October 5, 2011

FROM: Terry Marasco, POB 69 Baker, NV 89311 775-234-7323 tmarasco@sbcglobal.net

TO: Susan Joseph-Taylor, Chief Hearing Officer, Office of the State Engineer, 901 South Stewart Street, Suite 2002 , Carson City , NV 89701

RE: Comments to BLM DEIS **Clark, Lincoln, and White Pine Counties Groundwater Development Project Draft EIS, 3.1 Air and Atmospheric Values**

Dear Ms. Joseph-Taylor:

Please include these comments to the BLM in the State Engineer's analysis. Of particular note is the Cahill letter to me. Overall the BLM analysis of air resources is seriously flawed and should not be considered by the state engineer.

BLM's discussion of particulate transport is seriously flawed and I recommend that the DEIS decision be delayed until a full study is done on this issue. Hundreds of articles on particulate transport over vast areas in the hundreds of miles (e.g., Saharan desert duct to Europe) are noted and available. The statement **("Most emissions in the PM10 size range will decrease exponentially during downwind transport as they are removed from the atmosphere due to gravitational forces (Hinds 1999). Ultra fine particles, less than 0.1 micron in diameter, are June 2011 BLM Chapter 3, Page 3.1-60 Chapter 3, Section 3.1, Air and Atmospheric Values Cumulative Impacts removed from the atmosphere by diffusion to surfaces and also do not travel very far downwind (Hinds 1999). Only a very small fraction of wind erosion emissions from the cumulative project area are expected to be transported into Salt Lake County, Utah, which is over 50 miles from the closest area expected to be impacted by groundwater drawdown")** cannot be supported by extensive literature on the transport of particulates which state they can travel hundreds of miles and certainly to the Wasatch Front in Utah.

This project will generate **34,742 TONS of windblown dust PER YEAR,** containing radioactive materials deposited downwind from the nuclear testing as well as heavy metals that impact human health such as asbestos, zinc, cadmium and selenium.

The DEIS quotes Professor Hinds' textbook on aerosol particles (dust) and insinuates they fall out rapidly. I spoke with Dr. Hinds yesterday and this was what he stated. First it depends on the extent and force of a dust storm. He acknowledged the incident where dust was settling in Los Angeles carried hundreds of miles from the dry Owens lakebed. There is a volume of research on dust being carried for hundreds of miles such as comes to the Wasatch Front from the west desert.

This from: Properties of dust aerosol particles transported to Portugal from the Sahara desert, FRANK WAGNER et al., 2008: "Desert dust is one of the major constituents of natural aerosol particles in the atmosphere and the African Sahara is the largest desert area and also the primary dust source on Earth (Washington et al., 2003). Particles originating from there are transported over **several thousands of kilometres** over the Atlantic Ocean as far as North America (see e.g. Prospero, 1999), and over Europe reaching northern latitudes as far as England, Northern Germany and Denmark (Ansmann et al., 2003). A desert dust outbreak is also one of the main causes, which leads high PM10 particle mass concentrations in Southern Europe (see e.g. Rodríguez et al., 2001; Borge et al., 2007)."

I also asked Dr. Hinds about this statement in the DEIS: "Ultra fine particles, less than 0.1 micron in diameter, are removed from the atmosphere by diffusion to surfaces and also do not travel very far downwind (Hinds 1999)." Dr. Hinds called this statement "a stretch".

Additionally, the effects of dust transport over terrain variety needs to be studied further:

1) Reheis, M. C. (1997), Dust deposition downwind of Owens (dry) Lake,

1991–1994: Preliminary findings, J. Geophys. Res., 102(D22), 25999-26008.

