ANNUAL REPORT ON GEOTRACES ACTIVITIES IN ISRAEL
MAY 2014 – JUNE 2015

This report summarizes activities by scientists in Israel that are related to the GEOTRACES objectives.
Briefly, this report presents the related work of Yeala Shaked, Adi Torfstein, Yishai Weinstein and Boaz Luz. I also provided a paragraph about the work of the Israeli National Monitoring Program, which includes a long and extensive time series of open ocean measurments in the Gulf of Eilat/Aqaba.

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

Seawater analyses: surface seawater from Eilat (north Gulf of Aqaba) was filtered and sent for analysis of trace metals to Martha Geldhill and Eric Acktenberg in Geomar Kiel. These samples are part of a larger experiment where we check dissolution rates of dust in the presence and absence of Trichodesmium and its associated bacteria.
In each experiment we will determine the background metals in the water and then check for metal accumulation / removal following dust only, organism only, dust & organism etc.

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

I operate a sediment trap mooring that has been deployed continuously 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, $\delta^{13}C$ and $\delta^{15}N$ of the organic fraction, major and trace element concentrations of the bulk fraction, 230Th, 232Th, 234U, 238U. Planktonic assemblages are also picked and their chemical composition will be analyzed in the near future.

Different aspects of the above project are funded by the Israel Science Foundation as well as collaborative work with Dr. Stephanie Kienast at Dalhousie University funded by the Schulich Science Foundation.

A first set of seawater samples was analyzed for the dissolved composition of 232Th and 230Th during September 2014.

The Pb isotopic composition of Gulf of Eilat/Aqaba waters was measured at high temporal and spatial resolution during the summer of 2015, in collaboration with Adina Paytan (UCSC).
Trace element concentrations in depth profiles will be measured in the Gulf of Eilat routinely as of the summer of 2015.

Other sampling equipment and facilities:

1. A clean lab (class 1000) was recently constructed by Torfstein at the IUI. It is trace metal free and includes two class 100 workstations, a Teflon coated acid purification system (Analab), two Teflon coated hotplates (Analab) and a mq water system.
2. Eight Teflon coated GO-Flo bottles (12 Liters each), for trace element seawater sampling.
3. One McLane WTS-Large Volume pump, 142 mm diameter, LV04.

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 on a weekly basis continuously since 2006. Sampling takes place on the IUI pier and collects weekly 6-40 mg of suspended aerosols. 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.

Prof. Yishai Weinstein, Bar-Ilan University:
Measurements in the Mediterranean: Ra isotopes, mainly 228, although also short-lived and 226.
Equipment: Just purchased Quantulus 1220 and beta counter (gas proportional) for 234Th etc.
ultra low gamma counter
RaDeCC for short-lived radium isotopes (6 channels)
Rn emanation line + Lucas Cells

Prof. Boaz Luz, Institute of Earth Sciences, Hebrew University of Jerusalem: (background text in brackets):

My involvement in GEOTRACES is in the study of 17O-excess of dissolved O2 in the deep ocean
(Unlike O2 concentration, the excess is a conservative property at depth and indicates conditions at the surface formation regions of deep water masses. In general, low excess means that dissolved O2 is affected only by air-sea gas exchange. In contrast, higher values indicate presence of upper water photosynthesis. We have substantial evidence that NADW in the deep Sargasso Sea does not contain photosynthetic O2. This shows that the source regions in the high latitude N. Atlantic are dominated by air-sea O2 exchange in winter with no effect of photosynthesis).

Samples of deep water from the S. Atlantic were taken for us on GEOTRACES Cruise D357. (Surprisingly, 17O-excess of dissolved O2 in both AABW and NADW were significantly higher than in the N. Atlantic and clearly indicate presence of photosynthetic O2 in the source region where these deep waters formed. This discovery was the basis for writing grant proposals to further investigate how photosynthetic O2 is introduced to the deep ocean.)

I now have a 3 yr funded project from the Israel Science Foundation to work on the deep sea. A major part of the project is documentation of the excess in the open ocean. By generous help from GEOTRACES, we obtained samples from the deep Mediterranean and currently work is underway in two GEOTRACES cruises in the Arctic Ocean. So far we have been able to clearly demonstrate that high 17O-excess is generated when the ocean surfaces is covered by sea ice. Light penetrates through the ice and drives production of new O2, which remains in the surface ocean because the ice cover prevents air-sea gas exchange. Further work will show how much and by what mechanism this photosynthetic O2 finds it way into various parts of the deep ocean.

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