

SOLAS TURKEY

compiled by Baris Salihoglu

Notes:

Reporting Period is January 2009 – December 2009

Information will be used for: reporting, fundraising, networking, strategic development & outreach

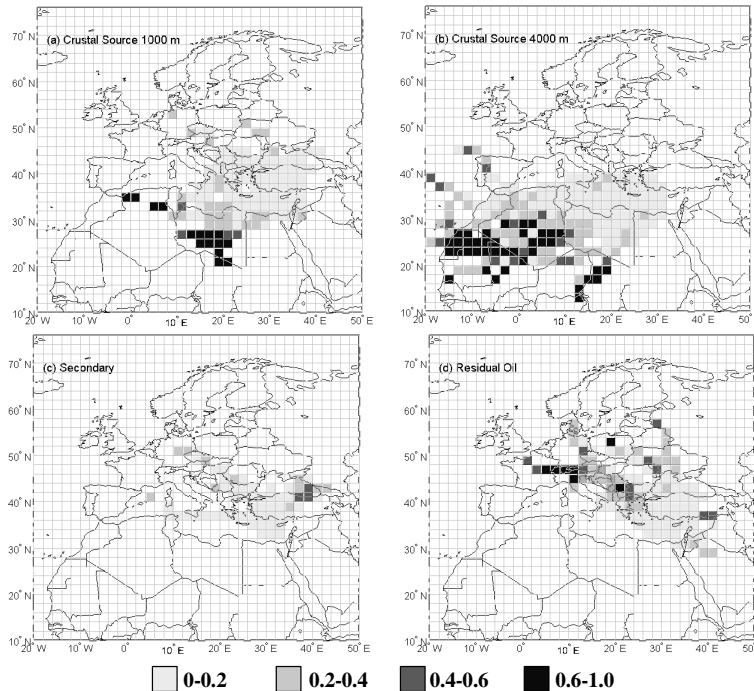
1. Scientific highlights

Origin and source regions of PM₁₀ in the Eastern Mediterranean atmosphere

Daily PM₁₀ aerosol filters were collected from a rural site located on the coastline of the Eastern Mediterranean, Erdemli/IMS-METU (36° 33' 54" N and 34° 15' 18" E, at about 22 m above sea level and 10 meters away from sea), Turkey between April 2001 and April 2002.

The Potential Source Contribution Function (PSCF) analysis has been applied to identify potential source areas of PM₁₀ monitored at Erdemli station (IMS-METU). PSCF maps [Fig] highlighted that the Saharan desert is the main source area for crustal components. Secondary aerosol components could only be associated with the south-Eastern Black Sea, whereas Southern Germany, Northern Italy, Eastern France, Central Poland, the former Republic of Yugoslavia and Albania was identified as the main source regions for residual oil [1].

1. Origin and source regions of PM₁₀ in the Eastern Mediterranean atmosphere (2009). Atmospheric Research 92, 464–474.



Distribution of PSCF values for factor scores higher than 1 of crustal (1000 m, a), crustal (4000 m, b), secondary (c) and residual oil (d). Only statistically significant PSCF values at the 95 % confidence level are shown.

Dust cloud interactions, in cloud formation of reduced iron, formation of amino acids and its impact on receiving bodies

It has been shown that desert dust and cloud interactions leads to the formation of reduced iron within cloud droplets provided that the solar radiation is above some threshold level (Saydam and Senyuva, 2002). Following this pioneering work it has further been shown that this specific nature is not only specific to Saharan desert dust. Soil samples collected from various points around Afghanistan have further shown that the ephemeral lake located in south-western Afghanistan acts not only as a dust and reduced iron source but also supplies ample amounts of nitrate and nitrite during the course of NWM over Arabian sea.

The impacts of desert origin dust on various environments have also been investigated. It has been further shown that wet dust deposition of desert origin dust enhances algae growth on aqueous environments. Experiments carried out by using *Spirulina plantesis sp* illustrated that similar growth rates obtained by using desert dust and well balanced fertilizer (Zarrouk soln) solutions. Gözde (2005).



The lower atmosphere is also important for us since the air we breathe is also located in the lower atmosphere. Thus any change or alterations in the composition of air also affects us. It has been shown for the first time that Saharan desert dust transport also activates trigeminovascular system. (Doganay et al., 2009) The massive HAB observed over the Persian Gulf during 2009/10 and during late 2009 has also been investigated in detail through satellite based remote sensing and by using archived meteorological data. Despite various arguments it was possible to show that each bloom event is in fact associated with wet desert dust deposition.

2. Main accomplishments (research projects, cruises, special events, workshops, outreach, capacity building, remote sensing used etc)

METU-IMS Group participated to Sesame Cruise during March-April and September-October 2008. For this purpose, group organized and programmed aerosol studies during cruises. Recently, group has involved in CityZen project.

