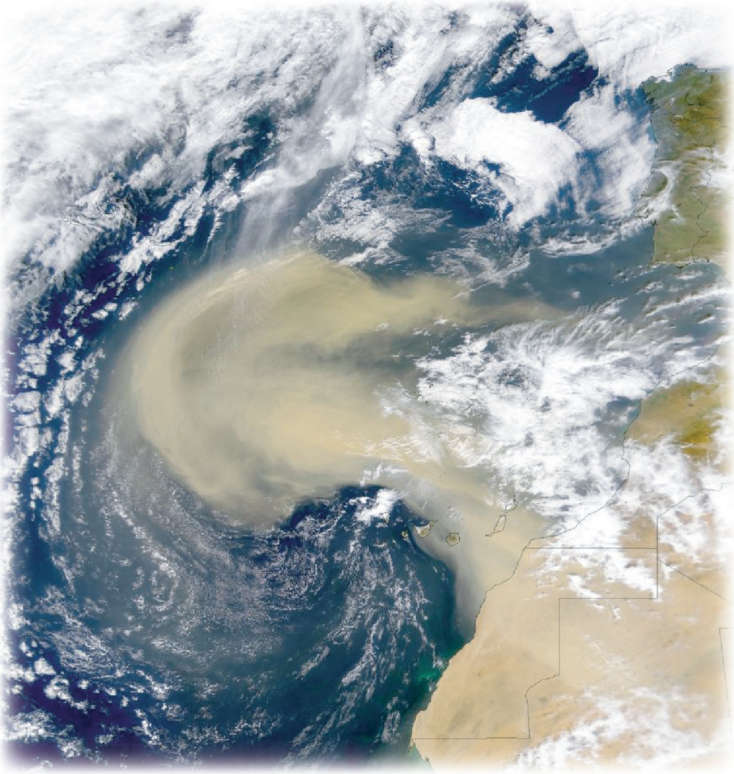
2004 solas science

surface ocean - lower atmosphere study

halifax nova scotia canada



13-16 october 2004

www.uea.ac.uk/env/solas/SS04

NSERC CRSNG

Fondation canadienne pour les sciences du climat et de l'atmosphère (FCSCA)
Canadian Foundation for Climate and Atmospheric Sciences (CFCAS)

IAI

APN Asia-Pacific Network for Global Change Research

International Council for Science
Scientific Committee on Oceanic Research

NATURAL ENVIRONMENT RESEARCH COUNCIL

SOLAS Science 2004:

A SOLAS Open Science Conference

13 – 16 October 2004
Halifax, Nova Scotia, Canada

Produced by:
Caroline-Renae Alexander
Olivia Errey
Casey Ryan

http://www.solas-int.org

Contents

Welcome

SOLAS (Surface Ocean - Lower Atmosphere Study) is a new international research initiative that has as its goal:

To achieve quantitative understanding of the key biogeochemical-physical interactions and feedbacks between the ocean and the atmosphere, and of how this coupled system affects and is affected by climate and environmental change.

Achievement of this goal is important in order to understand and quantify the role that ocean-atmosphere interactions play in the regulation of climate and global change.

The domain of SOLAS is focussed on processes at the air-sea interface and includes a natural emphasis on the atmospheric and upper-ocean boundary layers, while recognising that some of the processes to be studied will, of necessity, be linked to significantly greater height and depth scales. SOLAS research will cover all ocean areas including coastal seas and ice-covered areas.

A fundamental characteristic of SOLAS is that the research is not only interdisciplinary (involving biogeochemistry, physics, mathematical modelling, etc.), but also involves closely coupled studies requiring marine and atmospheric scientists to work together. Such research will require a shift in attitude within the academic and funding communities, both of which are generally organised on a medium-by-medium basis in most countries.

SOLAS deals with the following issues or foci. Each focus is divided into several activities.

On behalf of Halifax Regional Council, I would like to take this opportunity to welcome you to the SOLAS International Open Science Conference, October 13 to 16, 2004

During your stay, I hope you will explore all that our region has to offer. In the heart of the downtown, you'll find art galleries, museums, historic sites and churches, shopping, sidewalk cafés and lots of friendly restaurants and nightclubs.

Our region also boasts beautiful sandy beaches, rugged shorelines and colourful gardens – a nature lover's paradise.

There's something to be said for Maritime hospitality. We hope you will enjoy the conference – and enjoy your stay in the place we love to call home.

Respectfully,

I remain

Peter J. Kelly

Mayor

Focus 1: Biogeochemical Interactions and Feedbacks Between Ocean and Atmosphere

The objective of Focus 1 is to quantify feedback mechanisms involving biogeochemical coupling across the air-sea interface, which can only be achieved by studying the ocean and atmosphere in concert. These couplings include emissions of trace gases and particles and their reactions of importance in atmospheric chemistry and climate, and deposition of nutrients that control ma-rine biological activity and carbon uptake.

Activity 1.1 Sea-salt Particle Formation and Transformations
Activity 1.2 Trace Gas Emissions and Photochemical Feedbacks
Activity 1.3 Dimethylsulphide and Climate
Activity 1.4 Iron and Marine Productivity
Activity 1.5 Ocean-Atmosphere Cycling of Nitrogen

Focus 2: Exchange Processes at the Air-Sea Interface and the Role of Transport and Transformation in the Atmospheric and Oceanic Boundary Layers

The objective in Focus 2 is to develop a quantitative understanding of processes responsible for air-sea exchange of mass, momentum and energy to permit accurate calculation of regional and global fluxes. This requires establishing the dependence of these interfacial transfer mechanisms on physical, biological and chemical factors within the boundary layers, and the horizontal and vertical transport and transformation processes that regulate these exchanges.

Activity 2.1 Exchange Across the Air-Sea Interface
Activity 2.2 Processes in the Oceanic Boundary Layer
Activity 2.3 Processes in the Atmospheric Boundary Layer

Focus 3: Air-Sea Flux of CO_2 and Other Long-Lived Radiatively Active Gases

The air-sea CO_2 flux is a key inter-reservoir exchange within the global carbon cycle. The oceans also play an important role in the global budgets of other long-lived radiatively active gases, including N_2O and to some extent CH_4. The objective of Focus 3 is to characterise the air-sea flux of these gases and the boundary layer mechanisms that drive them, in order to as-sess their sensitivity to variations in environmental forcing.

Activity 3.1 Geographic and Sub-Decadal Variability of Air-Sea CO_2 Fluxes
Activity 3.2 Surface Layer Carbon Transformations in the Oceans: Sensitivity to Global Change
Activity 3.3 Air-Sea Flux of N_2O and CH_4

Sponsors

The Asia-Pacific Network for Global Change Research is an inter-governmental network whose primary purposes are to foster global environmental change research in the Asia-Pacific region, increase developing country participation in that research, and to strengthen links between the science community and policy makers. The APN is funding young scientists from the Asian-Pacific region to attend this conference.

www.apn.gr.jp

SCOR is a leading non-governmental organization for the promotion and coordination of international oceanographic activities. SCOR does not have the resources to fund research directly; therefore activities focuses on promoting international cooperation in planning and conducting oceanographic research. SCOR has assisted in funding the running of the SOLAS Science conference 2004, and is providing financial backing for the attendance of scientists from developing countries.

www.jhu.edu/~scor

The United Kingdom's Natural Environment Research Council provides independent research and training tin the environmental sciences. Employing 2,700 people in NERC research centers and funding a further 1,800 annually through research and training awards, NERC exists to gather and apply knowledge, improve understanding and predict the behavior of the natural environment and its resources. NERC provides funding for the SOLAS International Project Office based in the University of East Anglia, Norwich, UK.

www.nerc.ac.uk

Sponsors

Fondation canadienne pour les sciences du climat et de l'atmosphère (FCSCA)

Canadian Foundation for Climate and Atmospheric Sciences (CFCAS)

The Canadian Foundation for Climate and Atmospheric Sciences funds research that improves the scientific understanding of processes and predictions, provides relevant science to policy makers and improves understanding of the ways in which these challenges affect human health and the natural environment in addition to strengthening Canada's scientific capacity.

www.cfcas.org

NSERC
CRSNG

NSERC's role is to make investments in people, discovery and innovation for the benefit of all Canadians. We invest in people by supporting more than 17,700 university students and postdoctoral fellows in their advanced studies. We promote discovery by funding more than 9,600 university professors every year. And we help make innovation happen by encouraging more than 500 Canadian companies to invest in university research.

www.nserc.ca

IAI

The Inter-American Institute for Global Change Research is an intergovernmental organization supported by 19 countries in the Americas dedicated to pursuing the principles of scientific excellence, international cooperation, and the open exchange of scientific information to increase the understanding of global change phenomena and their socio-economic implications. The IAI is sponsoring scientists from the Americas to attendance this conference.

www.iai.int

Organising Committees

Organising Committee

Caroline-Renae Alexander (C-SOLAS)
Olivia Errey (SOLAS-IPO)
Peter Liss (UEA)
Sylvie Roy (C-SOLAS)
Casey Ryan (SOLAS-IPO)
Daniela Turk (C-SOLAS)

Co-Chairs
William Miller (U.GA)
Maurice Levasseur (C-SOLAS)

Local Organizing Committee & Volunteers

Dalhousie Dept. of Oceanography

Lu Wang	lwang2@dal.ca
Li Zhai	li.zhai@phys.ocean.dal.ca
Ron Goodridge	
Helen Lau	kwhlau@dal.ca
Chris Algar	calgar@dal.ca

Undergraduate Honour Science Students
Dalhousie Science Co-op Program
???????????????

Social events

Ice Breaker

Tuesday 12th, 7 – 9 pm

Food and refreshment will be served in the Atlantic Ballroom of the Westin hotel. Each delegate will receive two ICEBREAKER tickets for one free drink per ticket. A cash-bar service will also be available. Hot and Cold hors d'oeuvres and mussels by the pound, will also be served.

Guests will be entertained by strolling musicians, and a SOLAS photo exposé will also be on display for the viewing pleasure of the guests.

Banquet

Friday 15th

Double Decker Shuttle

6:40 – 7:20 pm

Guests will have thtravel by double decker bus along Lower Water Street and the Historic Properties to the Casino Nova Scotia.

Cocktail Reception

6:45 – 7:30 pm

The beautiful Compass room has been reserved for cocktails on the 2nd level of the Casino. The Compass room offers a spectacular panoramic view of the Halifax harbour with full balcony access. Each delegate will receive free coupons for use in the Casino. (Photo ID may be required by the Casino for proof of age). A variety of wine, rum and fruit punches will be served. A cash-bar service will also be available.

Banquet Dinner

7:30 – 9:00 pm

Dinner will be served in the grand Schooner room, across the hall from the Compass room. A Highlander bagpiper, in full Scottish regalia will precede dinner service.

Dinner entertainment will feature three of Halifax's finest contemporary dancers, "Point/Counterpoint". Lisa Phinney, a SOLAS Master's student and professional dancer, presents excerpts of this new dance work, exploring the analogues between science and the creative process.

The Moderator for the evening is Dr. William Miller and the Guest Speaker is Dr. Robert Duce.

cont' over

Social events

Banquet (cont')

Evening Entertainment 9:00 – 11:30 pm

The Carson Downey Band will entertain with their high energy blues, soul and rock 'n' roll style that has opened to "standing room only" on national and International tours.

Prizes and Awards 10:00 – 10:30 pm

Presentations will be made during the intermission between band sets.

Return Double Decker Shuttle 11:30 – 12:30 am

Bus service to the Westin is available for those guests returning to the Hotel.

Halifax

Restaurant Guide

Breakfasts

There are fewer options available for early morning meals. Listed are locations within a block of the Westin Hotel.

Elements	1181 Hollis St.	Hot/Cold Buffet ($14)	6:30am – 11:00am, 7 days
Café Pronto	1181 Hollis St.	Cold Pasteries ($3+)	7:00am–4:00pm, 7 days
Castello Café	5151 Terminal	Hot/Cold Meal Selections ($5)	6:30am – noon, 7 days
South End Diner		Hot/Cold Meal Selection ($5)	7:30am – 11:00am, Closed Sunday
Tim Hortons Café	1047 Barrington	Cold Pasteries ($2+)	24 hours, 7 days

Lunch/Suppers:

Halifax downtown boasts over 300 restaurants. Here are just a few choices, listed in relation to proximity to the Westin Hotel. The main concentration of restaurants is at Lower Water Street and Barrington Street.

