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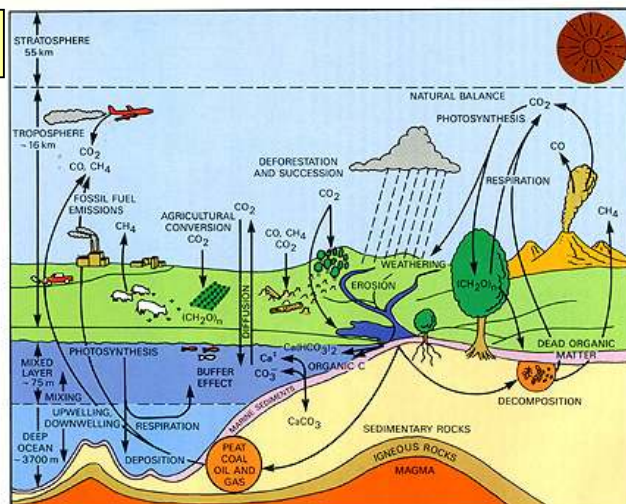
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FROM EDITOR'S DESK

This issue presents a special review of Biogeochemical aspects of Arsenic in Groundwater Mobilization in North-Eastern India. In view of the concerns about the Arsenic contamination in groundwater of Tarrai regions of North East Himalayas, Data of groundwater quality parameters along with Arsenic contamination has been examined. An attempt has been in this review to identify various sources of Arsenic and its release mechanisms. Based on the preliminary observations, the arsenic contamination may be of geological origin and can be attributed to arsenopyrite minerals.

In addition, this issue consists of the details of recent and forthcoming conferences/workshop, News clipping, and recent publication related to the field of biogeochemistry.

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Editor

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Biogeochemical aspects of Arsenic in Groundwater Mobilization in North-Eastern India

Groundwater arsenic contamination and sufferings of people have been reported in more than twenty countries in different parts of the world. Most of the concern over groundwater pollution are associated with anthropogenic activities. In general, groundwater contamination are geogenic and nowadays most of them are related to waste disposal (private sewage disposal systems, land disposal of solid waste, municipal wastewater, wastewater impoundments, land spreading of sludge, brine disposal from the petroleum industry, mine wastes, deep-well disposal of liquid wastes, animal feedlot wastes, radioactive wastes) or not directly related to waste disposal (accidents, certain agricultural activities, mining, acid rain, improper well construction and maintenance, road salt).

Groundwater moving through sedimentary rocks and soils may pick up a wide range of dissolved ions such as magnesium, calcium, chlorides, etc. Some of the aquifers in various parts of the world were reported to have high natural concentration of dissolved constituents such as arsenic, boron, and selenium. The effect of these natural sources of contamination of groundwater quality depends on the type of contaminant and its concentrations. The magnitude of Arsenic contamination is considered highest in five Asian countries and the severity is in order of Bangladesh>India>Mangolia>China>Taiwan. The world's two biggest cases of groundwater arsenic contamination and those that affected the greatest number of people were in Bangladesh and West Bengal (Chowdhury, 2000, Saxena et al., 2004, Bhattacharya et al., 2002).

Arsenic is a semimetal or metalloid, occurring naturally in the environment and as a by-product of some agricultural and industrial activities. It can enter drinking water through the ground or as runoff into surface water resources. Industrial and agricultural effluents also contribute arsenic to water in some areas. It is widely thought that naturally occurring arsenic dissolves due to weathering processes of certain minerals in rock formations when groundwater levels drop significantly. Surface arsenic-related pollutants enter the groundwater systems by gradually moving with the inflow of groundwater from rains, melting of snow, etc. Drinking water, especially groundwater is a major source of arsenic for most people living in Gangetic plains and Delta regions of the SE Asia. In many parts of world, including Taiwan, Argentina and Chile, it is As contamination in ground water is derived from volcanic sources and leached into drinking water sources through mining waste (CMAJ, 2002).

