mihanović, H., 2020. Dissolved organic carbon and surface active substances in the northern Adriatic Sea: long-term trends, variability and drivers. *Sci. Tot. Environ.* 730, 139104, doi:10.1016/j.scitotenv.2020.13910.
- Ciglencečki, I., Čanković, M., Kuzmić, M., Pagano, M., 2020. Accumulation of organic matter in a mesotidal Mediterranean lagoon (Boughrara, Tunisia). *Estuar. Coast. Shelf Sci.* 240, 106780.

Completed GEOTRACES PhD or Master theses

- Master Thesis, Iva Kostanjšek, Characterization of sedimentary environment and plastics in marine and beach sediment in Stupica Mala bay (Žirje island), University of Zagreb, 2021.
- Master Thesis, Renata Matekalo, Trace metals concentrations in seawater and on microplastic particles from Mala Martinska beach sediments near Šibenik, University of Zagreb, 2021.

GEOTRACES presentations in international conferences

- RISK 2020 Conference, Tbilisi, Gorgia, April 2020., Transport of Saharan Dust Over Mediterranean Basin -Ecological and Health Risks, Orlović-Leko, Ciglenečki, Dutour Sikirić, Mateša.
- 71. International Society of Electrochemistry meeting, Belgrade, Serbia, Electroanalytical characterization of polysulfides (Sx²⁻) in model solution and euxinic seawater conditions, S. Mateša, I.Ciglenečki
- EGU 2021-9040, Viena April 2021, Hypothesis on impact of winter conditions on annual organic production in the northern Adriatic, N. Supić, A. Budiša, I. Ciglenečki et al.
- EGU 2021-5793, Viena April 2021, Climatology of dust deposition in the Adriatic Sea and biological response of Rogoznica Lake (central Adriatic), B. Mifka, I. Ciglenečki, M. Telišman Prtenjak
- EGU 2021-12269, Viena April 2021, Radioactivity measurements in the atmosphere and water column of Rogoznica Lake (central Adriatic), I. Tucaković, S. Mateša, I. Coha, M. Marguš, M. Čanković, I. Ciglenečki.
- EGU 2021-9204, Viena April 2021, Post medieval cargo - contemporary problem source of mercury in pristine seawater environment (Gnalić, Biograd na Moru, Croatia), V. Cuculić, N. Cukrov, I. Radić Rossi, Ž. Kwokal
- EGU 2021, Viena April 2021, Correlation of microplastic type and metal association: Croatian coast case study (Žirje Island), H. Fajković, N. Cukrov, Ž. Kwokal, K. Pikelj, L. Huljek, I. Kostanjšek, V. Cuculić
- EGU 2021, Viena April 2021, Trace metals load on beached microplastics in the anthropogenically influenced estuarine environment - Croatian middle Adriatic, V. Cuculić, H. Fajković, Ž. Kwokal, R. Matekalo.
- MICRO 2020 International Conference, Plasto-tarball - a sinkhole for microplastic (Croatian coast case study), H. Fajković, V. Cuculić, N. Cukrov, Ž. Kwokal, K. Pikelj, L.; Huljek, S. Marinović; Baztan, Juan (ur.). Lanzarote: 333877

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