ABSTRACT: Salt-rich dust derived from the Owens Lake playa is deposited in significant quantities to distances of at least 40 km north and south of the playa. Semiannual measurements from 1991 to 1994 of dust deposition rates (dust flux) and composition 2 m above the ground at seven sites in Owens Valley show that (1) dust in Owens Valley is derived mainly from the playa, although areas closer to the sites can also be sources; (2) south of the playa, dust flux is higher in the winter than in the summer, but north of the playa, dust flux is about the same or slightly lower in the winter; (3) on the playa, interannual variation in dust flux is large (factors of 5–10 during the 3 years), but at downwind sites, the variation is much smaller; (4) the dust typically has total soluble salt content as high as 30%, generally much higher than that of dust elsewhere in southern Nevada and California; and (5) to a distance of at least 40 km south of the playa, soluble salt flux is significantly higher than regional rates. The dust flux measurements indicate that significant quantities of salt-rich dust are probably being added to the soils in the region around Owens Lake playa; these dust additions may affect soil p H and vegetation.

2) Cahill, T. A., T. E. Gill, J. S. Reid, E. A. Gearhart, and D. A. Gillette (1996), Saltating particles, playa crusts and dust aerosols at Owens (dry) Lake, California, Earth Surface Processes and Landforms, 21(7), 621-639.

ABSTRACT: As part of the multinational Lake Owens Dust Experiment (LODE), we have studied the generation of dust storms on the south sand sheet of Owens (dry) Lake, California, an anthropogenically desiccated playa reported to be the single greatest source of particulate matter in North America. During March 1993, we performed an intensive field study including eight significant dust storms, building on our prior work (1978–1984) and preliminary studies (1991–1992). We studied sources and magnitude of coarse saltating particles, the meteorological conditions that allow them to become mobile across the flat playa of Owens (dry) Lake, and how the motion of saltating particles across different types of playa surfaces results in the generation of PM10 dusts (aerosol particles smaller than 10 μm aerodynamic diameter). Saltating grains of lacustrine sand and broken crust abrade and disaggregate the playa surface into fine aerosols, and the resulting PM10 concentrations recorded during major dust storms are among the highest ever recorded in North America. On 23 March 1993, we measured a 2 h concentration on the playa of 40 620 μg m−3, as far as we can determine the highest ambient PM10 value ever recorded in the U.S.A. Abrasion of salt-silt-clay crusts by saltation is shown to be responsible for all but a small part of one dust storm. The quantity 'sand run', saltating particle transport multiplied by wind run, is shown to be very closely correlated with dust aerosol concentration. Finally, we have established that on-lake bed studies are essential for quantitative prediction of dust events on the Owens (dry) Lake bed, despite the difficult conditions encountered.

3) Breshears, D. D., J. J. Whicker, C. B. Zou, J. P. Field, and C. D. Allen (2009), A conceptual framework for dryland aeolian sediment transport along the grassland-forest continuum: Effects of woody plant canopy cover and disturbance, Geomorphology, 105(1-2), 28-38, doi:doi:

DOI: 10.1016/j.geomorph.2007.12.018.

ABSTRACT: Aeolian processes are of particular importance in dryland ecosystems where ground cover is inherently sparse because of limited precipitation. Dryland ecosystems include grassland, shrubland, savanna, woodland, and forest, and can be viewed collectively as a continuum of woody plant cover spanning from grasslands with no woody plant cover up to forests with nearly complete woody plant cover. Along this continuum, the spacing and shape of woody plants determine the spatial density of roughness elements, which directly affects aeolian sediment transport. Despite the extensiveness of dryland ecosystems, studies of aeolian sediment transport have generally focused on agricultural fields, deserts, or highly disturbed sites where rates of transport are likely to be greatest. Until recently, few measurements have been made of aeolian sediment transport over multiple wind events and across a variety of types of dryland ecosystems. To evaluate potential trends in aeolian sediment transport as a function of woody plant cover, estimates of aeolian sediment transport from recently published studies, in concert with rates from four additional locations (two grassland and two woodland sites), are reported here. The synthesis of these reports leads to the development of a new conceptual framework for aeolian sediment transport in dryland ecosystems along the grassland–forest continuum.

