SOLAS Turkey

compiled by Mustafa Kocak and Baris Salihoglu

Notes:
Reporting Period is January 2011 – December 2011
Information will be used for: reporting, fundraising, networking, strategic development & outreach

1. Key scientific SOLAS-relevant highlights/findings (you may include figures and references)

Iron solubility in crustal and anthropogenic aerosols: The Eastern Mediterranean as a case study

Seguret et al., 2011

Study presents seawater dissolution experiments for aerosol samples simultaneously collected across the Levantine Basin (LB, Eastern Mediterranean Sea), a marine system influenced by seasonal atmospheric inputs. Two distinct populations exhibited contrasting kinetic profiles, those representative of strong Saharan dust events which had variable iron release profiles with a maximum solubility of 0.94±1.48 % (1 s.d.) whereas those which had a relatively greater anthropogenic influence had consistent profiles (fast release, ≤ 2h,of dissolved iron in seawater followed by removal) with a maximum solubility of 11.5±9.3 % (1 s.d.). First estimates of atmospheric fluxes of soluble iron a represented, ranging from 8.64±10.76 $mgm^{-2}y^{-1}$ for the Northern LB to 6.48±7.78 $mgm^{-2}y^{-1}$ for the Southern LB. Estimates of Fe fluxes to oceanic basins are important for constraining the global iron budget, and dust dissolution kinetic profiles provide information on the mechanisms involved during the release of aerosol Fe in seawater post atmospheric deposition.

Kinetic dissolution profiles of the two aerosol populations

All anthropogenically influenced aerosols showed similar dissolution profiles (Fig.1.a) with the maximum dFe concentration occurring after 2h of contact with seawater, followed by a fast decrease. The mean maximum solubility for these aerosols was 11.5±9.3 %. The decrease in solubility after 2h may be a result of

(i) re-adsorption onto the aerosol particles on the filter (not the filter itself as no adsorption was apparent while equilibrating the blank filter in seawater) and/or

(ii) conversion of dissolved Fe to particulate species and/or organic complexes.

The mean seawater concentrations of released dissolved Fe for each of the equilibration periods (2, 4 and 8 h) were 11.5±9.3 nM; 4.0±3.5nM; 2.9±3.4 nM, respectively. After 8h, four aerosol samples had dFe concentrations > 2.0 nM. This indicates either (i) equilibrium between dissolved and particulate Fe was not reached after 8h or (ii) equilibrium may have been reached but soluble organic material had also been released, stabilizing higher dFe concentrations. For three of these four aerosol samples, dFe concentrations were not significantly different after 4 and 8h of dissolution, suggesting that equilibrium had been reached and hence the release of soluble organic matter played an important role.

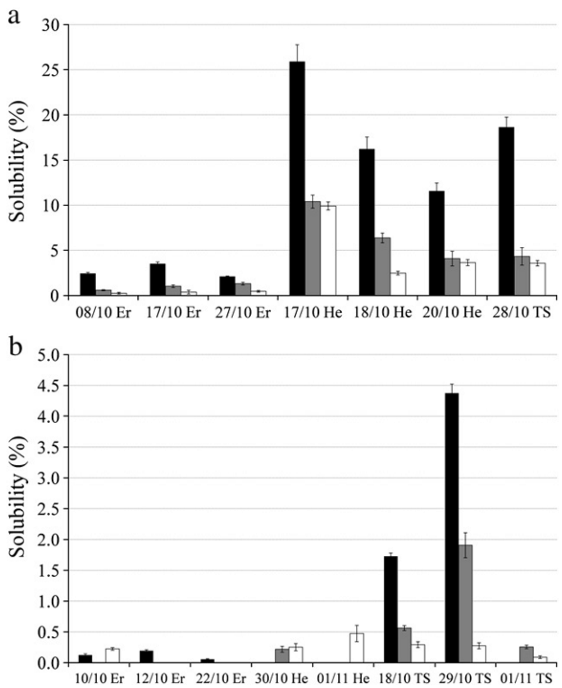

Figure 1. Percent solubility of iron during dissolutions of
a) anthropogenically influenced samples (n=8) and
b) crustally derived samples (n=7) from the three sites overtime (h).
ER= Erdemli,
HE= Heraklion,
TS= Tel-Shikmona
with the corresponding sampling dates (day/month) in 2007.