The health of tens of millions of people world-wide is at risk from drinking arsenic-contaminated well water. In most cases this arsenic occurs naturally within the subsurface aquifers, rather than being derived from identifiable point sources of pollution. The mobilization of As into the aqueous phase is the first crucial step in the process that eventually leads to human arsenicosis. Arsenic occurs in four oxidation states: As^{+5} , As^{+3} , As^0 and As^{-3} . As^{+5} and As^{+3} are the most common in nature, whereas the As^{-3} and As^{+5} are rare.

Iron oxides are strong sorbents of arsenic, thereby regulating its fate and transport. As a consequence, reductive iron transformations can have pronounced influences on arsenic partitioning. In fact, the primary process by which arsenic is displaced from solids appears to be a shift from aerobic to anaerobic conditions. Nevertheless, it is presently not confirmed whether arsenic mobilization under anaerobic conditions results from a transformation from As(V) to As(III) or from mineralogical changes as a consequence of iron and manganese reduction. Furthermore, the specific conditions that may lead to arsenic release within anaerobic environments have yet to be fully resolved

Desorption behavior of arsenic from ferrihydrite-, goethite- and hematite-coated sand within aerobic and anaerobic systems under hydrodynamic conditions alters the mobility of As. It is widely believed that reductive transformation, inclusive of dissolution and recrystallization, invokes a displacement of As(III) and As(V). However, desorption and transport of As(V) is transitory whereas As(III) undergoes

prolonged and pronounced desorption. Ferrihydrite transformation limits (rather than promotes) desorption of As(III) under conditions of intense Fe(III) reduction, potentially through precipitation of a secondary arsenic-bearing ferrous-iron phase. Formation of reduced iron oxide phases through the generation of high Fe(II) concentrations (>0.8 mM) severely retards As(III) desorption. Conversely, at lower Fe(II) concentrations (<0.8 mM), ferrihydrite transformation does not appear to retard arsenite desorption—although it does not promote it either. Arsenite mobilization in the absence of Fe(II), and concomitant resulting mineralogical transformations of ferrihydrite. Long-term respiration on Fe(III) within goethite or hematite would result in arsenic release once the surface sites are sufficiently depressed to induce desorption. Arsenic release under anaerobic conditions, (bio)transformation of ferrihydrite (or lepidocrocite) may in fact stabilize As(III), limiting its mobility within soils and sediments.

Dissolved arsenic can occur in natural waters in both inorganic and organic forms. Arsenic's inorganic forms include formal oxidation states As(V), arsenate, and As (III), arsenite, with primary aqueous species at natural pHs being anionic in arsenate ($H_2AsO_4^-$ and $HAsO_4^{2-}$) or neutral for arsenite ($As(OH)_3$). The location of As on the periodic table directly below phosphorus predicts an analogous chemical behavior for arsenate and phosphate including incorporation into organic molecules. However, As has no recognized use in enzymatic systems and could potentially interfere with numerous biological mechanisms normally dependent on phosphorus (Anderson & Bruland, 2009). They have suggested that organisms have developed mechanisms to isolate and detoxify As by producing organoarsenicals.

In addition, incorporation of As into arsonium zwitterions such as arsenobetaine and arsenocholine may serve dual purposes of detoxification and osmoregulation analogous to some sulfur compounds. They have collected water samples from a number of lakes and estuaries, mostly in California, showed measurable concentrations of methylated arsenic (equivalent to 1-59% of total As) with the exception of one highly alkaline lake. Neither depleted phosphate concentrations nor high dissolved salts correlated with the appearance of methylated forms of As. A temporal study of As speciation, demonstrated that dimethylarsinic acid increased sufficiently to become the dominant form of dissolved As within the surface photic zone during late summer and fall. Methylated forms decreased while arsenate increased when the lake over-turned in early December, which suggested a degradation of dimethylarsinic acid to arsenate.

