

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN ISRAEL

May 1st, 2017 to March 30th, 2018

This report summarizes GEOTRACES related activities between May 2017 and April 2018 in Israel. It further includes a paragraph about the work of the Israeli National Monitoring Program, which includes a long and extensive time series of open ocean measurements in the Gulf of Eilat/Aqaba.

1. Dr. Adi Torfstein, Institute of Earth Sciences, Hebrew University of Jerusalem (HUJI), and Interuniversity Institute (IUI) for Marine Sciences of Eilat:

Research

- **Sediment traps:** Torfstein's group operates a sediment trap mooring that has been deployed continuously in the center of the north Gulf of Aqaba/Eilat since January 2014. This mooring combines two types of traps and time resolutions:
 - KC-Denmark cylinder trap stations deployed at five depth points (water depth is 600 meters) that are sampled at a monthly resolution
 - McLane PARFLUX-II time series trap that collects the sinking particulates at a depth of 400 meters (water depth is 600 meters) on a ~daily resolution (between 24-48 hours) across the year
 - The mooring also hosts continuously a S4 current meter (InterOcean Systems, Inc.) that records current direction and velocity at a 10 minute resolution
- **Dust:** Two dust samplers are deployed continuously at the Interuniversity Institute (IUI) for Marine Sciences of Eilat.
- **Seawater:** Red Sea deep seawater profiles are sampled regularly and analyzed for trace element concentrations, Pb isotopic compositions and $^{230}\text{Th}/^{232}\text{Th}$ ratios.
- During the reporting period, Torfstein's research group includes: two postdocs (Daniel Palchan, David Weinstein), a PhD student (Natalie Tchernichovsky), 4 MSc students (Tal Ben-Altabet, Gil Lapid, Merav Gilboa, Ortal Sava), and a lab technician (Barak Yarden).

Funding

- Funding is provided by the Israel Science Foundation (PI Torfstein).

Meetings

- Results of work on modern dust time series and their coupling with downcore late Quaternary sediment records in the Red Sea was presented at the PAGES OSM Zaragoza, Spain and at the Goldschmidt meeting Paris, France.
- MSc student Ortal Sava presented the history of Late Quaternary export production in the Red Sea in the Israel Geological Society annual meeting
- MSc student Tal Ben-Altabet participated in the GEOTRACES summer school in Brest, France (August, 2017), where he presented his work on temporal and vertical dynamics of trace

element distributions in seawater across dust storm events and water column overturning

Related publications:

- Torfstein A. and Kienast S.S. (2018) No correlation between atmospheric dust and surface chlorophyll-a in the oligotrophic Gulf of Aqaba, northern Red Sea. *Journal of Geophysical Research - biogeosciences*, 123, doi.org/10.1002/2017JG004063.
- Torfstein A., Teutsch N., Tirosh O., Shaked Y., Rivlin T., Zipori A., Stein M., Lazar B. and Erel Y. (2017) Chemical characterization of atmospheric dust from a weekly time series in the north Red Sea between 2006-2010. *Geochimica et Cosmochimica Acta* 211, 373-393.
- Steiner Z., Lazar B., Torfstein A. and Erez Y. (2017) Testing how variations in water column productivity affect trace metal accumulation in marine sediments: the Gulf of Aqaba, Red Sea. *Chemical Geology* 473, 40-49.

2. Prof. Yeala Shaked, Institute of Earth Sciences, Hebrew University of Jerusalem, and Interuniversity Institute for Marine Sciences of Eilat:

Workshops and meetings

- Yeala Shaked participated in the GEOTRACES SSC meeting in Salvador.
- Yeala Shaked presented her synthesis paper on availability of iron to phytoplankton in the ocean using GEOTRACES data during the SCOR FeMIP meeting and ASLO meeting in Portland.

Research

- Y. Shaked spent her sabbatical at UBC with Maita Maldonado during 2016-2017, jointly revisiting and seeking for unifying approaches to evaluate the in situ availability of oceanic dissolved Fe to natural phytoplankton.
- Her research group with 2 PhD students (Nivi Kessler, Siyuan Wang), a post-doc (Sunbhajit Basu), and a research technician (Murielle Dray) continue investigating the bioavailability of dust and mineral iron to cyanobacteria. The study of dust as a source of iron to *Trichodesmium* is conducted with various international collaborators, including Satish Myneni from Princeton (Synchrotron analysis of bio-induced transformations of dust), Rhona Stuart from Livermore National Laboratories (Fe uptake from dust using Nano-Sims), and Martha Gledhill from GeoMar (siderophore identification with Orbitrap mass spectrometer).

Funding

- Funding is provided by the Israeli Science Foundation research grant (PI Y. Shaked): "Bioavailability of particulate Fe to planktonic cyanobacteria", and by the German-Israeli Foundation for Scientific Research and Development (GIF) research grant (PIS Y. Shaked, M. Gledhill and E. Achterberg): "Dust iron utilization by natural *Trichodesmium* colonies"

Related publications in 2017-2018

- Torfstein A, Teutsch N, Tirosh O, Shaked Y, Rivlin T, Zipori A, Stein M, Lazar B, and Y. Erel. 2017. Chemical characterization of atmospheric dust from a weekly time series in the north Red Sea between 2006 and 2010, *Geochimica et Cosmochimica Acta*, 211; 373-393.
- Basu S and Y. Shaked. Mineral iron utilization by natural and cultured *Trichodesmium* and associated bacteria, *Limnology and Oceanography*, In Press.

3. Additional activities at the InterUniversity Institute (IUI) for Marine Sciences of Eilat (location of Adi Torfstein and Yeala Shaked):

A dust collection system has been sampling suspended aerosols on a weekly basis continuously since 2006 on the IUI pier. All samples between 2006-2010 have been measured for major and trace element concentrations on the water-dissolved, acid-leachable and silicate fractions.

The National Monitoring Program (NMP) for the Gulf of Eilat/Aqaba operates out of the IUI (<http://www.iui-eilat.ac.il/Research/NMPAbout.aspx>). Activities include monthly cruises across the north Gulf of Eilat/Aqaba, during which physical, chemical and biological measurements are performed in depth profiles (at a water depth of 700 meters) together with spatial-surface coverage. The main-relevant parameters monitored are:

Temperature, salinity, dissolved oxygen, pH, alkalinity, POC, NO₂, NO₃, Si(OH)₄, PO₄, Chl-a.

The samples are collected with the IUI Research Vessel, which has a powder coated aluminium Rosette (SeaBird) with 12 niskin bottles (12 liters each), and a CTD (SeaBird electronics). These measurements have been performed continuously since the year 2000. Analyses are performed at the IUI labs.

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