

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN KUWAIT

May 1st, 2017 to March 30th, 2018

Major progress

- Kuwait Institute for Scientific Research (KISR) State of Kuwait started the construction of new research vessel (55 m) in Spain. This research vessel will play an important role for future research projects and strong collaboration with Geotraces to explore trace metal distribution and their isotopes using clean techniques in the Arabian Gulf, Sea of Oman and the Arabian Sea.
- Completed 4 transects in 3 seasons in Kuwait waters for the first time investigating the distribution of trace metals in Kuwait's waters.

New Scientific Results

Completed project titled 'Assessment of Dissolved Trace Metals Distribution in Kuwait Waters' revealed important findings in terms of trace metal distribution in Kuwait waters using a clean techniques using proven well-tested methodology i.e., adsorptive cathodic stripping voltammetry (Ad-CSV) and flow injection analyzer (FIA) and multivariate statistical approach. A new manuscript has been accepted for publication at Marine pollution pollutant. A full detail of the paper and the major findings is stated below. Also, distribution of total organic carbon in Kuwait waters and the long term implications for the Oxygen Minimum Zone of the Arabian Sea is recently published. A full detail of the manuscript is given in the new publication list section.

Major findings of the recent trace metal research project

- Dissolved trace metals were analyzed for the first time using clean analytical techniques from the NW Arabian Gulf on a spatial and seasonal basis.
- Nutrient-trace metal interactions and its synergistic effect on phytoplankton standing stock was investigated using multivariate statistical approach – A first of its kind study from the Arabian Gulf.
- Multivariate analyses revealed marked spatial and seasonal disparity in water quality in the NW Arabian Gulf, off Kuwait
- Based on correlation analysis, supply and demand of macronutrients and total dissolved trace metals were proposed for phytoplankton community in the Kuwait Bay and offshore waters on a seasonal basis.
- Labile trace metal concentrations calculated from C: trace metal stoichiometry yielded comparable results with outcomes from correlation analysis on supply and demand scenario.