Groundwater Status in Northeastern States

Table 1: Physical properties of water samples in NE states of India

NE States	pH	D.O (mg/L)	TDS (mg/L)	Turbidity (NTU)	Temp (°C)	Iron mg/L
Arunachal Pradesh	6.0-8.3	5.2-12.2	10-70	1-17	9.8-26.3	1.05-4.93
Assam	5.5-7.4	3.4-8.0	10-249	5-47	16.4-25	0.22-49.3
Manipur	6.4-8.7	5.0-9.0	10-121	1-20	18.5-23	0.74- 4.32
Meghalaya	4.0-8.0	3.8-12.6	20-360	1-14	10.1-27	-
Mizoram	4.8-7.4	1.0-10.2	10-200	1-25	15-32	-
Nagaland	5.8-8.0	0.1-3.7	10-115	1-29	13.1-25	0.33-1.9
Tripura	4.3-8.3	0.1-8.8	100-205	1-62	20.5-29.5	0.48- 10.9

Sources: Singh (2004)

Table 1 indicated that, the water pH was found slightly acidic in reaction in six North Eastern States. The pH of drinking water of Arunachal Pradesh and Manipur was found within the permissible level as per guidelines of BIS. In these seven states DO value was found above the permissible level. Whereas in Nagaland, the DO value was found below the permissible level i.e. between 0.1-3.7 mg/L. Drinking water of all the NE states contain less amount of TDS ranging from 10-360 mg/L. Maximum TDS was

observed in Assam and Tripura state. The amount of iron is relatively high and almost all states contain iron above the permissible level in drinking water.

In the North Eastern region of India, natural springs and dug wells are the only cost effective and viable means of fulfilling the needs of freshwater for present population. High concentration of arsenic (As) in groundwater in the northeastern states of India has become a major cause of concern in recent years. As in groundwater has been detected in some parts of Assam, Tripura, Manipur, Nagaland and Arunachal Pradesh. In India after West Bengal and the bordering districts of Bangladesh, arsenic in groundwater was detected in part of Assam, Arunachal Pradesh, Manipur, Nagaland and Tripura. Maximum arsenic content was observed in Jorhat (Titabor, Dhakgorah, Selenghat and Moriani Block), Dhemaji (Sissiborgoan and Dhemaji Block), Golaghat district (Podumani Block) and Lakhimpur (Boginodi, Lakhimpur Block) in Assam; West Tripura (Triania Block), Dhalai (Salema Block) and North Tripura (Dharmanagar Block) districts in Tripura, Thuobal (Kakching Block) in Manipur and Dibang valley (Midland) in Arunachal Pradesh .



Sources: Chakraborti et al. (2007).
Fig 1: Distribution of Arsenic in North Eastern Region of India

Chakraborti et al. 2003 and 2007; Nickson et al. 2005 have reported that in most of the arsenic affected floodplains in Asia are by the side of the rivers that originate in the Himalayas or Tibetan Plateau. Thus it is considered that

Himalayas and surrounding mountains are potential sources of arsenic bearing minerals. Because the North-Eastern Hill states are part of the Himalayan mountain range, we anticipated finding groundwater arsenic contamination in the Newer Alluvium (Holocene) (Terrai regions)of the Brahmaputra, Barak, Surma and Imphal rivers. These basins cover parts of all the seven North- Eastern Hill states: Arunachal Pradesh, Assam, Meghalaya, Tripura, Nagaland, Manipur and Mizoram (Fig. 1)

Baruah et al., (2003) reported a significant variation of As in natural organic matter of North east, India and nature of accumulation of As in these matters. They concluded that total arsenic content shows an increasing enrichment from east to west of North eastern region of India. The concentration of arsenic in ground water exceeds the permissible level (10µg/L, WHO) in one district out of 9 districts in Manipur. Arsenic concentration was very high and varies between 798-986 µg/l in Kakching block area of Thoubal district (Singh, 2004). Singh, 2006 reported that because of high arsenic concentration where people are suffering from many types of arsenical skin lesions, skin cancer and other internal cancer like lung in North eastern region. However latest study by chakraborti et al., 2007 reported arsenic contamination in groundwater of three districts, Imphal west, Imphal East and Thoubal were exceeding 10 and 50 µg/l .