The findings suggest that: (1) for relatively undisturbed ecosystems, shrublands have inherently greater aeolian sediment transport because of wake interference flow associated with intermediate levels of density and spacing of woody plants; and (2) for disturbed ecosystems, the upper bound for aeolian sediment transport decreases as a function of increasing amounts of woody plant cover because of the effects of the height and density of the canopy on airflow patterns and ground cover associated with woody plant cover. Consequently, aeolian sediment transport following disturbance spans the largest range of rates in grasslands and associated systems with no woody plants (e.g., agricultural fields), an intermediate range in shrublands, and a relatively small range in woodlands and forests. These trends are consistent with previous observations relating large rates of wind erosion to intermediate values for spatial density of roughness elements. The framework for aeolian sediment transport, which is also relevant to dust fluxes, wind erosion, and related aeolian processes, is applicable to a diverse suite of environmental challenges, including land degradation and desertification, dust storms, contaminant transport, and alterations of the hydrological cycle.

It is clear to me from these citations that your analysis cannot be supported by the literature.

Also herein is a letter from Thomas A. Cahill, Professor of Physics and Atmospheric Sciences and Head, DELTA Group:

UNIVERSITY OF CALIFORNIA, DAVIS

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DELTA GROUP

CHEMICAL ENGINEERING AND MATERIALS SCIENCE /PHYSICS/

ATMOSPHERIC SCIENCES / APPLIED SCIENCE
(530) 752-4674; (530) 752-1120

UNIVERSITY OF CALIFORNIA, DAVIS (530) 752-9804 FAX

ONE SHIELDS AVENUE tacahill@ucdavis.edu

DAVIS, CA 95616
http://delta.ucdavis.edu

July 18, 2008

To: Terry Marasco

Silver Jack Inn & LectroLux Cafe

POB 69, Baker NV 89311

From: Thomas A. Cahill

Professor of Physics and Atmospheric Sciences and

Head, DELTA Group

Re: Impacts of water withdrawals

I have considerable experience with drying lake playas and the dust they generate, and am strongly concerned that water withdrawals from existing lakes and playas will cause vast violations of US EPA air quality standards from blowing dust.

I was principal investigator of extensive studies of Owens (dry) lake and Mono Lake for the Air Resources board, 1978 – 1984, principal investigator for the CA State lands Commission at Owens lake 1991 – 1994, expert for the Mono lake Committee 1982 – 1992, and expert witness for the CA State Lands Commission (which controls Owens lake bed) in the CA Water Resources Control Board hearings, from 1992 – 1994.

In the first ARB report 1979, we documented the impact of LA Water and Power's drying up of the playa of Owens Lake in the 1920s, which was causing massive dust storms for 50 years with no hint of ever stopping. The flat dried lake bed erodes in strong desert winds, generating not just sand but inhalable fine particles that, in the cases of Owens and Mono playas, contain toxics such as arsenic.

It is my expert opinion that these potential impacts be fully investigated prior to any decision to withdraw any water from desert valleys, and if as I suspect such problems will occur, withdrawals can not be tolerated without violations of federal air quality statues. Sevier Lake, in particular, causes me concern.

Reports:

Final Report to the California Air Resources Board on Contract No. A7-178-30. A Study of Ambient Aerosols in the Owens Valley Area. November 1979

Barone, John B.; Kusko, Bruce.; Ashbaugh, Lowell H.; Cahill, Thomas A.

Final Report the California Air Resources Board on Contract No. A9-147-31

The Effect of Mono Lake on the Air Quality in the Mono Lake Region

Kusko, Bruce H.; Barone, John B.; Cahill, Thomas A.

September 1981

Final Report to the California Air Resources Board on Contract No. A1-144-32

Study of Particle Episodes at Mono Lake

Kusko, Bruce H.; Cahill, Thomas A.

April 1984

Report to the Community and Organization Research Institute

Air Quality at Mono Lake

Cahill, Thomas A.; Gill, Thomas E.

April 1987

Mitigation of Windblown Dusts and Reclamation of Public Trust Values, Owens Lake, California: *Partial Mitigation of PMIO Episodes Through Control of Salting Particles and Reduction of Wind Shear.*

Final Report to the California State Lands Commission on Contract No. C9175.

