

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN ISRAEL

May 1st, 2016 to April 30th, 2017

This report summarizes activities between June 2016 and April 2017 by scientists in Israel that are related to the GEOTRACES objectives. 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.

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

Research & funding

- ***Sediment traps:*** My 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
 - The collected samples are weighted, analyzed for their organic C and N content, $d^{13}C$ and $d^{15}N$ of the organic fraction, major and trace element concentrations of the bulk fraction, ^{230}Th , ^{232}Th , ^{234}U , ^{238}U . Planktonic assemblages are picked from different grain size fractions of the trap material
- ***Dust:*** Two dust samplers are deployed continuously at the IUI.
- ***Seawater:*** seawater profiles are sampled regularly and analyzed for trace element concentrations. The Pb isotopic composition of seawater is also measured on most of these samples. Seawater profiles have been sampled systematically for ^{234}Th .
- ***Funding:*** Funding is provided by the Israel Science Foundation as well as collaborative work funded by the Schulich Science Foundation.

Personnel

- During the reporting period, the HUJI/IUI research group includes: two postdocs (Alison Hartman (now at USGS Missouri), Daniel Palchan), a PhD student (Natalie Tchernichovsky), 3 MSc students (Tal Ben-Altabet, Ortal Sava, Merav Gilboa), an undergraduate research assistant (Ohad Steinberg), and a lab technician (Barak Yarden).
- Israeli and international collaborators include: Dr. Ahuva Almogi-Labin (Geological Survey of Israel), Dr. Stephanie Kienast (Dalhousie University), Dr. Adina Paytan (UCSC), Prof. Jerry McManus (LDEO), Dr. Claudia Benitez-Nelson (U South Carolina)

Related publications

- Torfstein A., Teutsch N., Tirosh O., Shaked Y., Rivlin T., Zipori A., Stein M., Lazar B. and Erel Y. (submitted after revision) Chemical characterization of atmospheric dust from a weekly time series in the north Red Sea between 2006-2010. *Geochimica et Cosmochimica Acta*.
- Torfstein A. and Kienast S.S (in review) No correlation between atmospheric dust and surface ocean chlorophyll-a in the oligotrophic Gulf of Aqaba, northern Red Sea.

Other sampling equipment and facilities at IUI

- A clean lab (class 1000) includes two class 100 workstations, a Teflon coated acid purification system (Analab), two Teflon coated hotplates (Analab), a mq water system, a prepFAST-MC system.
- Eight Teflon coated GO-Flo bottles (12 Liters each), for trace element seawater sampling.
- One McLane WTS-Large Volume pump, 142 mm diameter, LV04.

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

Workshops and meetings

- Yeala Shaked presented and participated in the GEOTRACES synthesis workshop: Biogeochemical cycling of trace elements within the ocean, that took place between 1-4 August 2016 in Lamont-Doherty Earth Observatory, Palisades, NY, USA. She has taken the lead on a synthesis paper on availability of iron to phytoplankton in the ocean using GEOTRACES data.
- Yeala Shaked presented in ASLO in Honolulu research on dust as a source of iron to *Trichodesmium* and had numerous discussions related to the GEOTRACERS synthesis paper

Research & funding

- The research involves 2 PIs (Shaked, Nir Keren), 2 PhD students (Nivi Kessler, Chana Kranzler), a post-doc (Sunbhajit Basu), two research technicians (Murielle Dray, Rachel-Armoza-Zvoluni). 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).
- We combine laboratory studies of cultured cyanobacteria and field studies with natural phytoplankton from Eilat. Emphasis is placed on mechanistic understanding of bio-mediated transformations and uptake of both dissolved and particulate Fe
- The PhD of Chana Kranzler (HUJI) was approved: "Iron acquisition mechanisms in a unicellular, planktonic cyanobacterium"

- Funding is provided by the Israeli Science Foundation for the study of “Bioavailability of particulate Fe to planktonic cyanobacteria”

Related publications in 2016-2017

- Kranzler, C., Kessler, N., Keren, N. and Y. Shaked. 2016. Enhanced ferrihydrite dissolution by a unicellular, planktonic cyanobacterium: insights into the bioavailability of particulate iron. *Environmental Microbiology and Environmental Microbiology Reports*. doi:10.1111/1462-2920.13496
- Schoffman H, Lis H, Shaked Y and N. Keren .2016. Iron–Nutrient Interactions within Phytoplankton. *Frontiers in Plant Sciences*. 7(1223). doi: 10.3389/fpls.2016.01223

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.

Submitted by Adi Torfstein (adi.torf@mail.huji.ac.il).