States	Arsenic Concentration in µg/L
Arunachal Pradesh	58-618
Assam	50-657
Manipur	10-986
Nagaland	50-657
Tripura	65-474

Sources: Singh, (2004).

Table 2 indicates that arsenic pollution in groundwater of northeast states is very high and people may be at risk if they consume of water contaminated by arsenic $>50\mu\text{g/L}$. The adverse impact of As on human health has been documented and there are now indications that As can also have a negative effect on agricultural production systems. Remediation of As contaminated water is therefore critical.

Arsenic contamination in Northeastern states is possibly of geological origin and the immediate source material for groundwater is likely to be ferric arsenate (with or without ferric arsenite) derived from an alteration of product of the mineral arsenopyrite that was transported by geological agent into the Bengal delta and flood plains of Assam valley. Hence there is a need for integrated research to understand sources, release mechanisms, mobilization of As in aquifers and the chemistry of arsenic and high arsenic variance in groundwater of Northeastern state.

Groundwater Status in Manipur

The groundwater study has suggested the arsenic contamination in the aquifers of Imphal and Thoubal. Singh, (2004, 2006) reported high arsenic concentration in one district out of 9 districts in Manipur which varies between $798\text{--}986\ \mu\text{g L}^{-1}$ in Kakching block area of Thoubal district. Chakraborti et al., (2008) has reported arsenic contamination in groundwater in three districts i.e. Imphal west, Imphal East and Thoubal. However, those studies were not focussing in detail on the sources and hydrogeochemical processes that controls their mobility in the area.

Table 3: Summary statistics for concentrations of chemical constituents of groundwater samples in Bishnupur, Imphal and Thoubal district, Manipur

	Bishnupur			Imphal			Thoubal		
	max	Min	aver	max	min	aver	max	min	aver
pH	8.6	6.6	7.44	8.1	6.3	7.22	8.2	6.6	7.34
ORP (mv)	24	-180	-89.18	93	15	53.14	119	-243	-9.54
EC ($\mu\text{S cm}^{-1}$)	1360	330	742.39	3840	210	1607.11	4800	410	2122
TDS (mg L^{-1})	672	156	362.34	1850	145	802.44	2367	226	1060
HCO_3 (mg L^{-1})	353	87.7	196.50	575.3	74.8	253.11	399.5	113.5	233
SO_4 (mg L^{-1})	8.13	0	2.81	173.5	0	60.71	44.45	0	16.4
PO_4 (mg L^{-1})	4.37	0	1.15	5.26	0	1.45	4.12	0	1.63
Fe (mg L^{-1})	3.59	0.02	1.04	4.78	0	1.87	4.31	0	1.69
Ca (mg L^{-1})	142	16	65.4	187.4	21.6	90.3	468	17.6	175.4
Mg (mg L^{-1})	46.1	3.8	23.7	75.8	13	41.5	114.2	14.2	56.6
Na (mg L^{-1})	136.1	20.3	69.4	250	13.4	118.3	261.2	14.2	109.6
K (mg L^{-1})	8.1	0.4	2.1	3.6	0.3	1.7	6.8	0.4	2.3
Cl (mg L^{-1})	322.2	17.9	109.1	710.8	9	286.4	1280	9	510.3
Arsenic ($\mu\text{g L}^{-1}$)	200	1	47.83	110	10	39.5	51	16	38.5

Sources: Oinam et al., 2009 (Unpublished DST young scientist report)