Submitted by: Air Quality Group Crocker Nuclear Lab and Dept. of Land Air and Water Resources University of California Davis- CA 95616.

October 12, 1995. Prepared By: *Thomas A. Cahill, Thomas E. Gill, Scott A. Copeland, Michael S. Taylor, Kyle S. Noderer, Bruce R. White, Hyon M. Cho, Michael A. Patterson, Mee Ling Yau, Gregory A. Torres, Dabrina D. Dutcher, and Tezz Niemeyer.*

Publications:

Cahill, T.A., L.L. Ashbaugh, R.A. Eldred, P.J. Feeney, B.H. Kusko, and R.G. Flocchini. **Comparisons between size-segregated resuspended soil samples and ambient aerosols in the western United States.** *Atmospheric Aerosol: Source/Air Quality Relationships.* E. Macias, Editor. No. 15:270-285. American Chemical Society Symposium Series, No. 167 (1981).

Barone, J.B., L.L. Ashbaugh, B.H. Kusko, and T.A. Cahill. **The effect of Owens Dry Lake on air quality in the Owens Valley with implications for the Mono Lake area.** *Atmospheric Aerosol: Source/Air Quality Relationships.* P. Radke, Editor. No. 18:327-346. ACS Symposium Series, No. 167 (1981).

Gill, Thomas E. and Thomas A. Cahill. **Playa-generated dust storms from Owens Lake.** *IN the History of Water: Eastern Sierra Nevada, Owens Valley, White-Inyo Mountains.* Clarence A. Hall, Jr., Victoria Doyle-Jones, and Barbara Widawski; Editors. Proceedings of the Fourth White Mountain Research Station Symposium. University of California, Los Angeles, CA. Vol. 4, Pp. 63-73 (1992).

Gill, Thomas E. and Thomas A. Cahill. **Drying saline lake beds: A regionally significant PM_{10} source. Transactions of the PM_{10} Standards and Nontraditional Particulate Source Controls.** Air & Waste Management Association/EPA International Specialty Conference. January 12-15, 1992. *Air & Waste Management Association.* Judith C. Chow and Duane M. Ono, Editors. Vol. I, No. 22, Pp. 440-454 (1992).

Reid, Jeffrey S., Thomas A. Cahill, Robert G. Flocchini, Bruce White, Micheal R. Dunlap, and Duane M. Ono. **Characteristics of fugitive dusts generated at Owens Lake (dry), California, during the fall dust season.** A&WMA Conference, Denver, CO, June 13-18, 1993. *Air & Waste Management Association,* paper number 93-TA-28.03.

Reid, J.S., Flocchini, R.G., Cahill, T.A., Ruth, R.S., and Salgado, D.P. **Local Meteorological Transport, and Source Aerosol Characteristics of Late Autumn Owens Lake (Dry) Dust Storms. 1994** *Atmospheric Environment,* Vol. 28, No. 0, pp. 1699-1706

Thomas Cahill, Dale Gillette, D.W. Fryrear, Trevor Ley, Elizabeth Gearhart, Thomas Gill. **Ratio of Vertical Flux of PM10 to Total Horizontal Mass Flux of Airborne Particles in Wind Erosion for a Loam Textured Soil: Results of the Lake Owens Dust Experiment (LODE).** 1995 *Air and Waste Management Association,* 88th Annual Meeting, San Antonio, Texas, Paper No. 95-TA38.02, pp. 1-16.

Cahill, Thomas A., John J. Carroll, Dave Campbell, Thomas E. Gill. **Status of the Sierra Nevada, Chapter 48, Air Quality.** 1996 *Sierra Nevada Ecosystem Project, Final Report to Congress.* Wildland Resources Center Report No. 37, University of California, Davis. Volume II, Chapter 48, 1227-1261.

Gill T., **Eolian sediments generated by anthropogenic disturbance of playas: Human impact on the geomorphic system, geomorphic impacts on the human system.** 1996 Abstract published in Occasional paper #2, Desert Research Institute Quaternary Sciences Center, Presented at the *Conference on Eolian Response to Global Change, Zzyzx, CA*, March 1994. *Geomorphology* Vol. 17:207-228.