Black bars= 2h,
Gray bars= 4h and
White bars= 8h.
Error bars= ±1 s.d.

The changes in solubility of crustal aerosol samples with time of seawater equilibration are plotted in Fig.1.b. The overall mean maximum solubility was 0.94±1.48 % for all the samples considered and the maximum was reached at different equilibration times. In contrast to the anthropogenic aerosols, different kinetic trends were observed;

(i) a maximum solubility reached within 2–4 h followed by a decrease,

(ii) an increase in solubility without the attainment of equilibrium during the 8 h study period, and

(iii) no change insolubility with time.

These differences illustrate the contrasting behavior of aerosols from different sources due to their chemical composition and atmospheric aging processes.

Dry atmospheric fluxes of seawater soluble iron over the Levantine Basin

The calculated soluble iron fluxes for the two Levantine sub-basins were 8.79±10.23 $mgm^{-2}y^{-1}$ for the NLB and 9.01±9.94 $mgm^{-2}y^{-1}$ for the SLB. Having calculated the depositional fluxes it is then possible to calculate the atmospheric inputs across the Northern and Southern Basins, assuming the surface areas are 111,000 and 436,000 km^2 respectively (Ludwing and Maybeck,2003). The soluble iron inputs for the two basins ranged from 960±1100 ty^{-1} for NLB to 3900±4300 ty^{-1} for SLB. The NLB had lower inputs of soluble iron compared with the SLB, mainly as a result of the larger defined surface area of the SLB. Such a difference between the two basins has also been observed by Koçak et al. (2005).

2. Activities/main accomplishments (research projects, cruises, special events, workshops, remote

sensing used, model and data intercomparisons etc)

IMS METU is granted an infrastructure project by the state funding agency to establish the Center for Marine Ecosystems and Climate Research (CMECLIM). CMECLIM aims to develop and to test analysis systems for the operational synoptic description of the environmental status of the Mediterrenean, Marrmara and Black Sea coastal waters. ECOCLIM aims to provide knowledge tools that can help authorities and other stakeholders to manage routine tasks, emergency situations and evaluate trends. Within the framework of CMECLIM a new atmospheric sampling site with a tower will be established on the Black Sea coast.

3. Human dimensions (outreach, capacity building, public engagement etc)

Marine Ecosystem Evolution in a Changing Environment (MEECE) Summer School 7-14 September 2011, Ankara, METU campus

Venue: Functioning and Evolution of marine ecosystems

The main objective of this course was to advance the scientific knowledge in a group of young people, with a marine sciences academic background. More specifically, the aims of the summer school are to help the students to:

- Understand the mechanisms, functioning and evolution of marine Ecosystems
- Assess the state of these ecosystems by taking into account their unique environmental drivers and pressures from natural and anthropogenic sources
- Learn innovative ways of integrating predictive models that resolve global change driver, changes in ocean circulation, climate, ocean acidification, pollution, over fishing and alien invasive species into available circulation-biogeochemical models.
- Address non linear combinations of driver impacts in a dynamic environment by using numerical simulation models which include dynamic feedbacks.
- Learn what is ecosystem-based approach to management?

4. Top 10 publications in 2011 (Reports, articles, models, datasets, products, website etc)

Im, U., Poupkou, A., Incecik, S., Markakis, K., Kindap, T., Unal, A., Melas, D., Yenigun, O., Topcu, S., Odman, M. T., Tayanc, M., Guler, M., (2011) The impact of anthropogenic and biogenic emissions on surface ozone concentrations in Istanbul. Science of the Total Environment, 409, 7, 1255-1265

Kanakidou, M., Mihalopoulos, N., Kindap, T., Im, U., Vrekoussis, M., Gerasopoulos, E., Dermitzaki, E., Unal, A., Kocak, M., Markakis, K., Melas, D., Kouvarakis, G., Youssef, A.F., Richter, A., Hatzianastassiou, N., Hilboll, A., Ebojie, F., Wittrock, F., von Savigny, C., Burrows, J.P., Ladstaetter-Weissenmayer, A., Moubasher, H., (2011) Megacities as hot spots of air pollution in the East Mediterranean. Atmospheric Environment, 45, 6, 1223-1235.