The study by Oinam et al., (2009) shows that the Bishnupur, Imphal and Thoubal district of Manipur has been affected by arsenic contamination in groundwater. Besides Arsenic, Iron and Phosphate concentrations are higher than the permissible limit at certain locations in this region. Iron concentrations were higher than the permissible limit ($1\ \text{mg L}^{-1}$ WHO, 2004) in all the three seasons except for a few samples which are not in detectable limits in Imphal and Thoubal districts. Phosphate (PO_4^{3-}) concentrations were higher than the permissible limits ($0.1\ \text{mg L}^{-1}$; BIS, 1991) in selected tube wells in Imphal district and Thoubal district in all the three seasons. It is possible that phosphate derived from fertilizers as well as from the decay of natural organic matter, has been mobilized into the aquifers because of widespread irrigation and groundwater withdrawal (Acharyya et al., 2000). Phosphate can inhibit the immobilization of arsenic by competing for the same adsorption sites on the surface of most common solids such as iron and manganese oxides (Ioannis 2006). It shows that there is also an alternate potential arsenic source in this region i.e. from fertilisers, since arsenic is readily adsorbed onto phosphate and much of the phosphate fertiliser leaches into ground water. The correlation between arsenic and phosphate shows that the mobilization of arsenic may be partially

governed by anthropogenic (agricultural) activities (Oinam et al., 2009). Except few samples in Bishnupur, Imphal and Thoubal district, the concentration of chloride was higher than the permissible limits. In Bishnupur, Imphal and Thoubal district, the concentration of potassium was high in groundwater samples. The concentration of calcium and magnesium was high in all three districts.

Singh, (2004, 2006) and Chakraborti et al., (2008) have reported arsenic contamination in groundwater in Manipur. Even though a few studies have shown arsenic contamination in aquifers of North eastern India, there is a dire need for detailed spatial and temporal change maps of Arsenic contaminated aquifers. The research group at SES, JNU is working on the assessment and delineation of As and hydrogeochemistry in aquifers of Manipur. The present study highlighted the immense need for detailed studies for As and its speciation using frequent sampling as well as the hydrogeochemical mapping of the entire north-eastern region. The presence of arsenic (As) in groundwater in the north-eastern states of India and its effect on human health has thus become a serious concern in recent years. A long-term environmental planning is essential to blunt the danger from As pollution with respect to the environmental biogeochemical process occurring over there.

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Recent & Forthcoming Conference/Workshop related to Biogeochemistry

12th to 17th July 2009 **Gordon Research Conference — Catchment Science: Interactions Of Hydrology, Biology & Geochemistry - Thresholds, Tipping Points, And Non-Linearity: Integrated Catchment Science For The 21st Century, Proctor Academy, United States** Weblink: <http://www.grc.org/meetings.aspx?year=2009>

13th to 16th July 2009 **ICOBTE 2009 — 10th International Conference on the Biogeochemistry of Trace Elements; Chihuahua, Mexico,** Weblink: <http://icobte2009.cimav.edu.mx/index.php/contents/en>.

14th to 17th July 2009 **ICCE2009 — 12th EuCheMS International Conference on Chemistry and the Environment;** Weblink: <http://www.chemsoc.se/sidor/KK/icce2009.htm>

20th to 22nd July 2009 **AIR POLLUTION 2009 — Seventeenth International Conference on Modelling, Monitoring and Management of Air Pollution, Tallinn, Estonia;** Weblink: <http://www.wessex.ac.uk/conferences/2009/index.html>

20th to 23rd July 2009 **Ocean Carbon and Biogeochemistry Workshop 2009, Woods Hole Oceanographic Institution, Woods Hole, MA.** Contact: Mary Zawoysky at mzawoysky@whoi.edu. This year's workshop will include the following interdisciplinary sessions: The Next U.S. Carbon Cycle Science Plan, Observing Systems and Time-Series, The Future of OCB Research in the Southern Ocean, Ocean Acidification: Frontiers in Understanding Physiological and Ecological Responses, Implementing Research at the Intersection of Ocean Chemistry and Biology, NACP/OCB Coastal Interim Synthesis Activities. The registration deadline is June 15, 2009.

2nd to 14th August 2009 **Marine Ecosystems and Climate: Modeling and Analysis of Observed Variability, Boulder, Colorado, USA.** Contact: asp-coll2@asp.ucar.edu. Global climate change is altering the structure and functioning of ecosystems, which in turn affects availability of ecological resources and benefits, interactions between ecosystems and the climate system, and could affect economic systems that depend on ecosystems..