Cahill, Thomas A., Thomas E. Gill, Jeffrey S. Reid, and Elizabeth A. Gearhart. **Saltating particles, playa crusts and dust aerosols from Owens (Dry) Lake, California. 1996** Abstract published in Occasional Paper #2, Desert Research Institute Quaternary Sciences Center, Presented at the *Conference on Eolian Response to Global Change, Zzyzx, CA*, March 1994. Full paper *Earth Surface Processes and Landforms* Vol. 21, 621-639.

Gillette, D.A., D.W. Fryrear, T.E. Gill, T. Ley, T.A. Cahill, and E.A. Gearhart. **1997 Relation of vertical flux of particles smaller than 10 μm to total aeolian horizontal mass flux at Owens Lake.** Journal of Geophysical Research 102 (D22):26009-26015.

Gillette, D.A., D.W. Fryrear, J.B. Xiao, P. Stockton, D.M. Ono, P.J. Helm, T.E. Gill, and T. Ley. **1997 Large-scale variability of wind erosion mass flux rates at Owens Lake, 1, Vertical profiles of horizontal mass fluxes of wind-eroded particles with diameter greater than 50 μm.** *Journal of Geophysical Research* 102 (D22): 25977-25987.

Gill, Thomas E, Thomas A. Cahill, Scott A. Copeland, and Bruce R. White, **Sand Fences for control of wind erosion and dust emission at Owens lake, CA: Full scale testing, field deployment, and evaluation of effectiveness**, Dispersion Particulate A12.1, 2773-2780 (2003), *11th International Conference on Wind Engineering Texas Tech (2002)*

Thank you.

1. **Implications of high altitude desert dust transport from Western Sahara to Nile Delta during biomass burning season**

Anup K. Prasad[a, b, ♣, ✉], Hesham El-Askary[a, b, c, d], Menas Kafatos[a, b]

[a] School of Earth and Environmental Sciences, Schmid College of Science, Chapman University, Orange, CA 92866, USA

[b] Center of Excellence in Earth Observing, Chapman University, Orange, CA 92866, USA

[c] Department of Environmental Sciences, Faculty of Science, Alexandria University, Moharem Bek, Alexandria 21522, Egypt

[d] National Authority for Remote Sensing and Space Science (NARSS), Cairo, Egypt

Received 29 April 2010; revised 20 July 2010; Accepted 24 July 2010. Available online 25 August 2010.

Abstract

The air over major cities and rural regions of the Nile Delta is highly polluted during autumn which is the biomass burning season, locally known as black cloud. Previous studies have attributed the increased pollution levels during the black cloud season to the biomass or open burning of agricultural waste, vehicular, industrial emissions, and secondary aerosols.

However, new multi-sensor observations (column and vertical profiles) from satellites, dust transport models and associated meteorology present a different picture of the autumn pollution. Here we show, for the first time, the evidence of long range transport of dust at high altitude (2.5–6 km) from Western Sahara and its deposition over the Nile Delta region unlike current Models. The desert dust is found to be a major contributor to the local air quality which was previously considered to be due to pollution from biomass burning enhanced by the dominant northerly winds coming from Europe.

2. Epidemiology: November 2008 - Volume 19 - Issue 6 - pp 808-809doi: 10.1097/EDE.0b013e31818809e0
Air Pollution: Commentary

3. **Desert Dust: An Unrecognized Source of Dangerous Air Pollution?**

Sandstrom, Thomas; Forsberg, Bertil

Abstract

Abstract: Particulate matter (PM_{10}) air pollution is associated with respiratory and cardiovascular morbidity, and mortality. A recent systematic review pointed toward the fine particle fraction ($PM_{2.5}$) rather than the coarse fraction ($PM_{2.5-10}$) 2.5 and $PM_{2.5-10}$as being responsible for increased death rates. With this background, the report by Perez et al that windblown Saharan desert dust causes increased mortality in Barcelona, raises concern over possible underestimation of toxicity from coarse particles coming from desert sources. This may be of concern for large areas of the globe that periodically encounter high levels of windblown desert dust and warrants further attention.

JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 115, D00K29, 12 PP., 2010
doi:10.1029/2009JD013208

Source, long-range transport, and characteristics of a heavy dust pollution event in Shanghai

Qingyan

Center for Atmospheric Chemistry Study, Department of Environmental Science and Engineering, Fudan University, Shanghai, China

Shanghai Environmental Monitoring Center, Shanghai, China

Guoshun Zhuang

Center for Atmospheric Chemistry Study, Department of Environmental Science and Engineering, Fudan University, Shanghai, China

Juan Li

Center for Atmospheric Chemistry Study, Department of Environmental Science and Engineering, Fudan University, Shanghai, China

Kan Huang

Center for Atmospheric Chemistry Study, Department of Environmental Science and Engineering, Fudan University, Shanghai, China

Qiongzhen Wang

Center for Atmospheric Chemistry Study, Department of Environmental Science and Engineering, Fudan University, Shanghai, China

Rong Zhang

Center for Atmospheric Chemistry Study, Department of Environmental Science and Engineering, Fudan University, Shanghai, China

Joshua Fu

Department of Civil and Environmental Engineering, University of Tennessee, Knoxville, Tennessee, USA

Tao Lu

Shanghai Environmental Monitoring Center, Shanghai, China

Min Chen

Shanghai Center for Urban Environmental Meteorology, Shanghai, China

Qian Wang

Shanghai Environmental Monitoring Center, Shanghai, China

Ying Chen

Center for Atmospheric Chemistry Study, Department of Environmental Science and Engineering, Fudan University, Shanghai, China

Chang Xu

Center for Atmospheric Chemistry Study, Department of Environmental Science and Engineering, Fudan University, Shanghai, China

Bing Hou

Center for Atmospheric Chemistry Study, Department of Environmental Science and Engineering, Fudan University, Shanghai, China

Daily particulate matter with particles less than 2.5 μm in aerodynamic diameter ($PM_{2.5}$) and total suspended particulates (TSP) were analyzed for chemical composition and daily PM_{10}, SO_2, and NO_2 were monitored by automatic monitoring systems on the seven sites over China along the pathway of the long-range transport of the dust from 20 March to 19 April 2007. The highest recorded dust and daily Air Pollution Index topped 500 for the first time since 2002, when the routine continuous monitoring of PM_{10} was initiated in Shanghai. The daily 24 h average PM_{10} concentration of 648 $\mu g\ m^{-3}$ was observed on 2 April 2007. The ratios of SO_2/PM_{10}, NO_2/PM_{10}, and $PM_{2.5}/PM_{10}$ were 0.066, 0.077, and 15.5% on 2 April 2007, which were significantly different from the nondust day and could be used as the index to judge the occurrence of dust in Shanghai. On the peak dusty day, the ratios of crustal matter rose to 70% and 64% of the total mass of $PM_{2.5}$ and TSP, respectively, while the ratios were 13% and 37% on nondust days. The ratio of Ca/Al in the dust aerosol in Shanghai was much closer to that in Duolun and Yulin near Mongolia Gobi rather than that in Tazhong of Taklimakan desert, indicating that the dust was transported from Mongolia Gobi instead of Taklimakan desert in Xinjiang province. The compositions of sea salt aerosol in $PM_{2.5}$ and TSP, combined with back trajectories, indicated that the dust passed through the East China Seas before reaching Shanghai, which is one of the typical dust pathways that lead to heavily polluted days in Shanghai due to dust transport. The anthropogenic sources along the pathway also partially contributed to the PM pollution in Shanghai during this dust event.