Distance = 0.1 km

Elements	1181 Hollis St.	496-7960
Cafe Chianti	5165 South St.	423-7471
Tomasino's Cellar Ristorante	5173 South St.	422-9757
Taj Mahal Restaurant	5175 South St.	492-8251

Distance = 0.2 km

Castello Cafe	5151 Terminal Rd	422-5602
Henry House	1222 Barrington St.	423-5660
South End Diner	1128 Barrington St.	492-0271
Mu Lan Tea House	1360 Lower Water	420-1994

Halifax

Restaurant Guide (cont')

Distance = 0.4 km

Tim Hortons	1047 Barrington St.	425-9268
Stories Fine Dining	5184 Morris St.	444-4400
Kinh Do Vietnamese Restaurant	1284 Barrington St.	425-8555
Bish World Cuisine	1475 Lower Water St.	425-7993
Hamachi Steakhouse	1475 Lower Water St.	422-1600

Distance = 0.6 km

Little Caesars Pizza	1119 Queen St.	429-1500
The Submarine	5384 Inglis St.	423-7618
Darrell's Restaurant	5576 Fenwick St.	492-2344
Darrell's Sports Cafe	5576 Fenwick St.	492-2349
Peter's Pizzeria	5397 Inglis St.	425-6498
Juliennes Sandwich Tree	5595 Fenwick St.	423-2000
Mr Chang's Chinese Food Emporium	1304 Birmingham St.	423-8882
Da Maurizio	1496 Lower Water St.	423-0859

Distance = 0.8 km

Ichiban Sushi and Noodle	1505 Barrington St.	420-0194
Symposium Restaurant	1505 Barrington St.	423-6632
Tugs Pub	1549 Lower Water St.	425-7610
Waterfront Warehouse	1549 Lower Water St.	425-0866
Spice Urban Grill	1333 South Park	423-8428
Atlantis Steak & Lobster Co	5171 Salter St.	429-3875

Halifax

Business Centre

The Westin Hotel Business Centre is located in the main lobby area. Complementary computers are available with high speed internet services. A fax machine and printer are also available (b&w) at no charge.

Internet

Wireless high-speed Internet service is available on both the lobby and banquet floors. This service is complementary to all guests, an access code is required, which can be acquired at the front desk. (A Westin Window will appear in you browser, scroll down and choose the Internet option.)

Guest Room high-speed Internet costs $11.44/day, and will be charged to the room. For assistance, call the Westin Hotel Operator at 421-1000.

Photocopies

Photocopies are available at the Front Desk

Message Board

A message board will be available to delegates for posting of messages for other individuals or groups.

Halifax Metro Transit

Adult fare $1.75
(includes transfer to other buses or ferries, one way only)
www.region.halifax.ns.ca/metrotransit

Weather

Environment Canada
Hourly weather updates: 426-9090.
www.weatheroffice.ec.gc.ca/forecast/city_e.html?yhz

More tourist information:

Go to www.halifax.foundlocally.com

Delegate Assistance

If you require further assistance, please direct your queries to the "info" desk or to any personnel wearing the "info" logo.

Halifax

Other Amenities

Atlantic Super Store
1145 Barrington (next to Westin)
Tel: 492-3240
Grocery store, deli has take-out and hot and cold lunches, bakery and fruit fair, pharmacy, health and beauty, floral shop, dry cleaner, shoe repair, photo development (1 hr), digital photo kiosk, giftware, greeting cards and books.

Shoppers Drug Mart
24 hours a day, 7 days a week
5524 Spring Garden Road (15 min. walk)
Tel: 429-2400
Pharmacy, health and beauty, transit bus passes and Post Office.

Enterprise Car Rental:
1161 Hollis St. Suite 107 (next to Westin in VIA Rail Station)
Tel: 492-8400
www.enterprise.com

Prices for University members and Affiliates (ID#5CA1000), CDN$/day

Car Type	Unlimited	Limited
Sub-compact	$36.00	$34.00
Compact	$38.00	$36.00
Intermediate	$40.00	$38.00
Full-size (2 dr.)	$42.00	$40.00
Luxury/Premium	$47.00	$45.00

Limited mileage rates based on 200 free km/day (excess km charged at $.12/km)

Halifax

Museums

Maritime Museum of the Atlantic
1675 Lower Water Street. 424-7490
M 9:30-5:30, T 9:30-8:00, W-Sa 9:30-5:30 Su 1:00-5:00. Adult $8.
Titanic, Explosion and more…

NS Museum of Natural History
1747 Summer Street 424-7353
Tu-Sa 9:30-5, Su 1:00-5:00, M closed, W 'till 8pm. Adult $5.
Hurricane Juan exposé and watercolor diary; bug zoo and more…

Art Gallery of Nova Scotia
1723 Hollis Street 424-7542
M-Su 10:00-5:00, Th 'till 8:00pm
Adult $10. Daily tours, Sun Film and Music….

Historic Sites

Pier 21
1055 Marginal Road (Waterfront)
Adult $7.75, M-Su 9:30-5:00
www.pier21.ca.
Over one million Immigrants land…

Halifax Citadel
Sackville/Brunswick Steet
Adult $9, M-Su 9:00-5:00
Fortification, exhibits, living history program, museum.

Tours

Harbour Hopper
Waterfront pier 490-8687
Amphibious vessel
9am-9pm almost hourly
Adult $22.50. City and Harbour tour

Harbour Queen
Waterfront pier 420-1015
Showboat dinner cruise. 6:30-8:30pm
Adult $39.95 Meal and Music.

Mar II
Waterfront pier 420-1015
Tall ship pirate cruise. 5x daily, noon-midnight. Adult $19.95.

Peggy's Cove Express
Waterfront pier 422-4200
Whale watching, dolphins and puffins. $39.95 or $59.95 for 2 or 5.5 hour tours. www.peggyscove.com

Greyline Sight Seeing
Waterfront pier 425-9999
Amphibious tour: $26 Adult, 7 daily
Historic tour:$36 Adult, 10am &1pm
Peggy's cove: $49 Adult, noon (4 hrs)
Whale & nature: $95 Adult, 8:30am (8 hrs)
Lunenburg: $60 Adult, 8:30am (7hrs)

Halifax

Dinner theatre

Halifax Feast Dinner Theatre
1505 Barrington Street (in Maritime Centre) 420-1840
"The Cod Father" 7 pm nightly
$36.50 per person includes meal.

Grafton Street Dinner Theatre
1741 Grafton Street. 425-1761
"Good Vibrations" Tu-Su 6:45pm
$33.85 per person includes meal.

Dancing

The Dome	1740 Argyle St.
J.J. Rossy's	1883 Granville St.
My Apartment	1740 Argyle St.
Reflections Cabaret:	5184 Sackville St.

Live Bands

The Attic	1741 Grafton St.	423-0909
Cheers	1743 Grafton St.	421-1655
The Lower Deck	Historic Properties.	425-1501
New Palace Cabaret:	1721 Brunswick St.	429-5959
O'Carroll's Irish Pub	1860 Upper Water St.	423-4405
Your Father's Moustache	5686 Spring Garden Rd.	423-6766

Programme: Weds 13th

Time	Event	Location
08:00-10:00	*Registration Available*	
09:00-09:30	Welcome and Introduction Peter Liss	Commonwealth Room A
	Plenary talks. Chair: Maurice Levasseur	
09:30-10:15	Atsushi Tsuda, *An in-situ iron enrichment experiment in the western subarctic Pacific: SEEDS*	Commonwealth Room A
10:15-10:45	*Coffee break*	*Mezzanine*
10:45-11:30	Lucy Carpenter, *Air-sea exchange of volatile organic chemicals*	Commonwealth Room A
11:30-12:15	Ken Denman, *Modelling the planktonic community response to iron fertilization*	
12:15-13:45	*Lunch - see list of restaurants on p XX*	
13:45-14:30	Jan Bottenheim *OASIS: Interactions between the Ocean, Atmosphere, Sea Ice and Snow-pack in Polar regions*	Commonwealth Room A
	Poster Session, Chair: Doug Wallace	
14:30-16:15	SOLAS Focus 3: Air-sea flux of green-house gases *see page X for poster titles*	Atlantic Ballroom
16:15-16:45	*Coffee break*	*Mezzanine*
	Discussion Fora	
16:45-18:15	Interannual variability in the oceanic carbon cycle: resolving models and observations. Convenors: Nicolas Metzl and Corrine Le Quéré	Harbour Suite A
	The sea surface microlayer: mystery and magic. Convenor: Peter Liss	Harbour Suite B
	Ocean-atmosphere-sea ice-snow interactions. Convenors: Paty Matrai, Paul Shepson and Jan Bottenheim.	Lunenburg Room

Programme: Thurs 14th

Time	Event	Location
08:00-10:00	*Registration Available*	
	Plenary talks. Chair: Ken Denman	
08:45-09:30	Wade McGillis, *Surface processes controlling air-sea gas fluxes*	Commonwealth Room A
09:30-10:15	Ray Najjar, *The air-sea flux of oxygen*	
10:15-10:45	*Coffee break*	*Mezzanine*
10:45-11:30	Thomas Wagner, *Global monitoring of atmospheric trace gases, clouds and aerosols from UV/vis/NIR satellite instruments: Currents status and near future perspectives*	Commonwealth Room A
11:30-12:15	Nicolas Metzl, *Air-sea CO_2 fluxes in the Southern Ocean: natural and methodological variabilities*	
12:15-13:45	*Lunch - see list of restaurants on p XX*	
13:45-14:30	Corinne Le Quéré, *Ecosystem composition and CO_2 flux variability*	Commonwealth Room A
	Poster Session, Chair: Bill Miller	
14:30-16:15	SOLAS Focus 1: Biogeochemical Interactions and Feedbacks between Ocean and Atmosphere see page X for poster titles	Atlantic Ballroom
16:15-16:45	*Coffee break*	*Mezzanine*
	Discussion Fora	
16:45-18:15	Results from mesocosm perturbation experiments: What can they tell us about global change? Convenor: Ulf Riebesell	Harbour Suite A
	Photochemistry above and below the air-sea interface. Convenor: Bill Miller	Harbour Suite B
	Sea spray: generation, fate and effects. Convenor: Gerrit de Leeuw	Lunenburg Room
TBA	US SOLAS side meeting	Harbour Suite B

Programme: Fri 15th

Time	Event	Location
	Plenary talks. Chair: Peter Liss	
08:45-09:30	Julie La Roche, *Iron as a key nutrient regulating primary production and nitrogen fixation in the ocean*	Commonwealth Room A
09:15-10:00	Rafel Simo, *The occurrence and emission of DMS in the ocean: A view through space and time*	
10:00-10:45	*Coffee break*	*Mezzanine*
10:45-11:30	Paty Matrai, *Formation of atmospheric particles from marine biogenic precursors: Can we extrapolate from the Arctic to the world's oceans*	Commonwealth Room A
11:30-12:15	Dileep Kumar, *Coastal connections and pCO_2, N_2O and DMS levels in the North Indian Ocean*	
12:15-13:45	*Lunch - see list of restaurants on p XX*	
13:45-14:30	Greg Ayres, *Aerosol in the marine boundary layer: chemical, physical and meteorological interactions*	Commonwealth Room A
	Poster Session, Chair: Rik Wanninkhof	
14:30-16:15	Exchange processes at the air-sea interface and boundry layers	Atlantic Ballroom
16:15-16:45	*Coffee break*	*Mezzanine*
	Discussion Fora	
16:45-18:15	Successes and caveats in DMS oceanic modelling: How can experimentation contribute? Convenors: Maurice Levasseur, Christine Lancelot and Alain Vézina	Lunenburg Room
	Air-sea gas transfer uncertainty. Convenors: Bill Asher and Wade McGillis	Maritime Room
	Halogens in the Troposphere. Convenor: Ulrich Platt	Harbour Suite A
	Where now for open ocean fertilization experiments? Convenor: TBA	Harbour Suite B

Programme: Sat 16th

Time	Event	Location
	Plenary talks. Chair: Robert Duce	
08:45-09:30	Tim Jickells, *Atmospheric Inputs to the Oceans from the Continents: Sources, Magnitudes and Effects*	Commonwealth Room A
09:30-10:15	Julie Hall, *Links between Biogeochemistry and Ecosystems*	
10:15-11:00	*Coffee break*	*Mezzanine*
11:00-11:45	Chris Fairall, *Some recent progress in measurement and parameterization of air-sea gas transfer*	Commonwealth Room A
11:45-12:30	Ulrike Lohmann, *Aerosols and Climate: The Cloud Connection*	
12:30-13:15	Tom Pedersen, *Variability of Export Production in the Sea: Symptoms, History, and Implications for Climate*	
13:14	*End*	

Posters

Each poster will be assigned to one of the bays (labled A-M). There is no designated position within the bay. First come, first served.

Posters are on display for the whole day. Please remove your poster at the end of each day. Poster presenters are expected to stand by their poster for part of their poster session.

Pins or Velcro dots will be provided as required.

In order to support students and encourage excellence, SOLAS is offering prizes for the top three posters in each of the poster sessions. Students (PhD and MSc) are strongly encouraged to participate in the competition.