23rd to 28th August 2009 **Gordon Research Conference — Atmospheric Chemistry Waterville Valley Resort, United States;** Weblink: <http://www.grc.org/meetings.aspx?year=2009>

06th to 09th September 2009 **Environmental Effects of Nanoparticles and Nanomaterials 2009, Vienna, Austria;** Weblink: <http://umweltgeologie.univie.ac.at/> **Organizer:** University of Vienna (Vienna). Engineered nanoparticles and nanomaterials offer many potential socio economic, health and environmental benefits as a result of novel properties and behaviour that materials can exhibit when manufactured at the nanoscale. While the production of nanomaterials is undergoing exponential growth, their biological effects and environmental fate and behaviour are relatively unknown. This meeting is the third international meeting on this topic following the success of the 3rd meeting held in Birmingham last year. The venue for 2008 will be the University of Birmingham.

7th to 9th September 2009 **AMIREG2009 — Towards sustainable development: Assessing the footprint of resource utilization and hazardous waste management, Athens, Greece**; **Weblink:** <http://heliotopos.conferences.gr/?amireg2009>. The conference aims to provide a forum for the world's leading scientific and technical communities to address the key challenges related to all aspects of resource utilization and hazardous waste management with emphasis in sustainable development.

9th to 11th September 2009 **8th Green Chemistry Conference, Zaragoza, Spain**; **Weblink:** <http://8gcc.unizar.es>. **Organizer:** IUCT, Universidad de Zaragoza, Green Chemistry Network of Spain (REDQS). **Contact:** Prof José Urieta, Universidad de Zaragoza, Campus Pza San Francisco Zaragoza 53009 Spain; phone: (+ 34 976 76 1298).

13th to 16th September 2009 **Congress of the European Societies of Toxicology, Dresden, Germany**; **Weblink:** <http://www.eurotox2009.org/home.asp>. **Contact:** Conference Secretariat K.I.T. Congress Incentives GmbH Dresden Münzgasse 2 Dresden Germany 01067; phone: (+49-351-4967-540). Conference topics include bacterial toxins, biomarkers, biomonitoring, biologics, carcinogenesis, clinical toxicology, computational toxicology, consumers protection, DNA damage and repair, and environmental toxicology.

14th to 18th September 2009 **ISEB 19 — International Symposia on Environmental Biogeochemistry, Hamburg, Germany**; **Weblink:** http://www.isebiogeochemistry.com/ISEB_19.htm

17th to 18th September 2009 **International Symposium on Mineralogy, Environment and Health, Paris, France**; **Weblink:** http://www.univ-mlv.fr/master_geoenv/symposium2009.html. Environmental mineralogy and geochemistry is an interdisciplinary field dealing with systems at, or near, the surface of the Earth where the geosphere comes into contact with the hydrosphere, atmosphere and biosphere. This is the 'environment' on which plants and animals (including humans) depend for survival and which can be disrupted by human activity, particularly that associated with exploitation and utilization of Earth's resources. It deals with those systems containing minerals that constitute key environments (modern sediments, soils, atmospheric aerosols, parts of certain micro and macro organisms including the human body). Both pure systems and those contaminated through human activities are considered, and with emphasis on a fundamental (predictive) understanding of such systems at scales which can range from molecular to global.

10th to 14th October 2009 **International Symposium of Molecular Environmental Soil Science at the Interfaces in the Earth's Critical Zone, Hangzhou, China**; **Weblink:** <http://zjklsp.zju.edu.cn/ISMESS/>. The objective of this symposium is to provide a forum for the interactions and communication of soil chemists, mineralogists, microbiologists, and physicists with allied scientists including pure chemists, mineralogists, biologists, environmental scientists, ecologists, and ecotoxicologists to address the current state-of-the-art on "Molecular Environmental Soil Science".