4. Epidemiology: November 2008 - Volume 19 - Issue 6 - pp 800-807doi: 0.1097/EDE.0b013e31818131cf, Air Pollution: Original Article

Coarse Particles From Saharan Dust and Daily Mortality

Perez, Lauraa; Tobias, Aureliob; Querol, Xavierc; Künzli, Ninoa; Pey, Jorgec; Alastuey, Andrésc; Viana, Marc; Valero, Nataliae; González-Cabré, Manuele; Sunyer, Jordia

5. **Local air pollution and long-range mass transport of atmospheric particulate matter: A comparative study of the temporal evolution of the aerosol size fractions**
Antonio Febo 1, Fabio Guglielmi 2, Maurizio Manigrasso 3, Valerio Ciambottini 2, Pasquale Avino

6. **Journal of Radioanalytical and Nuclear Chemistry Volume 276, Number 1, 161-165, DOI: 10.1007/s10967-007-0426-4**

   Neutron activation analysis for identification of African mineral dust transport

   S. M. Almeida, M. C. Freitas and C. A. Pio

7. **Influence of Mesoscale Dynamics and Turbulence on Fine Dust Transport in Owens Valley** QINGFANG JIANG University Corporation for Atmospheric Research, Monterey, California, MING LIU AND JAMES D. DOYLE, Naval Research Laboratory, Monterey, California
8. **Groundwater influences on atmospheric dust generation in deserts**
   A.J. Elmore[a, ♣, ✉], J.M. Kaste[b, ✉], G.S. Okin[c, ✉], M.S. Fantle[d, ✉]

b

9. **Asian Dust Storm and pulmonary function of school children in Seoul**

Yun-Chul Hong[a], Xiao-Chuan Pan[b], Su-Young Kim[c], Kwangsik Park[d], Eun-Jung Park[d], Xiaobin Jin[b], Seung-Muk Yi[e], Yoon-Hee Kim[f], Choong-Hee Park[g], Sanghwan Song[g], Ho Kim

10. Spatial and temporal variations in airborne particulate matter (PM_{10} and $PM_{2.5}$) across Spain 1999–2005

X. Querol[a, ♣, ✉], A. Alastuey[a], T. Moreno[a], M.M. Viana[a], S. Castillo[a], J. Pey[a], S. Rodríguez[a], B. Artiñano[b], P. Salvador[b], M. Sánchez[b], S. Garcia Dos Santos[c], M.D. Herce Garraleta[c], R. Fernandez-Patier[c], S. Moreno-Grau[d], L. Negral[d], M.C. Minguillón[a, e], E. Monfort[e], M.J. Sanz[f], R. Palomo-Marín[g], E. Pinilla-Gil[g], E. Cuevas[h], J. de la Rosa[i], A. Sánchez de la Campa[i]

Eco News

India's 'dry' monsoon caused by air pollution

Last Updated: Saturday, October 01, 2011, 12:46

♠ 4066 ● 2

Tags: India, Monsoon, Air pollution

London: Indian air pollution has been blamed for its dry monsoon season, but a scientist has revealed that European pollution may also play a part in it.

The volume of the summer monsoon has been weakening since the 1950s.

And Yi Ming of Princeton University in New Jersey claimed his experimental models suggest that the effect of European aerosol pollution accounts for about half the drop in the volume of monsoon rainfall – the other half is down to pollution over south Asia.

"The summer monsoon provides up to 80 per cent of total annual rainfall in south Asia, and supports 20 per cent of the world's population," New Scientist quoted Ming as saying.

With his colleagues, Ming used climate models to assess how different factors changed the monsoon.

The monsoon is brought by large-scale wind patterns that transport heat between the northern and southern hemispheres.

For half the year the northern hemisphere experiences more solar heating and so is warmer than the southern hemisphere; the situation is reversed during the other six months.

As the winds head north over the Indian Ocean during the northern hemisphere's summer they pick up moisture, which falls as rain over south Asia.

Air pollution in the form of aerosols can weaken these long-distance wind patterns, however.

That's because it reflects sunlight back into space, cooling the polluted area.

Thick aerosol pollution over Europe in summer ensures that the northern hemisphere isn't much warmer than the southern hemisphere, so there is nothing to drive the winds – and nothing to trigger the monsoon.

In as-yet-unpublished experiments, he confirmed the important role that the European pollution plays in weakening the monsoon.