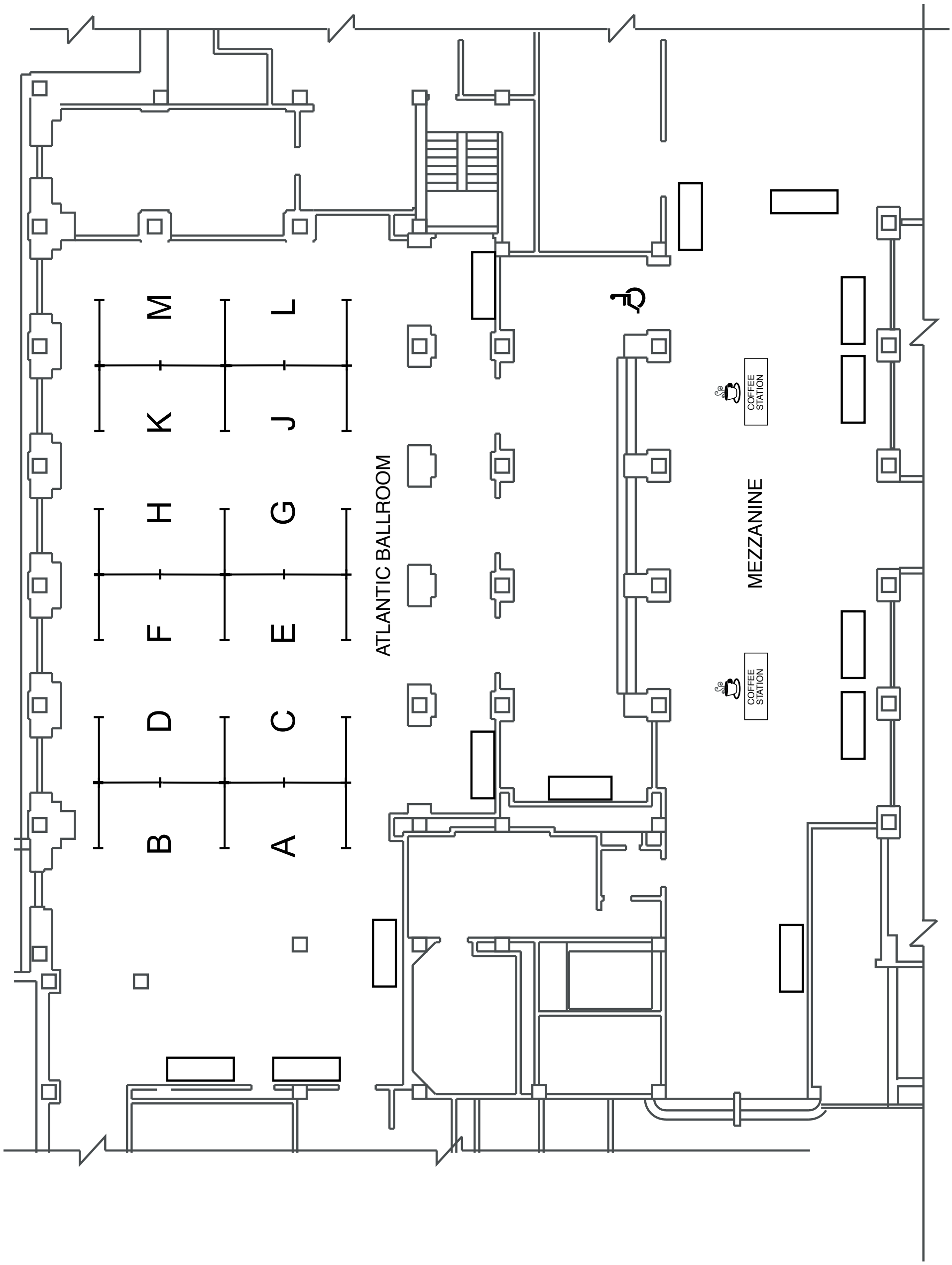
Each day the Poster session chair will convene a panel of judges to identify the top 3 posters based on research quality, topic originality and presentation.

Prizes will be awarded at the banquet on Friday 15th.

If you wish to participate in the competition, please affix the red sticker below to your poster.

Poster Session	Chair	Day
Air-sea flux of greenhouse gases	Doug Wallace	Weds 13th
Biogeochemical Interactions and Feedbacks between Ocean and Atmosphere	Bill Miller	Thurs 14th
Exchange Processes	Rik Wanninkhof	Fri 15th

Posters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ATLANTIC BALLROOM
MEZZANINE
COFFEE STATION
COFFEE STATION

Posters: Weds 13th

Research programme summaries

		poster bay
Ganzeveld, L.	The Integrated Land Ecosystem – Atmosphere Processes Study	A
Hughes, C.	UK Surface Ocean-Lower Atmosphere Study (UK SOLAS)	A
Robinson, C.	The Atlantic Meridional Transect Programme	A
Shi, G-Y.	SOLAS Activities in China	A
Turk, D	Canadian Surface Ocean-Lower Atmosphere Study (C-SOLAS)	A

CO_2, CO and O_2 fluxes and O_2 measurement techniques

Azetsu-Scott, K	Deep Convection and Uptake of Atmospheric CO_2 in the Labrador Sea	D
Borges, A.	Do we Have Enough Pieces of the Jigsaw to Integrate CO_2 Fluxes in the Coastal Ocean?	B
Boutin, J.	Seasonal Variability of fCO_2 and Air-Sea CO_2 Fluxes in the Subantarctic Zone of the Southern Ocean	D
Brévière, E.	Large Variabilities of air-sea CO_2 Exchange in the East Indian Sector of the Southern Ocean	D
DeGrandpre, M	Sea Surface pCO_2 and Deep Convection in the Labrador Sea	D
Delille, B.	Carbon Dioxide Dynamics in Antarctic Pack Ice and Transfer at the Ice-Sea and Air-Ice Interface	C
Hardman-Mountford, N.	Exploiting Earth Observation Data to Determining the Air-Sea Fluxes of CO_2	B
Kettle, A.	Diurnal Cycling of Carbon Monoxide in the Sargasso Sea	C
Iwata, T	A Long Time Continuous Observation of Air-Sea CO_2 Flux by the Eddy-Covariance Method over Coastal Ocean	C
Lo Monaco, C.	Study of the Carbon Cycle Decadal Variability in the South West Indian Ocean Using Observations and Global Ocean Simulations	C
Olsen, A.	Diurnal Variations of Surface Ocean pCO_2 and sea-air CO_2 Flux Evaluated Using Remotely Sensed Data.	B
Padín, X.	Seasonal CO_2 Uptake in the Biscay Bay During 2003	D
Papakyriakou, T.	Atmospheric CO_2 Fluxes Over Sea Ice: Results From the Canadian Arctic	C
Pascal, R.	A New Microelectrode Dissolved Oxygen Sensor	B
Schimanski, J	High-Precision Oxygen Measurements from Profiling Floats	B
Zhai, W.	The Partial Pressure of Carbon Dioxide and Air-sea Fluxes in the South China Sea: a Subtropical Marginal Sea as a Source of Atmospheric CO_2	C

Air sea fluxes of N_2O and CH_4

Cornejo, M.	Temporal variability of N_2O concentration and the ocean - atmosphere exchange in an upwelling area off Central Chile (36°S)	J
Forster, G.	Nitrous Oxide in the Atlantic Ocean	J

Posters: Weds 13th

		poster bay
Gallegos, J.	SIMON: An Automatic System for Continuous Measurements of Nitrous Oxide at Sea	J
Gebhardt, S.	Hydroxylamine in the Baltic Sea	J
Kitidis, V.	A Combined Geophysical-Biogeochemical Study of Methane Cycling in a Shallow Coastal Inlet (Ria de Vigo, NW Spain)	K
Purvaja, R	Nitrogen cycling in Indian Mangroves	J
Ramesh, R.	Dynamics of Nitrous Oxide and Methane Fluxes from Mangroves	J
Upstill-Goddard, R.	Bacterioneuston Control of Air-Water Methane Exchange Determined With a Laboratory Gas Exchange Tank.	K

Upper ocean carbon cycling and CDOM

Ahmed, M.	Nutrient and Phytoplankton Dynamics in Northern Bay of Bengal: An Ecological-physical Coupled Model	F
Akella, S.	Spectral CDOM Photobleaching Rates from Long-Term Irradiations of UK Coastal Waters	F
Avgoustidi, V.	Living in a Double CO_2 World: DMS Production by Marine Phytoplankton	H
Bellerby, R.	Planktonic Community Biogeochemical Response to Changing CO_2 Concentrations	G
Beman, J.	Large Phytoplankton Blooms Fuelled by Agricultural Runoff into Especially Vulnerable Ocean Waters	E
Devred, E.	Satellite Imagery in Support of C-SOLAS Cruises: Discrimination of Diatoms From Other Populations	G
Egge, J.	Assimilation, Organic Production and Release of Carbon	K
Forget, M-H.	Estimations of Photosynthetic Parameters Using Daily Water-Column Production in Different Aquatic Systems	G
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Plenary talks: Weds 13th

An In-situ Iron Enrichment Experiment in the Western Subarctic Pacific: SEEDS

Tsuda, A. Ocean Research Institute, University of Tokyo, Japan
tsuda@ori.u-tokyo.ac.jp

To test the iron hypothesis, an in situ iron-enrichment experiment (SEEDS) was performed in the western subarctic Pacific in summer 2001. About 350 kg of iron and the inert chemical tracer sulfur hexafluoride were introduced into a 10m deep surface mixed layer over an 8 X10 km area. During SEEDS there were iron-mediated increases in chlorophyll a concentrations (16 mg/m^3), primary production rates and photosynthetic energy conversion efficiency relative to waters outside the iron-enriched patch. The rapid and very high accumulation of phytoplankton biomass was caused by a floristic shift from open-ocean pennate diatoms to fast-growing centric diatoms and by shallow surface mixed layer (10-20m). The blooming of diatoms resulted in a marked consumption of macronutrients. The export flux between day 2 and day 13 was 12.6% of the integrated primary production in the iron-enriched patch. Major part of the carbon fixed by diatom blooming stayed in the surface mixed layer as biogenic particulate matter. The findings of SEEDS support the hypothesis that iron limits phytoplankton growth and biomass in a 'bottom up' manner in this area, but the fate of algal carbon remains unknown. We are planning a second iron enrichment experiment in the same area in summer 2004 (SEEDS II) for longer period (34 d). A brief summary of SEEDS II and comparisons among SEEDS I, SERIES and SEEDS II will be presented.

Evidence For Methanol Uptake in the North Atlantic Ocean

Carpenter, L. J. Department of Chemistry, University of York, UK
ljc4@york.ac.uk

At coastal atmospheric monitoring stations, can measurements of volatile organic chemicals (VOCs) in air give quantitative information about their marine sources and sinks? In this talk, atmospheric measurements of methanol (CH_3OH) and other VOCs at Mace Head on the west coast of Ireland are presented to support the hypothesis that the North Atlantic Ocean is a sink for CH_3OH and to calculate an uptake rate. Methanol has an almost ubiquitous presence throughout the troposphere and has been identified as having an important effect on the oxidative capacity, yet a major uncertainty is whether the ocean is a net source or sink. Atmospheric observations

Plenary talks: Weds 13th

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Modelling the Planktonic Community Response to Iron Fertilization

Denman, K.L. Canadian Centre for Climate Modelling and Analysis, University of Victoria and Institute of Ocean Sciences, Victoria, Canada
ken.denman@ec.gc.ca

SOLAS is focussed on observations of biogeochemical processes in the upper ocean and lower atmosphere that regulate exchanges of matter (gases and particulates) between the ocean and the atmosphere. Experiments involving purposeful perturbation of natural cycling are integral to SOLAS - as have already been conducted in several areas with iron additions to stimulate diatom growth and carbon sequestration to the ocean interior. SOLAS observations are usually obtained at a local scale; but a primary objective is to develop increased understanding of the relevant processes and improve parameterizations of these processes in models at regional and global scales. One tool for bridging the gap in scales is models - usually requiring iteration between detailed models of local studies and less-detailed models to be incorporated in general circulation models at regional and global scales. I present results from one-dimensional models designed to explore the planktonic ecosystem and biogeochemical responses to the 2002 SERIES iron fertilization experiment in the subarctic NE Pacific. The model captures the initial bloom of small phytoplankton followed by the larger bloom of diatoms, accompanied by a strong draw-down of the nutrient silicic acid and a buildup of subsurface ammonia. The sensitivity of model results to changes in food preference of microzooplankton (from small phytoplankton and detritus to diatoms), to the way aggregation and sinking losses are parameterized, and to the assumed uptake ratio by diatoms of Si to N is explored. Finally, preliminary results of a coupled 1-D atmosphere-ocean boundary layer model are discussed.

OASIS: interactions between the Ocean, Atmosphere, Sea Ice and Snow-pack in Polar regions

Bottenheim, J. W Meteorological Service of Canada, Toronto, Canada
Jan.Bottenheim@ec.gc.ca

Oceans form a large part of the Polar surface area. Especially in the Arctic the interface with the overlying atmosphere is not of a direct gas-liquid nature, but rather via a frozen ice sheet, covered by snow. The interaction between the atmosphere and these snow-covered surfaces has received little interest until recent years but it has now emerged that this snow layer is not simply a pristine, white blanket but in fact is a surprisingly reactive medium for chemical surface reactions with a strong impact on the troposphere. It has been concluded that interlinked physical, chemical, and biological mechanisms, fueled by the sun and occurring in this snow layer, are responsible for depletion of tropospheric ozone and gaseous mercury. At the same time production of highly reactive compounds (e.g. formaldehyde, nitrogen dioxide) has been observed at the snow surface. Chemically, the composition of this snow pack is determined by interactions both with the overlying atmosphere and the underlying ocean. Halogens from sea salt and organic material from biological activity in the ocean environment make up a large part of the chemical environment of the Polar snow packs. For decades human activity has led to the addition of waste products including acidic particles (sulphates) and toxic contaminants such as gaseous mercury and POPs (persistent organic pollutants). Virtually nothing is known about transformations of these contaminants in the snowpack and hence the nature and amounts of material that is released in the marine ecosystems during the melting of seasonal snow-packs and ice. This is especially disconcerting when considering that climate change will undoubtedly alter the nature of these transformations involving snow, ice, atmosphere, ocean, and, ultimately, biota.