Korotaev, G.K., Oguz, T., Dorofeyev, V.L., Demyshev, S.G., Kubryakov, A.I., Ratner, Yu.B., (2011) Development of Black Sea nowcasting and forecasting system. Ocean Science, 7, 5, 629-649.

Kose, N., Akkemik, U., Dalfes, H.N., Ozeren, M.S., (2011) Tree-ring reconstructions of May-June precipitation for western Anatolia. Quaternary Research, 75, 3, 438-450.

Koçak, M., Theodosi, C., Zarmpas, P., Im, U., Bougiatioti, A., Yenigun, O., Mihalopoulos, N., (2011) Particulate matter (PM10) in Istanbul: Origin, source areas and potential impact on surrounding regions. Atmospheric Environment, 45, 38, 6891-6900.

Philippart, C.J.M., Anadon, R., Danovaro, R., Dippner, J.W., Drinkwater, K.F., Hawkins, S.J., Oguz, T., O'Sullivan, G., Reid, P.C., (2011) Impacts of climate change on European marine ecosystems: Observations, expectations and indicators. Journal of Experimental Marine Biology and Ecology, 100, 1-2, 52-69.

Salihoglu B., Fach B. A., Oguz T., (2011) Control mechanisms on the ctenophore Mnemiopsis population dynamics: A modeling study. Journal of Marine Systems, 87, 1- 55-65.

Seguret, M.J.M., Kocak, M., Theodosi, C., Ussher, S.J., Worsfold, P.J., Herut, B., Mihalopoulos, N., Kubilay, N., Nimmo, M., (2011) Iron solubility in crustal and anthropogenic aerosols: The Eastern Mediterranean as a case study. Marine Chemistry, 126, 1-4, 229-238.

Sen, O. L., Unal, A., Bozkurt, D., Kindap, T., (2011) Temporal changes in the Euphrates and Tigris discharges and teleconnections. Environmental Research Letters , 6, 2. DOI: 10.1088/1748-9326/6/2/024012

Tugrul, S., Uysal, Z .,Erdogan, E., Yucel, N., (2011) Changes of Eutrofication Indicator Parameters (TP, DIN, Chl-a and TRIX) in the Cilician Basin (Northeast Mediterranean). Ekoloji, 20, 80, 33-41.

Vladymyrov, V., Kideys, A. E., (Myroshnychenko, V., Slipetsky, D., Shiganova, T., Abolmasova, G., Bingel, F., Tezcan, D., Ak, Y., Anninsky, B., Bat, L., Finenko, G., Gorbunov, V., Isinibilir, M., Kamburska, L., Mihneva, V., Ozdemir, Z. B., Romanova, Z., Sergeyeva, O., Stefanova, K., Xalvashi, M., (2011) A basin-wide Black Sea Mnemiopsis leidyi database. Aquatic Invasions, 6, 1, 115-122.

Yigiterhan, O., Murray, J.W., Tugrul, S., (2011) Trace metal composition of suspended particulate matter in the water column of the Black Sea. Marine Chemistry, 126, 1-4, 207-228.

5. International interactions and collaborations (including contributions to international assessments such as the IPCC, links with observation communities etc)

IMS- METU collaborates with Barak Herut (group leader), Ilana Berma-Frank, Michael Krom, Travis Meador, Christos Panagiotopoulos, Eyal Rahav and Nikolaos Mihalopoulos in the framework of mesocosm experiment BioDustMix (MESOAQUA, EC contract no: 228224).

6. Goals, priorities and plans for future activities/events

IMS-METU group is planning to improve laboratory infrastructures and obtain new instruments. The first year's motto is to have a Central Laboratory and instruments such as moored profiler, profiling floats, gliders and ion chromatography.

7. Other comments