The group has focused on

- a) Aerosol chemical characterization of the Eastern Mediterranean
- b) Solid state speciation method to assess bioavailable fractions of trace metals
- c) Possible impact of atmospheric (dry and wet) and riverine inputs of nutrients [such as NO_3^- , NH_4^+ , PO_4^{3-} and Si_{diss}] onto surface waters of Northeastern Mediterranean.
- d) Identification of the relationship between aerosol chemical composition and aerosol physical properties (such as aerosol optical thickness and angstrom coefficient) in the Eastern Mediterranean

Southern European Seas: Assessing and Modelling Ecosystem change (SESAME) project

Currently the Turkish research vessel R/V Bilim's cruises are ongoing as part of the [SESAME](http://144.122.146.197/SESAME/index.asp) (<http://144.122.146.197/SESAME/index.asp>) project under FP6 of EC. During the oceanographic cruise in the Mediterranean, the Aegean Sea, the sea of Marmara and the Black Sea, aerosol samples have been collected.

On the other hand IMS-METU has an atmospheric sample collection tower located at the campus of IMS-METU which is located on the Turkish coast of the eastern Mediterranean. Aerosol and rain samples have been collected on the tower to perform nutrient (nitrate, ammonium, phosphate, silicate) analyses since 1999.

Climatic Importance of Aerosols above the Eastern Mediterranean Area

A comprehensive study was conducted on the chemical and optical aerosol characteristics and their interrelation, for the eastern Mediterranean (Turkish Scientific and Technical Research Council –TUBITAK, 105Y368). This is a region where the direct radiative forcing by anthropogenic and natural aerosols is expected to be much larger than average, and for which model calculations suggested that anthropogenic sulphate levels and their direct radiative effects are very pronounced. At sites in Crete (Greece) and in Erdemli (Turkey) long –term measurements have been performed of (a) the chemical and optical characteristics of the boundary layer (in situ) aerosol, (b) the column integrated optical depth, aerosol size distribution. The various data sets obtained have been interrelated to each other to assess to what extent the ground-level in situ aerosol characteristics are representative for, are related to, or can be used for the prediction of the chemical and optical aerosol properties in the entire vertical column.

Evaluation of the Seawater solubility of Fe in the Eastern Mediterranean Aerosol

Project started in September 2007 (NATO collaborative Linkage Grant, CLG – Ref 982862). The study aims to develop and test a novel approach to determine the seawater solubility of aerosol Fe, to determine the seawater solubility and solid state speciation of Fe in (i) the Eastern Mediterranean marine aerosol (range of aerosol population types – ranging from anthropogenically dominated to Saharan dust dominated populations) at three contrasting sites (ii) changing seawater solubility and solid state speciation of Fe (and other trace metals) during the transport of intense Saharan dust events and to define the change in chemical composition (major, minor and water soluble constituents) of the marine aerosol during the passage of intense Saharan dust events over the Levantine Basin of the Eastern Mediterranean.

megaCITY-Zoom for the Environment

The main objectives of CityZen project (megaCITY-Zoom for the Environment, FP7 IP) are:

quantify and understand current air pollution distribution and development in and around megacities/hot spot regions, estimate the future impact from emission changes with a focus on the effect of rapid growth in the population of megacities/hot spots, estimate how megacities/hot spots influence climate change, develop tools to estimate interactions between different spatial scales (megacities to global) and bring the scientific results and methods developed and applied during the course of the project to semi-operational use with those consortium partners that on a more permanent basis provide technical underpinning of policy work.

METEOROLOGY / OCEANOGRAPHY NETWORK OF EXCELLENCE (MOMA) PILOT PROJECT

Within the context of MOMA project (<http://144.122.146.46>) there are two workpackages that focus on regional atmospheric models and aerosol dust transport models.

URBAN WASTEWATER MANAGEMENT ALONG COASTAL AREAS OF TURKEY: REIDENTIFICATION OF HOT SPOTS & SENSITIVE AREAS (SINHA) Pilot Project

Atmospheric versus river nutrient inputs into the NE Mediterranean (Cilician Basin) will be analysed. Within the context of this project certain atmospheric and marine hydrodynamic models coupled with ecosystem models will be used. Observed atmospheric inputs will be used in the model to test the influence of atmospheric pollutants on the defined sensitive areas.

AERONET

IMS-METU is also part of AERONET (<http://aeronet.gsfc.nasa.gov/>) network. A sunphotometer belonging to the network has been collecting data since 1999 and a readily accessible public domain database can be reached via the URL site given below.

http://aeronet.gsfc.nasa.gov/cgi-bin/type_one_station_opera_v2_new?site=IMS-METU-ERDEMLI&nachal=2&level=1&place_code=10

Modelling phosphorus and nitrogen cycles at oxic-anoxic interfaces in the water column

This is an IMS-METU/IFM-GEOMAR collaborative project

The main focus of the project is to analyse how the O₂ sensitive cycles of P and N affect productivity and atmospheric CO₂ in ocean basins of decreased O₂ (i.e. in the Black Sea basin).