In this presentation the knowns and unknowns of these processes will be highlighted, including new results concerning the potential role played by frost flowers in stimulating these processes. This will culminate in an introduction to the proposed OASIS program (Ocean-Atmosphere-Sea Ice-Snowpack interactions) which has as its mission statement the aim to determine the impact of OASIS chemical exchange on tropospheric chemistry and climate, as well as on the surface/biosphere and their feedbacks in the Polar regions of the globe.

Plenary talks: Thurs 14th

Surface Process Controlling Air-sea gas fluxes

McGillis, W. R. Henry Krumb School of Mines, Columbia University, USA
wrm2102@columbia.edu

The physical processes influencing the transport and transformations of climate relevant compounds across the air-sea interface and through the ocean and marine atmospheric boundary layers will be presented. In both the laboratory and field, measurements of air-sea gas exchange using micrometeorological techniques and conservative mass balances are used to elucidate the many physical process controlling air-sea gas transfer. These techniques provide quantification of air-water gas fluxes on small temporal scales adequate to reveal and understand the processes controlling the exchange. Focus will be on a wide range of environmental conditions including: wind, wind stress, waves, surfactants, bubbles, atmospheric and ocean stability, incident heat fluxes, and solubility. A synopsis of multi-disciplinary air-sea flux experiments and the physical and biogeochemical processes controlling the flux will also be discussed.

The Air-sea Oxygen Flux

Najjar, R. Department of Geosciences, Pennsylvania State University, USA
najjar@meteo.psu.edu

Knowledge of the air-sea oxygen flux is important for understanding global-scale budgets of carbon dioxide as well as for quantifying net community production in surface waters. Few, if any, direct measurements of the air-sea oxygen flux have been made, and so a variety of techniques have been developed for quantifying it, including bulk formulae applied to surface ocean dissolved oxygen measurements and three-dimensional inverse models of oceanic and atmospheric oxygen distributions. I will review our current understanding of the air-sea oxygen flux, including a description of spatial, seasonal and long-term variations. In short, our understanding of seasonal variations appears to exceed that of long-term and large-scale spatial variations. The limitations of existing techniques will also be discussed, as well as the possibility for direct measurements of the flux. Physical processes incur major uncertainties in existing methods: quantification of the impacts of bubbles and physical transport significantly limit the reliability of bulk formulae and inverse models, respectively

Plenary talks: Thurs 14th

Global Monitoring of Atmospheric Trace Gases, Clouds and Aerosols from UV/vis/NIR Satellite Instruments. Current Status and Neear Future Perspectives

Wagner, T. Institut für Umweltphysik, Uni-Heidelberg, Germany
thomas.wagner@iup.uni-heidelberg.de

In 1995 the first nadir looking UV/vis satellite instrument with a moderate spectral resolution (0.2 - 0.4 nm) over a broad spectral range (240-790 nm), the Global Ozone Monitoring Experiment (GOME), was launched on ERS-2. In the following years sophisticated differential optical absorption spectroscopy (DOAS) algorithms were developed for the detection of various atmospheric trace gases (O_3, NO_2, OClO, BrO, H_2O, HCHO, SO_2, O_2, O_4), several of which are located in the troposphere. The derived global data sets allow us to study different aspects of atmospheric chemistry and physics related to O_3 chemistry, tropospheric pollution, trace gas budgets, and climate change. In 2002 a second DOAS-type satellite instrument, the SCanning Imaging Absorption SpectroMeter for Atmospheric ChartographY (SCIAMACHY) was launched. In addition to GOME it measures over a wider wavelength range (240 nm - 2380) including also the absorption of several greenhouse gases (CO_2, CH_4, N_2O) and CO in the IR. Another advantage is that the ground pixel size for the nadir viewing mode was significantly reduced to 30 x 60 km (in a special mode even to 15 x 30 km). Especially for the observation of tropospheric trace gases this is very important because of the strong spatial gradients for many of these species. Several additional space borne DOAS instruments are planned for future missions. Three instruments of a second generation (GOME-2) of GOME instruments scheduled planned for the EUMETSAT MetOp 1, 2, and 3 platforms (2005-2020), extending the GOME and SCIAMACHY atmospheric chemistry measurement series in the UV/VIS into the next two decades. In addition, the Ozone Monitoring Instrument (OMI) will be launched in 2004 and will further improve the spatial resolution with ground pixels of only 13x24km. The talk will present various examples of satellite derived trace gas distributions and illustrates their usefulness for the understanding of the complex system earth.

Air-sea CO_2 fluxes in the Southern Ocean: natural and methodological variabilities

Metzl, N. LBCM/IPSL, Université Pierre et Marie Curie, Paris, France
metzl@moka.ccr.jussieu.fr

Observing and understanding the seasonal, interannual and decadal variations of the oceanic carbon cycle is crucial to better estimate the global carbon budget and to validate coupled complex climate models. Regions, such as the North Atlantic or the North and Tropical Pacific, have been and still regularly sampled to obtain oceanic CO_2 data and estimate variabilities of the air-sea CO_2 fluxes. In the Southern Hemisphere, especially south of 40°S, the international strategy of such measurements is not yet accomplished. However, long-term monitoring of biogeochemistry in the Southern Ocean is highly recommanded because in this sector there are still very large uncertainties attached to the present knowledge of global carbon budget. On the other hand, the Southern Ocean is recognized to be very sensitive to climate change in the context of futur anthropogenic forcing. This concerns many processes and feedback mechanisms, including thermodynamics, circulation, mixing and biogeochemistry, that could change the distribution of ocean CO_2 sources and sinks. This has to be observed as soon as possible and need to be understood in more details. In recent years, indirect methods, Atmospheric Inverse Models (AIMs, or top-down approach) and Biogeochemical Ocean Global Circulation Models (BOGCMs), have been developped to quantify the temporal variability of air-sea CO_2 fluxes. However, in the Southern Ocean the results are controversial: low CO_2 sink but large interannual variabilities are estimated with the AIMs, whereas most of BOGCMs calculate a strong CO_2 sink but low interannual variabilities. In order to understand these differences, I'll try to compare the indirect estimates with regional air-sea CO_2 fluxes based on oceanic observations (OISO cruises 1998-2004) conducted in the southern Indian Ocean, including during austral winter. The good news is that the AIMs approach appears comparable with the observations, offering some confidence for quantifying the present oceanic carbon budget and its variability, at least since 1980. The bad news is that BOGCMs, which are used for predicting climate change or understanding past climate, are not comparable to observations. New research directions for testing and/or changing BOGCMs will be proposed.

Ecosystem composition and CO_2 flux variability

LeQuéré, C. Max-Planck-Institutfür Biogeochemie, Jena, Germany
lequere@bgc-jena.mpg.de

Primary producers fix ~45 Pg of carbon every year. Roughly 10 of these Pg are exported from the surface to the intermediate and deep ocean by the sinking flux of organic matter. Ocean biogeochemistry models reproduce roughly these two numbers. Models also reproduce the mean surface chlorophyll as observed by satellite, but fail to reproduce it's year-to-year variability. An analysis of model results suggests that the representation of ecosystem processes is too tightly linked to physical transport in current model. We present early results from a Dynamic Green Ocean Model, which explicitly represents five Plankton Functional Types (PFTs) and parameterizes the exchange rates between PFTs and dissolved/particulate organic matter as a function of temperature. Model results suggests that a better representation of PFTs influences the variability in carbon fluxes, but more input and validation data (and data synthesis) are needed to better constrain these fluxes and to foresee how they may change in the future.

Plenary talks: Fri 15th

Iron as a Key Nutrient Regulating Primary Production and Nitrogen Fixation in the Ocean

La Roche, J. IFM-GEOMAR Leibniz-Institut für Meereswissenschaften, Kiel, Germany
jlaroche@ifm.uni-kiel.de

It is well established that the availability of dissolved iron plays an important role in controlling phytoplankton growth in the ocean. However, the impact of iron on phytoplankton groups and productivity varies with oceanic regions. Iron fertilization of HNLC regions promotes the growth of large diatoms and depletion of surface macronutrients. The high iron requirements of diazotrophs and their predominance in oceanic regions receiving high mineral dust deposition suggest that iron also limits oceanic nitrogen fixation. Extensive nutrient bioassay experiments in the tropical and subtropical Atlantic provide direct evidence supporting this hypothesis. Physiological and biochemical data indicate that diatoms and diazotrophs are most affected by iron limitation. A comparison of the genes involved in iron uptake and homeostasis in several marine phytoplankton species whose genome has been sequenced shows that iron uptake systems in diatoms have many similarities with other eukaryotic systems, and with yeast in particular. The response of diatoms to iron limitation includes non-specific responses, also observed with limitation by other nutrients, leading to down-regulation of the phytosynthetic apparatus and chlorosis. Responses more specific to iron limitation, include the substitution of flavodoxin for ferredoxin and the synthesis of high affinity iron uptake systems. Subtraction libraries constructed for Fe-replete and Fe-limited Thalassiosira weissflogii, as well as gene expression studies using quantitative real-rime PCR indicate that the flavodoxin gene transcript is several orders of magnitude more abundant in iron limited cells of three diatoms. Transcripts of other genes, possibly involved in iron transport, are also enriched under iron-limitation.

The Occurrence and Emission of DMS in the Ocean: A View Through Space and Time

Simó, R., Vallina, S., Vila, M. Institut de Ciéncies del Mar (CSIC), Barcelona, Catalonia, Spain
rsimo@icm.csic.es

Seventeen years after CLAW's suggestion that the production of DMS by the marine microbiota and its emission to the atmosphere could exert a regulation effect on climate through affecting cloud albedo over the oceans, this hypothetical mechanism still stands as one of the most emblematic case studies of Earth System science. A large body of research has unveiled the complexity that underlies the ocean-atmosphere DMS cycle, involving e.g. biodiversity patterns, succession dynamics, organism acclimation, trophic interactions, chemosensory strategies, aqueous photochemistry, air-sea exchange, atmospheric chemistry and cloud microphysics. On the way toward finding feedback links between oceanic biosphere and climate, researchers are exploring the response of the plankton-DMS system to a number of physicochemical forcings that operate at different scales: from the individual organism sensing a change in the UV radiation dose as it moves up and down the water column, to the long-term shifts in planktonic communities due to eutrophication or warming. Perhaps the large-scale dynamics of DMS and its effects on climate can only be fully understood (i.e. predicted) by scaling up the physiological behaviour of the individual cell as it interacts with other cells and its ever-changing environment. Here I will travel through space to show how single-cell (or population) methods are revealing new major players in the DMS cycle, and how satellite-derived data allow us to assess the relationship between oceanic DMS and potential cloud condensation nuclei on a global scale. I will also travel through time to explore different modes of variability in the DMS cycle: diel (through day and night), annual (through seasons), and interdecadal (as projected into enhanced greenhouse conditions).

Formation of Atmospheric Particles from Marine Biogenic Precursors: Can we Extrapolate from the Arctic to the World's Oceans?

P. Matrai[1], C. Leck, K. Bigg, E. Swietlicki, M. Tjernstrom, L. Tranvik and P. Wassmann
[1]Bigelow Laboratory for Ocean Sciences, W. Boothbay Harbor, USA
PMatrai@bigelow.org

During a long period of continuous observation (AOE-01) near 89°N, biological observations in seawater, microlayer and ice, helped understand the sources of organic particles, while meteorological and atmospheric measurements documented processes affecting their injection into the air, the evolution of the particles produced, particle growth and dispersal and the extent to which long-range continental transport might contribute to the arctic boundary layer aerosol. Meteorological measurements showed a very stable air temperature (-1.5-0°C), RH ca. 100%, a high frequency of shallow clouds (base at 50-150m) without the usual below-cloud haze, and visibility often exceeded 20 km. The air was usually well-mixed from the surface to 200m, where a temperature inversion facilitated mixing and inhibited exchange with the free troposphere. Cloud reflectivity should therefore have been more influenced by in situ CCN than any from distant sources. Very small particle formation indeed took place below clouds or in regions recently occupied by cloud or fog, rather than above clouds, as seen before. Phytoplankton were mostly flagellated forms, while meso-zooplankton biomass was mostly copepods. Primary and bacterial production was measurable and, like DMSP and DMS production, constrained to the ocean surface mixed layer. Virus-like particles were abundant in the leads surface microlayer and were enriched on days with small particle production. These small particles acted as centers for condensation of DMS oxidation products. Our new picture of the Arctic aerosol greatly expands the possibility of a climate feedback effect, since there is a much greater involvement of biological processes than with DMS alone.