18th to 23rd October 2009 **VIII International Symposium on Environmental Geochemistry and XII Brazilian Congress on Geochemistry, Ouro Preto, Brazil**; **Weblink :** <http://www.12cbgq.ufop.br/12cbgq/principaleng.htm>. **Contact:** Department of Geology and Department of Environmental, Engineering, Escola de Minas, Universidade, Federal de Ouro Preto, Campus Universita'rio, Ouro Preto, 35400-000, Brazil. **E-mail:** 12cbgq@degeo.ufop.br

30th to 1st November 2009 **ICCE 2009 — 4th International Congress of Chemistry and Environment, Tianjin, China**; **Weblink:** <http://www.chemenviron.org>. **Organizer:** Research Journal of Chemistry and Environment, India and Institute of Agro Environmental Protection, China. **Contact:** Dr Shankar Gargh, Sector AG/80, Scheme no.54, A.B.Road, Vijaynagar Indore 452010 India; phone: (+91-7314004000).

2nd to 10th November 2009 **Workshop and Conference on Biogeochemical Impacts of Climate and Land-Use Changes on Marine Ecosystems, Trieste, Italy;** Weblink: <http://agenda.ictp.it/smr.php?2066> Contact: the Abdus Salam International Centre for Theoretical Physics, Strada Costiera 11 34014 Trieste, Italy; phone: (+39-040-2240-9932)

17th to 20th November 2009 **3rd International Conference on Aquatic Resources: “Prospects and Challenges” (ICAR 09), Alexandria City, Egypt.** Contact: NIOF Secretariat, Anfoushy, Kayet Bay, Alexandria, Egypt. Tel.: +20-3-4801499 E-mail: niof@niof.sci.eg .Organized by the National Institute of Oceanography and Fisheries (NIOF), focuses on the problems and opportunities related to aquatic resources. Main topics include: Coastal oceanography; Global environmental changes in the coastal zone; Operational oceanography and monitoring systems; Coastal hazards and pollution, prevention and mitigation; Decadal and interdecadal geomorphological variabilities; Sustainable coastal management and human influence on coasts; Marine geophysical investigation, theoretical and experimental; Coastal zone ecosystem; Socio-economic analysis of sustainable development for aquatic environment; Biodiversity and its protection in aquatic environment; Natural disasters and marine hazardsmanagement; Renewable and non-renewable marine energy resources; Maritime transport, safety and management; New advances in Aquaculture; Sustainable development of fisheries; and Shallow and deep sea bottom living and nonliving exploration.

15th to 7th December 2009 **2nd International Conference on Management of Natural Resources, Sustainable Development and Ecological Hazards, “Ravage of the Planet II”, Western Cape, South Africa.** Weblink: <http://www.wessex.ac.uk> Contact: Conference Secretariat, Ravage of the Planet 2009, Wessex Institute of Technology Ashurst Lodge, Ashurst, Southampton S040, 7AA, UK. E-mail: ravage2009@wessex.ac.uk

6th to 10th March 2010 **1st International Conference on Coastal Zone Management of River Deltas and Low Land Coastlines, Alexandria, Egypt.** Weblink: <http://www.nwrc-egypt.org/CZMRDLLC/index.htm> Contact: Ibrahim El Shinnawy, CoRI, 15 El-Pharaana St., El Shallalat, Alexandria 21514, Egypt. Tel.: +20-3-4844614, E-mail: CZMRDLLC@nwrc-egypt.org Main themes include: Geological processes of deltas and river mouths; Coastal change processes and human influence on coasts; Coastal defense restoration and erosion mitigation; Coastal modeling and risk management; Coast and beach ecosystems; Dune and wetland management; and others.

24th to 26th March 2010 **2nd International Conference on Integrated Water Resources Management and Challenges of the Sustainable Development** Weblink <http://www.fsa.ac.ma/gire3d> Contact: Conference,Secretariat, Lhoussaine Bouchaou, University Ibn Zohr, Faculty of Sciences, BP 8106, 80000 Agadir,Morocco. Tel.: +21-228-220957. E-mail: GIRE3D@yahoo.fr Main topics include: Tools and technologies applied to integrated management of water resources; Impact of climatic changes, new installations and socio-economic development on water resources; and integrated water resources management: quantitative and qualitative aspects.