Climate change scenarios for Turkey

This project is carried out by Istanbul Technical University (ITU) by H. Nüzhet Dalfes Mehmet Karaca, Ömer Lütfi Şen, Tayfun Kindap, Ozan M. Göktürk, Deniz Bozkurt, Altuğ Ekici). The group from ITU specifically focuses on development of the On-Line MM5 Tracer Model and its Applications to Air Pollution Episodes in Istanbul Turkey and Sahara Dust Transport and Quality control and homogeneity of Turkish precipitation data.

Observations of climate change and variability in Turkey.

The influence of atmospheric oscillation indices (i.e. ENSO, NAO, NCP, AO) on climate change and variability in Turkey.

Research under these two topics is carried out by Prof. Murat Turkes and his group from Canakkale 18 Mart University (fef.comu.edu.tr/cografya/index.html).

COMU group has contributed to UN Climate Change treaty and Kyoto protocol text and carries out research on a variety of topics such as sustainable development, energy and climate change, climate of Turkey, synoptic climatology and meteorology, paleoclimate, observed climate change and variability.

3. Top 10 publications in 2009 (Reports, articles, models, datasets, products, website etc)

Koçak M., Mihalopoulos N., Kubilay N., 2009. Origin and source regions of PM10 in the Eastern Mediterranean atmosphere. *Atmospheric Research* 92, 464–474.

Türkeş, M., Koç, T. and Sarıç, F. 2009. Spatiotemporal variability of precipitation total series over Turkey. *International Journal of Climatology* 29: 1056-1074.

Doganay H, Akcali D, Goktas T, et al. (2009) *African dust-laden atmospheric conditions activate the trigeminovascular system. CEPHALALGIA*, 29, 1059-1068.

Tayanc, M., Im, U., Dogruel, M. and Karaca, M. (2009) Climate change in Turkey for the last half century. *Climatic Change* 94:483–502. DOI 10.1007/s10584-008-9511-0

Salihoglu, B. (2009) Effects of ENSO on the Cold Tongue and the Warm Pool ecosystems in the equatorial Pacific Ocean: a modelling study. *Journal of Marine Systems*. DOI:10.1016/j.jmarsys.2008.12.004.

Querol, X., Alastuey, A., Pey, J., Cusack, M., Perez, N., Mihalopoulos, N., C. Theodosi, C., E. Gerasopoulos E., Kubilay N., and Kocak M, 2009. Variability in regional background aerosols within the Mediterranean. *Atmospheric Chemistry and Physics* 9, 4575–4591

4. International interactions and collaborations

IMS- METU collaborates with Prof Nikos Mihalopoulos (Environmental Chemical Processes Laboratory, Department of Chemistry, University of Crete, POBox 2208, 71003 Voutes, Heraklion, Greece) within the cityZen and TUBITAK/GSRT frameworks

IMS-METU collaborates with Dr Malcolm Nimmo (Plymouth Environmental Research Center, School of Environmental Sciences, University of Plymouth, UK), Dr Barak Herut (Israel Oceanographic & Limnological Research, National Institute of Oceanography, P.O.Box 8030, Haifa 31080, ISRAEL) within the framework of a NATO linkage project.

IMS-METU and CNRS (Veronique Garcon), IFM-GEOMAR (Andreas Oschlies) and Istanbul Technical University (e.g., Mehmet Karaca, Namik Cagatay) collaborates on various SOLAS related projects.

5. Goals and plans for future activities

Examine nutrient input via atmospheric pathway to the surface ocean and assess its importance comparing with other sources such as riverine. Understand the key points of atmospheric nutrient deposition and biological impacts, the links between atmospheric deposition, ocean productivity and nutrient cycling and assess fertilization capacity of atmospheric input and response to surface ocean to input via atmospheric pathway. We are hoping to have a COST 735 meeting on the topic in Istanbul.

Both the hydrological and biochemical cycles involve land based and atmospheric inputs of materials and inputs from the sea into the atmosphere. There exist large uncertainties in materials introduced from land, and especially the river catchments and population centers of the Mediterranean and Black Sea region. The ratio of atmospheric inputs of nutrients (and other materials) into the sea is also of considerable magnitude. Observations and modeling of land-based and atmospheric particulate and freshwater transports therefore have to be given priority. We are hoping that EU FP7 calls can be opened on these topics, we are also planning to apply for national funding on the topics.

Investigate the impact of wet dust deposition on a global basis by using, MODIS Aqua or Terra



Annual Report for the year 2009:

satellite archives to identify regions where phytoplankton bloom is observed, TRMM wet deposition data archive to check the wet deposition, NOAA ARL HYSPLIT model to assign backtrajectory analysis for each wet dust deposition event.

6. Other comments

We are forming the SOLAS Turkey network, the core group members for now are: Baris Salihoglu, Mustafa Kocak, Temel Oguz, Emin Ozsoy, Nilgun Kubilay (IMS-METU), Mehmet Karaca, Tayfun Kindap (ITU), Murat Turkes (COMU), Cemal Saydam (HU), Mete Tayanc (CIU).

As mentioned above we are hoping to organize a COST 735 meeting in Istanbul which will also be a strong contribution towards emerging the SOLAS programme in Turkey.