Coastal Connections and pCO_2, N_2O and DMS levels in the North Indian Ocean

Kumar, M, D. National Institute of Oceanography, Goa, India
dileep@darya.nio.org

The North Indian Ocean is one of the most important regions in the world for ocean-atmosphere interactions associated with monsoons. It is estimated that about 20% of both CO_2 and sulphur (as dimethylsulphide) gases and 75% of N_2O are loaded into the South Asian atmosphere from natural emissions from this Ocean. Inter-basin (Arabian Sea and Bay of Bengal) differences in intensity of biogeochemical processes lead to gradients in dissolved concentrations and sea-to-air fluxes of these gases. Differences in biogeochemistry between east and west basins are primarily driven by regular oscillations of the Inter Tropical Convergence Zone. Monsoons lead to strong continental connections in the North Indian Ocean with reference to material transports and coastal biogeochemical processes. Large suspended load facilitates rapid sinking of organic material while discharged fresh water strongly stratifies the surface layer restricting the exchange of gases. Gradients in river inputs therefore drive the differences in concentrations of these gases between east and west. Strong Southwest monsoon upwelling and surface stratification result in a brief buildup of biogenic gases and coastal anoxia along the west coast of India. It is thus important to focus on land-ocean boundary to study air-sea exchange of gases since coastal and marginal seas can disproportionately contribute to global biogeochemical fluxes.

Aerosol in the Marine Boundary Layer: Chemical Physical and Meterological Interactions

Ayers, G. CSIRO Atmospheric Research, Victoria, Australia
greg.ayers@csiro.au

Chemical and physical properties of the marine boundary layer aerosol at any point in space and time result from the integration of chemical, physical and meteorological processes that interact in complex ways. Time and space scales involved in these interactions vary from fast photochemical processes with characteristic times of seconds, up to seasonal, interannual and longer timescales over which the climate system adjusts to variability in global meteorological and oceanic phenomena. In this talk we consider the manner in which the various time and space scales interact to produce variability in MBL aerosol properties.

Plenary talks: Sat 16th

Atmospheric Inputs the Oceans from the Continents - Sources, Magnitudes and Effects

Jickells, T. D. School of Environmental Sciences, University of East Anglia, Norwich, UK.
T.Jickells@uea.ac.uk

Atmospheric emissions on land from natural and anthropogenic processes can reach the coastal seas and open oceans. The nature of the emission process and subsequent atmospheric transformations profoundly influence the transport and deposition processes. In this talk I will focus on these issues of sources and transformations for some contaminants including lead as well as nutrients for marine systems such as fixed nitrogen and iron. The patterns of deposition to marine systems will be discussed along with the likely effects on marine biogeochemistry. Potential interactions between nutrients and also between nutrients and contaminants will be considered. Finally feedbacks from atmospheric deposition effects on marine biogeochemistry to climate and terrestrial systems will be discussed.

Links Between Biogeochemistry and Ecosystems in Marine Environments

Hall, J. NIWA, Hamilton, New Zealand
j.hall@niwa.cri.nz

Complex interactions between chemical factors such as concentration, distribution, and bioavailability of macronutrients and micronutrients that are required for life, and biological processes such as primary production, grazing and predation that alter the form and distribution of chemical elements in the ocean system are critical to the structure of marine ecosystems. The inputs, losses, dynamics and chemical forms of micro- and macronutrients influence the autotrophic and heterotrophic organisms found in the ocean with subsequent non-linear impacts on metabolic rates and processes, population dynamics, and food web and community structure. The bioavailability of macro- and micronutrients required for the functioning of specific enzymes and metabolic pathways may exert considerable control on the species composition of communities of marine organisms and functional metabolic pathways. Changes in microbial and phytoplankton activity due to changes in the concentrations, types and ratios of macro- and micronutrients can alter the composition, production, and subsequent degradation of organic matter. Through uptake, metabolic transformations, active and passive transport, extracellular complexation and recycling, biological communities exert considerable control on the oceanic abundance and distribution of macro- and micronutrients and other particle-reactive elements. Such transformations may themselves be influenced by factors internal to marine food webs, such as species composition, as well as external factors that may vary in time and space. Understanding marine biogeochemical cycles and ecosystems requires a significant increase in our understanding of the interactions between biological and geochemical processes. A series of key issues and examples will be presented.

Some Recent Progress in Measurement and Parameterization of Air-sea Gas Transfer

Fairall, C. NOAA Environmental Technology Laboratory, Boulder, USA
chris.fairall@noaa.gov

Air-sea fluxes of heat, momentum, moisture, and trace gases are critical components of the Earth's climate system. Carbon dioxide is the most prominent trace gas in this respect. Methane, ozone, DMS, etc., also contribute to the climate system and have further implications in ecosystems, pollution, and cloud dynamics. Direct measurements of air-sea energy and momentum fluxes in the last decades have led to substantial improvements in flux parameterizations with applications in numerical models and methods to estimate fluxes from bulk data. Research programs in climate, weather and air pollution have prompted the need for global air-sea flux estimates with ever increasing demands for temporal and spatial resolution.Thus, methods to determine fluxes from global data and to constrain fluxes in GCM applications have become a major research focus. In the last decade major progress has been made in applying micrometeorological methods for direct measurement of sea-air gas fluxes from ships and buoys and a recent series of field campaigns has greatly reduced uncertainties in the gas transfer velocity for CO_2. New fast sensor technologies are expected to fielded for DMS and ozone. Advances in physically based parameterizations of turbulent fluxes and the oceanic cool skin microlayer have led to much improved gas flux parameterizations capable of dealing with solubility, diffusivity, whitecap bubble enhancement and near-surface chemical reactions. Efforts are now underway to develop methods for estimation of gas transfer velocities from satellite observations.

Plenary talks: Sat 16th

Aerosols and Climate: The Cloud Connection

Lohmann, U. Swiss Federal Institute of Technology, Zurich, Switzerland
Ulrike.Lohmann@dal.ca

Anthropogenic aerosols, such as sulfates and carbonaceous particles, exert an indirect climate effect by acting as cloud condensation nuclei and thereby affecting the initial cloud droplet number concentration, albedo, precipitation formation, and lifetime of warm clouds. These effects are very uncertain partly because our insufficient understanding of the effect of organic aerosols. Organic aerosols could increase the number of cloud droplets as compared to, for instance, ammonium sulfate if they decrease the surface tension. On the other hand, they may retard cloud formation because organics are generally less soluble than ammonium sulfate. Under different environments different effects may dominate. In this talk, I will present Lagrangian parcel model simulations in order to understand the effect of organics as cloud condensation nuclei. The model studies are guided by data taken over the Atlantic Ocean as part of the Canadian SOLAS cruise in 2003 and by data taken over the Arctic Ocean as part of the Arctic Ocean Experiment in 1996.

Variability of Export Production in the Sea: Symptoms, History, and Implications for Climate

Pedersen, T. Oceanography, Earth and Ocean Sciences, University of British Columbia, Vancouver, Canada
pedersen@eos.ubc.ca

No abstract submitted (on its way in a few hours he says....)

Attendance List

Md. Kawser Ahmed
University of Dhaka
Curzon Hall Campus
Dhaka 1000
Bangladesh
+880 2 8014273
kawser_du@yahoo.com

Caroline Renae Alexander
University of Dalhousie
C-SOLAS Secretariat
1355 Oxford Street
Halifax Nova Scotia B3H 4J1
Canada
+1 902 494 2870
caroline.alexander@dal.ca

Kingsley Alinonu
Alinco sons enterprises
1 omommeji sanni street
Agege Lagos state 2 3401
Nigeria
+23 401 473 4137
ero4luv@yahoo.com

Kazushi Aranami
National Institute for Environmental Studies
Environmental Chemistry Division
16-2 Onogawa
Tsukuba Ibaraki 305-8506
Japan
+81 29 850 2902
aranami.kazushi@nies.go.jp

Stephen Archer
Plymouth Marine Laboratory
Prospect Place
Plymouth Devon PL1 3DH
UK
+44 (0) 1752 633100
stda@pml.ac.uk

William Asher
University of Washington
Applied Physics Laboratory
1013 NE 40th Street
Seattle WA 9 8105
USA
+1 206 543 5942
asher@apl.washington.edu

Nicole R. Auer
Baltic Sea Research Institute
Marine Chemistry
Seestraße 15
Rostock 1 8119
Germany
+49(0)3815197379
nicole.auer@io-warnemuende.de

Valia Avgoustidi
Plymouth Marine Laboratory
Prospect Place, West Hoe
Plymouth PL1 3DH
UK
+44 (0) 1752 633100
vaav@pml.ac.uk

Gregory Ayers
CSIRO Atmospheric Research
Aspendale Victoria 3195
Australia
+61 3 9239 4687
greg.ayers@csiro.au

Kumiko Azetsu-Scott
Bedford Institute of Oceanography
Fisheries and Oceans
1 Challenger Dr.
Dartmouth Nova Scotia B2Y 4A2
Canada
+1 902 426 8572
Azetsu-ScottK@mar.dfo-mpo.gc.ca

Hermann W Bange
IFM-GEOMAR
Mar. Biogeochem. Div.
Duesternbrooker Weg 20
Kiel 2 4105
Germany
+49 431 6004204
hbange@ifm-geomar.de

Jonathan Barnes
Newcastle University
Marine Sciences and Technology
6 Poplar Crescent
Gateshead Tyne and Wear NE8 1QD
UK
+44 (0) 191 4772432
jonathan.barnes@ncl.ac.uk

Burkard Baschek
Woods Hole Oceanographic Institute
360 Woods Hole Rd
Woods Hole MA 0 2543
USA
+1 (508) 289-2563
bbaschek@whoi.edu

Tom Bell
University of East Anglia
School of Environmental Sciences
Norwich Norfolk NR4 7TJ
UK
+44 (0)1603 591315
thomas.bell@uea.ac.uk

Richard Bellerby
University of Bergen
Bjerknes Centre
Allegaten 55
Bergen 5007
Norway
+47 5558 2565
richard.bellerby@bjerknes.uib.no

J. Michael Beman
Stanford University
GES Department
Stanford CA 94305-2115
USA
+1 650 724 1535
beman@stanford.edu

Emile Bévière
Universite Pierre et Marie Curie
LBCM/IPSL
4, place Jussieu (case134)
Paris 75252 cedex 05
France
33-1 44 27 48 61
breviere@ccr.jussieu.fr

Jan W Bottenheim
Meterological Service of Canada
Air Quality Research Division
4905 Dufferin Street
Toronto Ontario M3H T4
Canada
+1 416 739 4838
Jan.Bottenheim@ec.gc.ca

Attendance List

Heather Bouman
Dalhousie University
Biological Oceanogrphy Section,
Bedford Institute of Oceanography
PO Box 1006 B240
Dartmouth NS B2Y 4A2
Canada
+1 902 426 4681
hbouman@dal.ca

Frank Bradley
CSIRO
Land and Water
Clunies Ross Street
Canberra ACT 2601
Australia
+61 2 6246 5575
frank.bradley@csiro.au

Wendy Broadgate
IGBP Secretariat
IGBP, Royal Swedish Academy of Sciences
Box 50005, Stockholm SE104 05
Sweden
+46 8 166448
wendy@igbp.kva.se

Gitane Caron
Université Laval
2024 rue Hélène-Boullé
Ste-Foy Québec G1V 2B9
Canada
+1 418 687 1574
Gitane.Caron@giroq.ulaval.ca

Lucy J Carpenter
University of York
Department of Chemistry
York YO10 5DD
UK
+44 (0)1904 434588
ljc4@york.ac.uk

Rose Chambers
University of East Anglia
School of Environmental Sciences
Norwich Norfolk NR4 7TJ
UK
+44 (0) 1603 591315
r.chambers@uea.ac.uk

Rosie Chance
University of East Anglia
School of Environmental Sciences
Norwich Norfolk NR4 7TJ
UK
+44 (0) 1603 591315
r.chance@uea.ac.uk

Jianmin Chen
Fudan University
Environmental Science and Egineering
220 Handan Road
Shanghai 20 0433
China
+86 21 65642521
jmchen@fudan.ac.cn

Marcela Alejandra Cornejo
University of Concepción
Oceanography, Regional Program of Physical
Oceanography and Climate
Cabina 7, Barrio Universitario
Concepción VIII Región Casilla 160-C
Chile
+56 41 203585
mcornejo@profc.udec.cl

Leticia Cotrim da Cunha
Max Planck Institute for Biogeochemistry
POSTFACH 100164
Jena D-07701
Germany
+49 3641576215
lcotrim@bgc-jena.mpg.de

William R. Crawford
Fisheries & Oceans Canada
Institute of Ocean Sciences
9860 West Saanich Road
Sidney BC V8L 4B2
Canada
+1 250 363 6369
crawfordb@pac.dfo-mpo.gc.ca

Gerrit de Leeuw
TNO-FEL
POB 96864
The Hague 2509 JG
Netherlands
+31 70 374 0462
deleeuw@fel.tno.nl