Some Recent Publication Related to Biogeochemistry

A.L. Redington, R.G. Derwent, C.S. Witham, A.J. Manning (2009) Sensitivity of modelled sulphate and nitrate aerosol to cloud, pH and ammonia emissions; *Atmospheric Environment*; Volume 43, Issue 20, pp 3227-3234.

Akula Venkatram, Vlad Isakov, Robert Seila, Richard Baldauf (2009) Modeling the impacts of traffic emissions on air toxics concentrations near roadways; *Atmospheric Environment*; Volume 43, Issue 20, pp 3191-3199.

- Andrew C. Johnson, Mike C. Acreman, Michael J. Dunbar, Stephen W. Feist, Anna Maria Giacomello, Rodolph E. Gozlan, Shelley A. Hinsley, Anton T. Ibbotson, Helen P. Jarvie, J. Iwan Jones, Matt Longshaw, Stephen C. Maberly, Terry J. Marsh, Colin Neal, Jonathan R. Newman, Miles A. Nunn, Roger W. Pickup, Nick S. Reynard, Caroline A. Sullivan, John P. Sumpter, et al. (2009) The British river of the future: How climate change and human activity might affect two contrasting river ecosystems in England; *Science of The Total Environment*; Volume 407, Issue 17, pp 4787-4798.
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- David A. Lipson, Russell K. Monson, Steven K. Schmidt and Michael N. Weintraub (2009) The trade-off between growth rate and yield in microbial communities and the consequences for under-snow soil respiration in a high elevation coniferous forest; *Biogeochemistry*; Volume 95, Number 1, pp 23-35.
- Detlev Helmig, Brian Seok, Mark W. Williams, Jacques Hueber and Robert Sanford (2009) Fluxes and chemistry of nitrogen oxides in the Niwot Ridge, Colorado, snowpack; *Biogeochemistry*; Volume 95, Number 1, pp 115-130.
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Recent News Clippings

- Times of India, 9th July 2009, **Not just heat, even dust speeds up snow melt.** The scientist says, the desert dust stirred as global warming dries larger areas and human activity increases in those regions. This dust darkens the surface of winter snows, warming it by absorbing sunlight that the white surface would have reflected. That causes the snow to melt earlier than in the past.
- Times of India, 30th May 2009, **Warming killing 3 lakh people every year,** death due to hunger, sickness and weather disasters to rise to half a million by 2030: Report. The study, commissioned by the Geneva – based Global Humanitarians Forum (GHF), estimates that climate change seriously affects 325 million people every year. Economic losses due to global warming amount to over \$125 billion annually – more than the flow of aid from rich to poor nations.
- Times of India, 24th April 2009, **Dip in pollution could speed up climate change, say scientists.** In a study the researchers have suggested that global warming speed up as the world starts becoming free of pollution, after they found that plants absorb more greenhouse gases when the air is polluted.
- Times of India, 22nd April 2009, **World over, rivers are drying up.** An analysis of 935 major rivers from 1948 to 2004 showed an overall decline in total discharge. Researchers found that if things stay the same, by 2050 the river won't be able to provide all of the water needed 60 % to 90% of the time.
- Times of India, 21st April 2009, **Stay slim to save the earth, obese contribute 1 tonne of CO₂ more than average person a year.**
- Times of India, 20th April 2009, **Scientists find way to convert CO₂ into biofuel.** The scientists at the state –backed Institute of Bioengineering and Nanotechnology said they used

non toxic organocatalysts to make ethanol. The team, led by Yugen Zhang, used N-heterocyclic carbenes (NHCs), an organocatalysts, in the chemical reaction with the carbon dioxide. The process also used hyrosilane, a combination of silica and hydrogen.

➤ Times of India, 17th April 2009, **Spam generates 17 m tons of CO₂**. Spam hs been blamed for production of over 33bn kilowatt – hours of energy every year, enough to power more than 2.4m homes. A day without spam would amount to taking 2.2 m cars off the road.



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