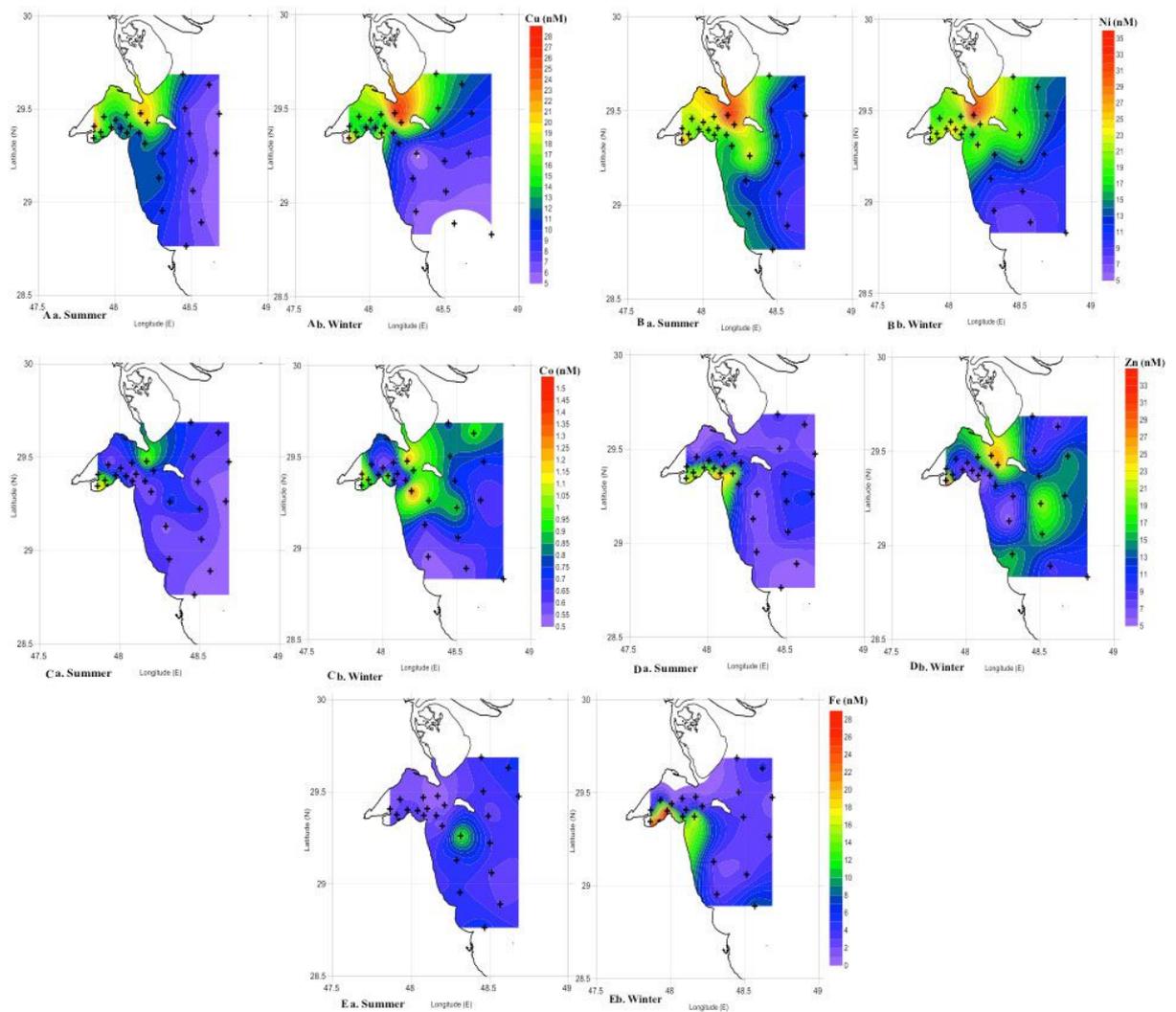


Figure 7. Trace metal distribution in Kuwait water in summer and winter : Cu (Aa.Summer & Ab. Winter), Ni (Ba. Summer & Bb. Winter), Co (Ca. Summer & Cb.Winter), Zn (Da. Summer & Db.Winter) and Fe (Ea. Summer & Eb. Winter)

Future Projects

- **Project Title:** Effect of mineral dust on ocean productivity and biogeochemistry of the northern Arabian Gulf.

Objective: To identify the sources and to assess the effect of mineral dust fluxes on biogeochemical processes in the northern Arabian Gulf.

The above project will be completed in collaboration with NIO, India.

- Similar transects conducted in the completed project will be repeated soon to update the database.
- Speciation measurements will be conducted soon to enhance our understanding on trace metal cycling and its correlation to phytoplankton in Kuwait waters.
- Development of a new sampling technique; in situ pumping system.

Other Activities

- Two training courses were conducted for regional and international researchers on

trace metals and nutrients;

- The Measurements of Trace Metals (Cu, Ni, Co & Fe) in Seawater using Adsorptive Cathodic Stripping Voltammetry (AdCSV) & Flow Injection Analyzer (FIA) (Introductory)
- The Measurements of Nutrients in Seawater
- Conducted trainings for university students during KISR summer training programs. Students were introduced to clean sampling and analysis. The title of the projects is stated below;
 - Distribution of Dissolved Trace Metals (Copper & Iron) in Kuwait's Waters; Correlation to Phytoplankton Biomass
 - Dissolved iron in Kuwait waters and biological relationship.

New Publications

- Turki Al-Said, Rakhesh Madhusoodhanan, Tapuspong Pokavanich, Faiza Al-Yamani, Razia Kedila, Aws Al-Ghunaim, Ali Al-Hashem. 2017. Environmental characterization of a semiarid hyper saline system based on dissolved trace metal-macronutrient synergy: A multivariate spatio-temporal approach. *Marine Pollution Bulletin* <http://dx.doi.org/10.1016/j.marpolbul.2017.10.009>
- Faiza Al-Yamani, Takahiro Yamamoto, Turki Al-Said, Aws Al-Ghunaim. 2017. Dynamic hydrographic variations in Northwestern Arabian Gulf over the past three decades: Temporal shifts and trends derived from long-term monitoring data. *Marine Pollution Bulletin* 122 (488-499) <http://dx.doi.org/10.1016/j.marpolbul.2017.06.056>
- Turki Al-Said, Aws Al-Ghunaim, Durvasula V. SubbaRao, Faiza Al-Yamani, Kholood Al-Rifaie, Ali Al-Baz. 2017. Salinity-driven decadal changes in phytoplankton community in the NW Arabian Gulf of Kuwait. *Environmental Monitoring and Assessment*, 189:268 <http://dx.doi.10.1007/s10661-017-5969-4>
- Turki Al-Said, S.W.A. Naqvi, Faiza Al-Yamani, Alexandr Goncharov, and Loreta Fernandes. 2018. High Total Organic Carbon and Hypoxia in the Water Column of the Arabian Gulf: Implications for the Oxygen Minimum Zone of the Arabian Sea. *Marine Pollution Bulletin* 129 (35-42).

Published Conference Paper

- Turki Al-Said, Rakhesh Madhusoodhanan, Aws Al-Ghunaim, Faiza Al-Yamani, Raziya Kedila, Loreta Fernandes and Walid Al-Zakri. 2018. The Effect of Water Quality including Trace metals on Sargassum in the semiarid waters off Kuwait, NW Arabian Gulf. KISR 14473. ASLO conference, Portland, USA 11-16/02/2018.

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