Michael D. DeGrandpre
University of Montana
Chemistry
32 Campus Drive
Missoula MT 5 9812
USA
+1 406 243 4118
Michael.DeGrandpre@umontana.edu

Kai Armin Degreif
University of Heidelberg
Institut für Umweltphysik
Im Neuenheimer Feld 229
Heidelberg D-69120
Germany
+49 6221 546529
Kai.Degreif@iup.uni-heidelberg.de

Daniela A del Valle
University of South Alabama
Marine Science
LSCB-25
Mobile Alabama 3 6688
USA
+1 251 861 7525
ddelvalle@disl.org

Kenneth L Denman
University of Victoria/IOS
CCCMA
716 Aboyne Ave
Sidney BC V8L 5G2
Canada
+1 250 363 8230
ken.denman@ec.gc.ca

Emmanuel Devred
Dalhousie University
Oceanography
1 Challenge Drive
Dartmouth Nova Scotia B2Y 4A2
Canada
+1 902 426 4681
devrede@mar.dfo-mpo.gc.ca

Joanna Lee Dixon
Plymouth Marine Laboratory
Prospect Place, The Hoe,
Plymouth Devon PL1 3DH
UK
+44 (0)1752 633412
jod@pml.ac.uk

Attendance List

Marcelo Sandin Dourado
Instituto Nacional de Pesquisas Espaciais (INPE)
Divisao de Sensoriamento Remoto
Av. dos Astronautas, 1758, Jardim da Granja
Sao Jose dos Campos Sao Paulo 12227-010
Brazil
+55 12 3945 6504
dourado@ltid.inpe.br

William Drennan
RSMAS/University of Miami
Applied Marine Physics
4600 Rickenbacker Causeway
Miami FL 3 3149
USA
+1 305 3614798
wdrennan@rsmas.miami.edu

Robert A. Duce
Texas A&M University
Dept. of Oceanography
College Station Texas 77843-3146
USA
+1 979 845-5756
rduce@ocean.tamu.edu

Dave Duchene
Independant
1477 Lower Water St., Apt. 323
Halifax NS B3J 3Z4
Canada
+1 902 425-8265
david@duchene.ca

Sarah Jane Eaton
Memoial University of Newfoundland
Earth Science
5 Macklin Place
St. John's Newfoundland A1E1N6
Canada
+1 709 7383284
sarah_eaton@hotmail.com

Karl Magnus Eek
University of Victoria
School of Earth and Ocean Sciences
2396 Hamiota Street
Victoria BC V8R 2N2
Canada
+1 250 370 2646
eekm@pac.dfo-mpo.gc.ca

Jorun K. Egge
University of Bergen
Dept of Biology
Jahnebakken 5
Bergen N-5020
Norway
+47 55584484
jorun.egge@bio.uib.no

Scott M Elliott
Los Alamos National Laboratory
COSIM
Mail Stop D413
Los Alamos NM 8 7545
USA
+1 505 606-0118
sme@lanl.gov

Olivia C Errey
SOLAS IPO
University of East Anglia
Norwich Norfolk NR4 7TJ
UK
+44 (0)1603 593 516
o.errey@uea.ac.uk

Christopher Fairall
NOAA Environmental Technology
325 Broadway
Boulder CO 8 0305
USA
+1 303 497 3253
chris.fairall@noaa.gov

Biswas Karabi Farhana
University of East Anglia
School of Environmental Sciences
46 Lovelace Road
Norwich Norfolk NR4 7AE
UK
+44 1603 457419
k.biswas@uea.ac.uk

Marie-Helene Forget
Dalhousie University
Biology
508 Waterstone Run
Lucasville NS B4B 1X6
Canada
(902) 865-0507
mforget@dal.ca

Grant L Forster
University of Newcastle upon Tyne
Marine Science and Technology
1 Fern Avenue
Sunderland Tyne and Wear SR6 7HT
UK
0191 5292101
grant.forster@ncl.ac.uk

César Fuentes-Yaco
Dalhousie
Oceanography
1 Challenger Drive
Dartmouth Nova Scotia B2Y 4A2
Canada
(902)426-4681
Fuentes-YacoC@mar.dfo-mpo.gc.ca

Masahiko Fujii
University of Maine
School of Marine Sciences
5741 Libby Hall
Orono ME 0 4473
USA
1 207 581 4338
mfujii@maine.edu

José Mauricio Gallegos
University of Concepción
Oceanography, Regional Program of Physical
Oceanography and Climate
Cabina 7 Barrio Universitario
Concepción VIII Región Casilla 160 - C
Chile
56 - 41 - 203835
mauricio@profc.udec.cl

Attendance List

Christoph Sebastian Garbe
University of Heidelberg
Interdisciplinary Center for
Scientific
Computing
Im Neuenheimer Feld 368
Heidelberg 6 9120
Germany
+49 6221 548876
Christoph.Garbe@iwr.uni-heidelberg.de

Laura Goldson
Plymouth Marine Laboratory
Prospect Place
West Hoe Plymouth PL1 3DH
UK
01752 633100
lego@pml.ac.uk

Michel Gosselin
Université du Québec à Rimouski
ISMER
310, Allée des Ursulines
Rimouski Québec G5L 3A1
Canada
1-418-723-1986 Ext. 1761
michel_gosselin@uqar.qc.ca

Jim Gunson
Met Office
Fitzroy Road
Exeter EX1 3PB
United Kingdom
44 (0)1392 884242
jim.gunson@metoffice.com

Jinghua Guo
Beijing Normal University
Tne Center for Atmospheric
Environmental Study
19 Xinjiekouwai Street
Beijing Beijing 10 0875
China
86-10-62207493
gzhuang@bnu.edu.cn

Michelle S Hale
Memorial University of
Newfoundland
Ocean Sciences Centre
St. John's NL A1C5S7
Canada
1 709 737 2011
mhale@mun.ca

Julie Hall
National Intitute of Water and
Atmospheric
Research
Silverdale Road, Gate 10
Hamilton PO Box 11-115
NZ
+46 18 4712262
j.hall@niwa.cri.nz

Dennis A. Hansell
University of Miami
RSMAS
4600 Rickenbacker Causeway
Miami FL 3 3156
USA
305-361-4078
dhansell@rsmas.miami.edu

Nick Hardman-Mountford
Plymouth Marine Laboratory
CASIX
Prospect Place
Plymouth Devon PL1 3DH
UK
+ 01752 633429
casix_dir@pml.ac.uk

Jeffrey Hare
University of Colorado
CIRES
325 Broadway
Boulder CO 8 0305
USA
303-497-5864
jeff.hare@noaa.gov

Mike J Harvey
National Institute of Water and
Atmospheric Research (NIWA)
PO Box 14-901
Wellington 6002
New Zealand
+64 4 9349704
m.harvey@niwa.co.nz

Shinya Hashimoto
University of Shizuoka
Institute for Environmental Sciences
52-1 Yada
Shizuoka Shizuoka 422-8526
Japan
+81-54-264-5782
hashimos@u-shizuoka-ken.ac.jp

Jose Joaquin Hernandez-Brito
University of Las Palmas of Gran
Canaria
Edificio CC. Básicas
Departamento de Química.
Campus de Tafira Baja
Las Palmas de Gran Canaria 3
5017
Spain
34 -928 45 29 19
josejoaquin.hernandezbrito@gobiernodecanarias.org

Eric Hintsa
Woods Hole Oceanographic
Institution
Marine Chemistry
266 Woods Hole Road
Woods Hole MA 0 2543
USA
508 289-3301
ehintsa@whoi.edu

David Ho
Lamont-Doherty Earth Obs.
61 Route 9W
Palisades NY 1 0964
USA
845-365-8706
david@ldeo.columbia.edu

Jens C Hollwedel
University of heidelberg
Institut fuer Umweltphysik
Im Neuenheimer Feld 229
Heidelberg 6 9120
Germany
+49 6221 545477
jens.hollwedel@iup.uni-heidelberg.de

Gerd Hönninger
Environment Canada
Meteorological Service of Canada
4905 Dufferin Street
Toronto Ontario M3H 5T4
Canada
+1 416 739 4856
Gerd.Hoenninger@ec.gc.ca

Attendance List

Barry J Huebert
University of Hawaii
Oceanography
1000 Pope Rd. MSB 406
Honolulu HI 9 6822
USA
1-808-956-6896
huebert@hawaii.edu

Claire Hughes
SOLAS, University of East Anglia
School of Environmental Sciences
Norwich Norfolk NR4 7TJ
UK
01603 591530
claire.hughes@uea.ac.uk

Gao Huiwang
Ocean University of China
5 Yushan Road
Qingdao 26 6003
China
0086-532-2032977
hwgao@ouc.edu.cn

Pierre Huonnic
University of Nantes
2 rue de la Houssiniere
Nantes 4 4322
France
33 2 51 12 56 66
martin@isomer.univ-nantes.fr

Toru Iwata
Okayama University
3-1-1, Tsushima-naka
Okayama-city Okayama 700-8530
Japan
81-86-251-8846
iwata@cc.okayama-u.ac.jp

Alastair D. Jenkins
Bjerknes Centre for Climate
Research
Geophysical Institute, Allégaten 70
Bergen 5007
Norway
+47-.55582632
alastair.jenkins@bjerknes.uib.no

Timothy D Jickells
University of East Anglia
School of Environmental Sciences
Norwich Norfolk NR4 7TJ
UK
+44(0)1603 593117
T.Jickells@uea.ac.uk

olanrewaju tolulope jinadu
NIIT INSTITUTE
E-TECH CURRICULUM
najson house off somorin street
obantoko
abeokuta ogun state 110001/p.o.
box 346 totoro abk
nigeria
234-39244613
olanmicky@yahoo.com

Truls Johannessen
Univeristy of Bergen
GFI-BCCR
4301 RICKENBACKER CSWY
Miami Florida 33149-1026
USA
13053614374
truls.johannessen@noaa.gov

Anne M Johansen
Central Washington University
Chemistry
400 E University Way
Ellensburg WA 98926-7539
USA
509-963-2164
johansea@cwu.edu

Anne M. Johansen
Central Washington University
Chemistry
400 E University Way
Ellensburg WA 98926-7539
USA
509-963-2164
johansea@cwu.edu

James E Johnson
UW-JISAO, NOAA-PMEL
7600 Sand Pt. Wy. NE
Seattle WA 9 8115
USA
206-526-6355
james.e.johnson@noaa.gov

Martin Johnson
University of East Anglia
School of Environmental Sciences
Norwich Norfolk NR4 7TJ
UK
01603 593324
martin.johnson@uea.ac.uk

Ian Joint
Plymouth Marine Laboratory
Prospect Place
Plymouth PL1 3DH
UK
+44 1752 633100
i.joint@pml.ac.uk

Jan Kaiser
Princeton University
Geosciences
Guyot Hall, Washington Road
Princeton NJ 0 8544
United States
609 258-7428
kaiser@princeton.edu

Ryo Kazaoka
Kyoto University
Division of Earth and Planetary
Sciences,
Graduate School of Science
Kyoto 606-8502
Japan
+81-75-753-4277
kazaoka@kugi.kyoto-u.ac.jp

Anthony James Kettle
University of East Anglia
School of Environmental Sciences
Norwich Norfolk NR4 7TJ
UK
+44 1603 592759
e098@uea.ac.uk

Hideji Kida
Kyoto University
Geophysics
Department of Geophysics
Kyoto Kyoto 606-8502
Japan
+81-75-753-4271
kida@kugi.kyoto-u.ac.jp

Attendance List

David J. Kieber
State University of New York,
College of
Environmental Science and
Forestry
Chemistry
1 Forestry Drive
Syracuse New York 1 3210
United States
315470 6951
djkieber@esf.edu

Ronald P Kiene
Unversity of South Alabama
Marine Sciences
LSCB-25
Mobile Alabama 3 6688
USA
251-861-7526
rkiene@disl.org

Vassilis Kitidis
University of Newcastle
Marine Science & Tech
Claremont Rd
Newcastle upon Tyne NE1 7RU
United Kingdom
+44-(0)191-2225608
vassilis.kitidis@ncl.ac.uk

Silvia Kloster
Max Planck Institute for
Meteorology
Atmosphere in the Earth System
Bundestrasse 53
Hamburg 2 2305
Germany
494041173388
kloster@dkrz.de

Fumiyoshi Kondo
Okayama University
3-1-1
Tsushima-naka Okayama
Japan
+81-468-67-9510
fkondo@jamstec.go.jp

Dileep M Kumar
National Institue of Oceanography
Chemical Oceanography
Dona Paula Goa 40 3004
India
91-(0)832-2450398
dileep@darya.nio.org

Mutaz Ali Kutub
AlQuds University
Environment and Earth Science
6-Noir Edin
Jerusalem P. O. Box 19164
Israel
972 (0)507 794687
qutob@planet.edu

Marina Kuznetsova
Stony Brook University
MSRC
Stony Brook NY 11794-5000
USA
(631)632-87-39
marina.kuznetsova@sunysb.edu

Julie La Roche
IFM-GEOMAR Leibniz-Institut für
Meereswissenschaften
Marine Biogeochemie
Düsternbrooker Weg 20
Kiel 2 4105
Germany
+49 431 600-4212
jlaroche@ifm.uni-kiel.de

Christiane Lancelot
Université Libre de Bruxelles
ESA
Boulevard du Triomphe
Campus de la Plaine, CP 221
Bruxelles 1050
Belgium
32-2-650 59 88
lancelot@ulb.ac.be

Delphine Lannuzel
Université libre de Bruxelles
Océanographie Chimique et
Géochimie
des Eaux
118 rue colonel Van Gele
Bruxelles 1040
Belgium
+32 2 732 75 61
dlannuze@ulb.ac.be

Diane Lavoie
University of Victoria
School of Earth and Ocean
Sciences
PO Box 3055 Stn CSC
Victoria British-Columbia V8W 3P6
Canada
(250)-363-8266
lavoied@uvic.ca

Yvonnick Le Clainche
Université Laval
Quebec-Ocean
Pavillon Vachon Québec G1K 7P4
Canada
418-656-5917 #6274
yvonnick.leclainche@giroq.ulaval.ca

Corinne Le Quéré
Max-Planck-Institut für
Biogeochemie
Hans-Knöll-Straße 10
Jena 0 7745
Germany
+49-3641-576217
lequere@bgc-jena.mpg.de

Caroline Leck
Stockholm University
Meteorology
Stockholm SE-106 91 Stockholm
Sweden
+46-8-16 43 54
lina@misu.su.se

Pamela J Lehr
Dalhousie University
Physics and Atmospheric Science
6268 Allan St
Halifax NS B3L 1G9
Canada
902-494-1233
lehr@mathstat.dal.ca

Maurice Edgard Levasseur
Université Laval
Département de biologie
Pavillon Alexandre Vachon
Québec Québec G1K 7P4
Canada
418-656-3207
maurice.levasseur@bio.ulaval.ca

Attendance List

Tie Li
Ocean University of China
Department of Marine Chemistry
5 Yushan Road
Qingdao Shandong 26 6003
P.R. China
+86-532-2032484
litie99@hotmail.com

Xin Li
Chinese Academy of Sciences
Institute of Atmospheric Physics
52 Sanlihe Rd
Beijing 10 0029
China
+86 10 68597289
xinxin8@yahoo.com.cn

Peter S Liss
University of East Anglia
School of Environmental Sciences
University Drive
Norwich Norfolk NR4 7TJ
UK
+44(0)1603 592563
p.liss@uea.ac.uk

Martine Lizotte
Université Laval
1475 Marie-Rollet
Québec G1S 2H5
Canada
(418) 688-2346
Martine.Lizotte@giroq.ulaval.ca

Claire Lo Monaco
Université Pierre et Marie Curie
LBCM / IPSL
4 place Jussieu
Paris 75252 cedex 05
France
+33 (0)1 44 27 48 61
lomonaco@ccr.jussieu.fr

Ulrike Lohmann
ETH Zurich
Atmospheric and Climate Science
ETH Hoenggerberg HPP
Zurich CH-8093
Switzerland
+41-1-633-2755
Ulrike.Lohmann@dal.ca

Michael S. Long
UNC Wilmington
Chemistry
601 S College Rd
Wilmington NC 2 8403
USA
+49-6221-546528
michael.long@iup.uni-heidelberg.de

Gill Malin
University of East Anglia
School of Environmental Sciences
University Plain
Norwich NR4 7TJ
U.K.
44 1603 592531
g.malin@uea.ac.uk

Tuhin Kumar Mandal
National Physical Laboratory
Dr.K.S.Krishnan Rd
New Delhi 11 0012
India
+91-11-25748268
tuhin@mail.nplindia.ernet.in

Manfredi Manizza
Max-Planck-Institute for
Biogeochemistry, Germany
Hans Knoll Strasse, 10
Jena D007745
Germany
0049-03641-576214
mmanizza@bgc-jena.mpg.de

Julia Marshall
Dalhousie University
Physics and Atmospheric Science
1979 Vernon St.
Halifax NS B3H 3P1
Canada
902 431 5808
marshall@mathstat.dal.ca

Randall V. Martin
Dalhousie University
Physics and Atmospheric Science
Coburg Road
Halifax Nova Scotia B3H 3J5
Canada
902-494-3915
randall.martin@dal.ca

Veronique Martin-Jezequel
University of Nantes
2 rue de la Houssiniere
Nantes F-44322
France
33 2 51 12 56 66
martin@isomer.univ-nantes.fr

Amparo Martinez-Arroyo
Universidad Nacional Autonoma
de Mexico
Centro de Ciencias de la
Atmosfera
CCA, Circuito Exterior Cd.
Universitaria
Mexico Distrito Federal 0 4510
MEXICO
(52-55) 56 22 40 59
amparo@atmosfera.unam.mx

Patricia Matrai
Bigelow Laboratory for Ocean
Sciences
180 McKown Point Road
W. Boothbay Harbor ME 04575-
475
USA
(207) 633-9614
PMatrai@bigelow.org

Jenny Mattsson
Stockholm University
Meteorology
Svante Arrhenius vag 12,
Stockholm SE-106 91
Sweden
+46 8 162416
jennym@misu.su.se

Wade R McGillis
Columbia University
Henry Krumb School of Mines
927 Seeley Mudd Building
New York NY 1 0027
USA
508-289-3325
wrm2102@columbia.edu

Attendance List

Galen A McKinley
University of Wisconsin
Atmospheric and Oceanic Sciences
1225 W. Dayton St
Madison WI 5 3706
USA
608 262 2828
galen@aos.wisc.edu

Craig L. McNeil
URI
GSO
South Ferry Road
Narragansett RI 0 2882
USA
401-874-6722
mcneil@gso.uri.edu

Zhi-Ping Mei
University of Quebec at Rimouski
Institute of Marine Sciences of Rimouski
310 allee des Ursulines,
Rimouski Quebec G5L 3A1
Canada
+1 (418) 723-1986 ext. 1664
zhi-ping.mei@uqar.qc.ca

Liliane Merlivat
LODYC / CNRS / University Paris 6
4 place Jussieu
Paris 7 5005
France
3314427 7072
merlivat@lodyc.jussieu.fr

Anissa Merzouk
Université Laval
Pavillon Alexandre-Vachon, Room 2078
Québec Québec G1K 7P4
Canada
(418) 656-2131 #6274
anissa.merzouk@giroq.ulaval.ca

Nicolas Metzl
Universite Pierre et Marie Curie
Laboratoire de Biogeochimie et Chimie
Marines (LBCM)
4, place Jussieu
Paris Cedex 5 7 5252
France
33(0)1 44 27 33 94
metzl@moka.ccr.jussieu.fr

Sonia Michaud
Fisheries and Oceans Sciences
850 Route de la mer
Mont-Joli Quebec G5H 3Z4
Canada
418775 0602
michauds@dfo-mpo.gc.ca

Lisa A. Miller
Institute of Ocean Sciences
9860 West Saanich Road
Sidney BC V8L 4B2
Canada
+1 250 363 6673
millerli@pac.dfo-mpo.gc.ca

William L. Miller
University of Georgia
Marine Science
Marine Sciences Bldg.
Athens GA 3 0602
USA
706 542 4299
bmiller@uga.edu

Matthew M Mills
IfM-Geomar
Biogeochemistry
Düsternbrooker weg 20
Kiel 2 4105
Germany
+49 431 6004255
mmills@ifm-geomar.de

Kazuhiko Miura
Science University of Tokyo
Physics
1-3 Kagurazaka
Shinjuku-ku, Tokyo 162-8601
JAPAN
+81-3-5228-8215
miura@rs.kagu.sut.ac.jp

Robert M Moore
Dalhousie University
Oceanography
1355 Oxford Street
Halifax NS B3H 4J1
Canada
902 494 3871
robert.moore@dal.ca

Mark Moore
Southampton Oceanography Centre
European Way
Southampton SO14 3ZH
UK
023 8059 6446
cmm297@soc.soton.ac.uk

Beatriz Mouriño
Woods Hole Oceanographic Institution
Applied Ocean Physics and Engineering
Department
Bigelow MS#9
Woods Hole MA 0 2543
USA
508-289-3739
bmourino@whoi.edu

Martin Mühling
Plymouth Marine Laboratory
Prospect Place
Plymouth PL1 3DH
UK
+44 1752 633100
mmuh@pml.ac.uk

Ippei Nagao
Nagoya University
Graduate School of Environmental Studies
Furo-cho, Chikusa-ku
Nagoya 464-8601
Japan
+81-52-789-3484
nagao@ihas.nagoya-u.ac.jp

Raymond Najjar
The Pennsylvania State University
Pennsylvania
USA
najjar@meteo.psu.edu

Attendance List

Fumiko Nakagawa
Hokkaido University
Graduate School of Science
N10 W8 Kita-ku
Sapporo Hokkaido 060-0810
Japan
+81-11-706-2731
fuminaka@ep.sci.hokudai.ac.jp

Tokuhiro Nakamura
The University of Tokyo
Graduate School of Science
Minamidai 1-15-1
Nakano-ku Tokyo 164-0014
Japan
+81-3-5351-6411
toku@ori.u-tokyo.ac.jp

Susanne Neuer
Arizona State University
School of Life Sciences
LSE 421
Tempe AZ 8 5287
USA
480 727 7254
susanne.neuer@asu.edu

Philip D Nightingale
Plymouth Marine Laboratory
Prospect Place
Plymouth PL1 3DH
UK
44 (0) 1752 633100
p.nightingale@pml.ac.uk

Ann-Lise Norman
The University of Calgary
Physics & Astronomy
2500 University Dr. N.W.
Calgary Alberta T2N 1N4
Canada
403-220-5405
annlisen@phas.ucalgary.ca

Are Olsen
University of Bergen
Geophysical Institute
Allegaten 70
Bergen 5007
Norway
+ 47 55 58 43 22
are.olsen@gfi.uib.no

Nicholas JP Owens
Plymouth Marine Laboratory
Prospect Place The Hoe
Plymouth Devon P1 3DH
United Kingdom
01752 633111
njpo@pml.ac.uk

Markus Pahlow
Dalhousie University
Oceanography
1355 Oxford St.
Halifax NS B3H 4J1
Canada
(902)426-3843
Markus.Pahlow@dal.ca

Carl Palmer
University of York
Department of Chemistry
Heslington
York YO10 5DD
UK
01904 434588
cjp118@york.ac.uk

Robin W Pascal
Southampton Oceanography Centre
OED
Empress Dock
Southampton Hampshire SO14 3ZH
England
+44 23 80596138
rwp@soc.soton.ac.uk

Uta Passow
Alfred Wegener Institut
am Handelshafen 12
Bremerhaven 2 7570
Germany
49 471 4831 1450
upassow@awi-bremerhaven.de

Tom Pedersen
University of British Columbia
Oceanography, Earth and Ocean Sciences
Vancouver BC V6T 1Z4
Canada
604-822-5984
pedersen@eos.ubc.ca

Angelica Pena
Institute of Ocean Sciences
Fisheries and Ocean Canada
PO Box 6000
Sidney British Columbia V8L 4B2
Canada
250-3636576
penaa@pac.dfo-mpo.gc.ca

William Perrie
Bedford Istitute of Oceanography / Dalhousie University
1 Challenger Dr.
Dartmouth Nova Scotia B2Y 4A2
Canada
1-902-426-3985
perriew@dfo-mpo.gc.ca

Christina Peters
Heidelberg University
Im Neuenheimer Feld 229
Heidelberg 6 9120
Germany
+49 (0)6221 546385
Christina.Peters@iup.uni-heidelberg.de

Lisa A Phinney
Dalhousie University
Physics and Atmospheric Science
Dunn Building
Halifax NS B3H 3J5
Canda
(902) 494-1233
lphinney@mathstat.dal.ca

Daniela Diz Pereira Pinto
Dalhousie University
Marine Affairs Program
Rua Alfredo Chaves 06/102
Rio de Janeiro 22260-160
Brazil
55-21-9922-3073
danidiz@gbl.com.br

Ulrich Platt
University of Heidelberg
Environmental Physics
INF 229
Heidelberg 6 9120
Germany
+496221 546339
ulrich.platt@iup.uni-heidelberg.de

Attendance List

Julien Pommier
Universite du Quebec a Rimouski
ISMER
310 allee des Ursulines
Rimouski Quebec G5L 3A1
Canada
1-418-723-1986 p 1392
julien.pommier@uqar.qc.ca

Kirsty Pringle
Univeristy of Leeds
Woodhouse Lane
Leeds LS2 9JT
England
0113 343 1596
kirsty@env.leeds.ac.uk

Birgit Quack
Leibniz-Instiut fuer
Meereswissenschaften
Marine Biogeochemie - Chemische
Ozeanographie
Duesternbrooker Weg 20
Kiel 2 4105
Germany
+431 6004206
bquack@ifm-geomar.de

Ramesh Ramachandran
Anna University
Institute for Ocean Management
Chennai Tamil Nadu 600 025
India
(91)44-2230-0108
rramesh_au@hotmail.com

Purvaja Ramachandran
Anna University
Institute for Ocean Management
Chennai Tamil Nadu 600 025
India
(91)44-2230-0108
purvaja@hotmail.com

Ling Jing Ren
Ocean University of China
College of Chemistry and
Chemical
Engineering
5 Yushan Road
Qingdao Shandong Province 26
6003
P R China
86-532-2033005
renjingl@mail.ouc.edu.cn

Ulf Riebesell
IFM-GEOMAR
Marine Biogeochemistry
Düsternbrooker Weg 20
Kiel 2 4105
Germany
49 431 600 4581
uriebesell@ifm-geomar.de

Aida F. Ríos
CSIC-IIM, Vigo
Oceanography
Eduardo Cabello, 6
Vigo 3 6208
Vigo
+34-986231930 Ext. 371
aida@iim.csic.es

Richard B Rivkin
Memorial University of
Newfoundland
Ocean Sciences Centre
Marine Lab Drive
St. John's Newfoundland A1C 5S7
Canada
709 737 3720
rrivkin@mun.ca

Carol Robinson
Plymouth Marine Laboratory
Prospect Place
Plymouth PL1 3DH
UK
+ 44 (0)1752 633462
carol.robinson@pml.ac.uk

Sylvie Odette Roy
Dalhousie
Oceanography
1355 Oxford St.
Halifax Nova Scotia B3H 4J1
Canada
902-494-1612
sylvie.roy@dal.ca

Fahrul fr Rozi
ITS - Indonesia
Marine Engineering
Jl. Manukan Mukti Blok 10B/9
Surabaya Jawa Timur 6 0185
Indonesia
62-031-70996296
fahrul_rozi@mail.com

Vladimir Ryabinin
World Climate Research
Programme
7bis, Av. de la Paix
Geneva 1211
Switzerland
4122730 8486
vryabinin@wmo.int

Casey Ryan
SOLAS IPO
University of East Anglia
Norwich Norfolk NR4 7TJ
UK
+44(0)1603 593516
casey.ryan@uea.ac.uk

Lokesh Kumar Sahu
Physical Research Laboratory
Space and Atmospheric Physics
Navrangpura
Ahmedabad Gujarat 380 009
India
079-26302129
lokesh@prl.ernet.in

Michael G Scarratt
Fisheries and Oceans Canada
Maurice Lamontagne Institute
850 Route de la Mer
Mont-Joli QC G5H 3Z4
Canada
418-775-0508
ScarrattM@dfo-mpo.gc.ca

Jens Schimanski
IFM-GEOMAR
Duesternbrooker Weg 20
Kiel 2 4105
Germany
+49 431 600 4203
jschimanski@ifm-geomar.de

Kim Schmidt
Government of Canada
Fisheries and Oceans Canada
12W126-200 Kent St
Ottawa Ontario K1A 0E6
Canada
613-991-6935
schmidtk@dfo-mpo.gc.ca

Attendance List

Véronique Schoemann
Université Libre de Bruxelles
ESA
Boulevard du Triomphe
Campus de la Plaine, CP 221
Bruxelles 1050
Belgium
32-2-650 59 92
vschoem@ulb.ac.be

Detlef Prof Schulz-Bull
Baltic Sea Research Institute-Warnemünde
Marine Chemistry
Seestr. 15
Rostock-Warnemünde 1 8119
Germany
0049 3815197310
detlef.schulz-bull@io-warnemuende.de

Richard Sempéré
CNRS-LMGEM, Marseille
Centre d'Oceanologie de Marseille
LMGEM, Case 901, Campus de Luminy
Marseille 13 288, Cedex 9
France
33 (0)4 91 82 93 61
sempere@com.univ-mrs.fr

Stephanie L Shaw
UC Berkeley
Environmental Science, Policy, and Management
251A Hilgard Hall
Berkeley CA 9 4123
USA
510-642-9732
slshaw@alum.mit.edu

Guang-Yu SHI
Chinese Academy of Sciences
Institute of Atmospheric Physics
52 Sanlihe Rd
Beijing 10 0029
China
+86 10 68597289
shigy@mail.iap.ac.cn

Adriana Gisel Silvera
Universidad Autonoma de Baja California
Facultad de Ciencias Marinas
Reforma 1311
Ensenada Baja California 2 2830
Mexico
(52)6461744570
agglez@uabc.mx

Rafel Simó
Institut de Ciences del Mar- CSIC
PG Maritim de la Barceloneta 37-49
Barcelona Catalonia 0 8003
Spain
+34 932309590
rsimo@icm.csic.es

Dominick Spracklen
University of Leeds
School of the Environment
Leeds LS2 9TJ
UK
0113 3431635
dominick@env.leeds.ac.uk

Rachel H.R. Stanley
Woods Hole Oceanographic Institution
Marine Chemistry
266 Woods Hole Rd.
Woods Hole MA 0 2543
USA
508-289-2927
rstanley@whoi.edu

Nadja S. Steiner
University of Victoria
CCCMA
Box 1700
Victoria BC V8W 2Y2
Country
250 363 3385
Nadja.Steiner@ec.gc.ca

Vanisa Surapipith
Pollution Control Department
Ministry of Environment
Paholyotin Soi 7
Bangkok 1 0400
Thailand
+66 2 2982305
vanisa@email.com

Colm Sweeney
Princeton University
AOS
304 Sayre Hall
Princeton NJ 08544 - 0710
USA
609-258-6619
csweeney@princeton.edu

Shigenobu Takeda
The University of Tokyo
Department of Aquatic Bioscience
Yayoi 1-1-1
Bunkyo-ku Tokyo 113-8657
Japan
81-3-5841-5290
atakeda@mail.ecc.u-tokyo.ac.jp

Peter K Taylor
Southampton Oceanography Centre
European Way
Southampton SO14 3ZH
UK
44 23 8059 6408
pkt@soc.soton.ac.uk

David Andrew Timothy
University of Victoria
School of Earth and Ocean Sciences
PO Box 3055 STN CSC
Victoria British Columbia V8W 3P6
Canada
250 472 5340
timothyd@pac.dfo-mpo.gc.ca

Dierdre A Toole
Woods Hole Oceanographic Institution
Marine Chemistry and Geochemistry
MS #25
Woods Hole MA 0 2543
USA
508-289-2682
dtoole@whoi.edu

Attendance List

Philippe D Tortell
University of British Columbia
Earth and Ocean Sciences
6270 University Blvd.
Vancouver BC V6T 1Z4
Canada
640-822-4728
ptortell@eos.ubc.ca

Atsushi Tsuda
University of Tokyo
Ocean research Institute
1-15-1 Minamidai
Nakano Tokyo 164-8639
Japan
81-3-5351-6476
tsuda@ori.u-tokyo.ac.jp

Osamu Tsukamoto
Okayama University
Department of Earth Sciences
3-1-1 Tsushima-naka
Okayama 700 8530
Japan
+81-86-251-7893
tsuka@cc.okayama-u.ac.jp

Daniela Turk
Dalhousie University
C-SOLAS Executive Director
1355 Oxford Street
Halifax Nova Scotia B3H 4J1
Canada
(902) 494-2870
neli@dal.ca

Mitsuo UEMATSU
University of Tokyo
Ocean Research Institute
1-15-1 Minamidai
Nakano-ku Tokyo 164-8639
Japan
+81-3-5351-6533
uematsu@ori.u-tokyo.ac.jp

Guenther Uher
University of Newcastle
Marine Science and Technology
Ridley Building, Claremont Road)
Newcastle upon Tyne Tyne & Wear
NE17RU
United Kingdom
+44(0)191 2226661
guenther.uher@ncl.ac.uk

Robert Charles Upstill-Goddard
University of Newcastle upon Tyne
School of Marine Science and Coastal
Management
Ridley Building, Claremont Road
Newcastle upon Tyne Tyne & Wear
NE1 7RU
United Kingdom
+44 191 222 5065
rob.goddard@ncl.ac.uk

Ed Urban
SCOR
The Johns Hopkins University
Dept. of Earth and Planetary Sciences
Baltimore MD 2 1218
USA
+1-410-516-4239
Ed.Urban@jhu.edu

Svein Vagle
Institute of Ocean Sciences
Instrument Development Group
9860 West Saanich Road
Sidney BC V8L 4B2
Canada
250-363-6788
vagles@dfo-mpo.gc.ca

Maria Vila
Institut de Ciences del Mar - CSIC
PG Maritim de la Barceloneta 37-49
Barcelona Catalonia 0 8003
Spain
+34 932309611
mariavila@cmima.csic.es

Christoph Voelker
Alfred Wegener Institute
Am Handelshafen 12
Bremerhaven 2 7515
Germany
+49 471 4831 1848
cvoelker@awi-bremerhaven.de

Meike Vogt
Max-Planck-Institute for Biogeochemistry, University of East Anglia
Global Ecology, Environmental Science
Postfach 100164
Jena 0 7701
Germany
0049 3641 57 6219
mvogt@bgc-jena.mpg.de

Roland von Glasow
University of Heidelberg
Institute for Environmental Physics
Im Neuenheimer Feld 229
Heidelberg 6 9120
Germany
+49-6221-546362
roland.von.glasow@iup.uni-heidelberg.de

Oksana Yurievna Vyalova
Institute of Biology of the Southern Seas,
National Academy of Science of Ukraine
Animal physiology and Biochemistry
Nachimov, 2
Sevastopol Crimea 9 9011
Ukraine
+38 0692 45 79 82
voksa@optima.com.ua

Thomas Wagner
University of Heidelberg
Institut fuer Umweltphysik
Im Neuenheimer Feld 229
Heidelberg 6 9120
Germany
+49 6221 546314
thomas.wagner@iup.uni-heidelberg.de

Sylvia Walter
Leibniz-Institut für Meereswissenschaften
Marine biogeochemistry
Am Fenn 16
Berlin 1 2167
Germany
0049-30-79786727
swalter@ifm-geomar.de

Attendance List

Lu Wang
Dalhousie University
Oceanography
1355 Oxford St.
Halifax NS B3H 4J1
Canada
902-494-3671
lwang2@dal.ca

Zifa Wang
Institute of Atmospheric Physics
Chinese Academy of Sciences
Deshenmenwai
Qijiahuozi building 40 Beijing 10
0029
China
86-10-82084278
zifawang@mail.iap.ac.cn

Hui Wang
National Science Foundation of
China
Division of Marine Science
TBC
Beijing TBC
China
TBC
wanghui@mail.nsfc.gov.cn

Richard Wanninkhof
NOAA/AOML
4301 Rickenbacker Causeway
Miami FL 3 3149
USA
305-361-4379
rik.wanninkhof@noaa.gov

Joan D. Willey
UNC Wilmington
Chemistry and Marine Science
601 S. College Rd.
Wilmington NC 28403-5932
USA
910-962-3459
willeyj@uncw.edu

Jonathan Williams
Max Planck Institute
Air Chemistry
J.J. Becher Weg 27
Mainz Rheinland-Pfalz 5 5128
Germany
+49 6131 305454
williams@mpch-mainz.mpg.de

Phillip Williamson
University of East Anglia / NERC
Environmental Sciences
Norwich NR4 7TJ
UK
+44 1603 593111
p.williamson@uea.ac.uk

Oliver W Wingenter
New Mexico Tech
Chemistry
801 Leroy
Socorro New Mexico 8 7801
USA
505-835-6006
oliver@nmt.edu

Gui-Peng Yang
Laval University
Quebec-Ocean
Pavillon Vachon
Local 2078 Quebec G1K 7P4
Canada
+1 (418) 656-2131 ext. 12240
gp.yang@giroq.ulaval.ca

Margaret J Yelland
Southampton Oceanography
Centre
Empress Dock
Southampton SO14 3ZH
UK
+44 23 8059 6406
mjy@soc.soton.ac.uk

Naoki Yoshie
Hokkaido Univ.
Graduate School of Environmental
Earth
Science
N10W5
Sapporo Hokkaido 060 0810
Japan
81-11-706-2288
naoki@ees.hokudai.ac.jp

Christopher J Zappa
Columbia University
LDEO
61 Route 9W
Palisades New York 1 0964
USA
845-365-8547
zappa@ldeo.columbia.edu

Weidong Zhai
Xiamen University
Evironmental Science Research
Center
Si-Ming-Nan-Lu Road
Xiamen 36 1005
China
86-592-2182811
wdzhai@yanan.xmu.edu.cn

Weiqing Zhang
Dalhousie University
Bedford Institute of Oceanography
1340 Barrington St.
Halifax Nova Scotia B3J 1Y9
Canada
1-902-426-2262
zhangw@dfo-mpo.gc.ca

Jun Zhao
Dalhousie University
Oceanography
1355 Oxford St.
Halifax N.S. B3H 4J1
Canada
(902) 494-8811
zhao@phys.ocean.dal.ca

Guoshun Zhuang
Beijing Normal University
Tne Center for Atmospheric
Environmental
Study
19 Xinjiekouwai Street
Beijing Beijing 10 0875
China
86-10-62207493
gzhuang@bnu.edu.cn