



Taller “Física y Química Ambiental” Workshop “Physics and Chemistry of the Environment”

10 – 13 April 2012,

Auditorio del Consejo de Investigaciones Científicas, Edificio de CENSALUD
Universidad de El Salvador

Este taller se realizará dentro del marco de la Carta de Entendimiento firmada en 2011 entre el Instituto de Física Ambiental (IUP) de la Universidad de Bremen (Alemania) y la Universidad de El Salvador (UES) y de las actividades de investigación del grupo de investigación del Prof. Carlos Rudamas, de la Escuela de Física, de la Facultad de Ciencias Naturales y Matemática (FFCCNNyM) de la Universidad de El Salvador. Se celebrará en el Auditorio del Consejo de Investigaciones Científicas de la UES (CIC-UES). También es parte de las actividades para la promoción de la investigación que la red centroamericana de exbecarios del DAAD para la investigación (CADAN:R) realiza.

Se espera que participen docentes y estudiantes avanzados de física, química, geofísica, matemática, biología e ingeniería.

Los objetivos de la serie conferencias son:

- Entrenar y capacitar estudiantes, docentes y profesionales de la Universidad de El Salvador y Centro América en el estudio de las ciencias ambientales
- Reunir estudiantes y docentes de la UES y de Centro América así como profesionales de la región para buscar formas de cooperación en la física y química ambiental.
- Dar la oportunidad a estudiantes, docentes y profesionales de la UES y de Centro América de interactuar con una científica líder en el campo de la química y física medioambiental y de reconocida experiencia internacional del Instituto de Física Medioambiental (IUP) de la Universidad de Bremen, Alemania.
- Terminar la preparación de un programa de doctorado en ciencias naturales y matemática para nuestra facultad en el que la Dra. Annette Ladstätter-Weissenmayer y el IUP cooperarán activamente dentro del marco de la carta de entendimiento firmada el año 2011.
- Terminar la preparación del apoyo por parte del IUP y de la Dra. Ladstätter-Weissenmayer a los cursos de especialidad en el plan de estudios del programa de licenciatura en física.
- Continuar con la preparación de proyectos de investigación en el área de la física y química medioambiental que se ha venido realizando en los últimos años.



CONFERENCISTA (Lecturer):

Priv.-Doz. Dr. Annette Ladstätter-Weissenmayer
Institute of Environmental Physics,
University of Bremen
Germany

Speciality: Chemistry and Physics of the Atmosphere

Brief CV:

Education

- **Oct 1982 - Oct 1988:** Studies of Chemistry, University of Mainz, Germany
- **Nov 1988 - Sep 1989:** Diploma Thesis in Atmospheric Chemistry, Max Planck Institute for Chemistry, Department of Air-chemistry in Mainz, Germany (Thesis Title: Providing of reference spectra of stratospheric trace gases in UV/VIS wavelength region)
- **Oct 1989 – Mar 1993:** PhD. student in Atmospheric Chemistry, Max Planck Institute for Chemistry, Department of Air-chemistry in Mainz, Germany
- Thesis Title: Spectroscopic analysis of nitrogen compounds using the DOAS system
- **Apr 1993 – now:** Junior Research Scientist, Institute of Environmental Physics and Remote Sensing, University Bremen, Germany, with Prof. Dr. John P. Burrows
- **Apr 2008:** Habilitation in Environmental Physics, University Bremen, Germany, (Thesis Title: O₃, NO₂, and HCHO in the Earth's Stratosphere and Troposphere: Use of GOME data, in-situ measurements, and chemical and transport models to understand Atmospheric Pollution Events in the Tropics and Sub-tropics)

Main Research Interests

- Environmental Analytical Chemistry:
- Formation of different halogen and nitrogen oxide compounds in the laboratory) and using DOAS (Differential Optical Absorption Spectroscopy) in UV/VIS wavelength region for obtaining reference spectra as a function of pressure and temperature for the analysis of satellite based



measurements from GOME (Global Ozone Monitoring Experiment) and SCIAMACHY ((SCanning Imaging Absorption spectroMeter for Atmospheric Chartography measurements); Measurements performed with a PTR-MS (Proton Proton Transfer Reaction - Mass Spectrometer) focusing on VOC (volatile organic compounds), indoor and outdoor and in field campaigns observations).

- Atmospheric Chemistry and Physics, Photochemistry and Chemical Kinetics, the development of in-situ and remote sensing measurement techniques to determine the amounts and distributions of trace atmospheric constituents, and their use as a tool for the study of air pollution, climate and chemistry interactions, improving numerical weather prediction, chemical weather and our understanding of biogeochemical cycles (experience in analysis of ground, satellite-, balloon- and airborne based measurements with respect to validate satellite based GOME and SCIAMACHY data and with respect to interpret the amount of tropospheric ozone and its precursors as well as the aerosol optical thickness and PM10).
- Combination with model calculation (3d chemical transport, box and trajectory model) for determination of sources and sinks as well as transport processes; lecturing in Atmospheric Physics, Chemistry and Climate as well as in Remote Sensing and General Physics and Mathematics.
- Analysis of satellite based GOME and SCIAMACHY, MERIS (MEDIUM Resolution Imaging Spectrometer) data with respect to aerosol optical thickness, PM10, tropospheric HCHO, NO₂, CHOCHO and tropical tropospheric O₃ and pollution events caused by e. g. biomass burning, urban pollution, biogenic emissions and lightning in the tropics, sub-tropics and mid-latitude



Workshop “Physics and Chemistry of the Environment”

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Programa tentativo (tentative Program)

Tuesday 10.04.2012	
08:00 - 09:00	Registration
09:00 - 09:30	Opening ceremony
09:30 - 12:45	Environmental physics (Lecture + exercises)
12:45 - 14:45	Lunch
14:45 - 18:00	Environmental chemistry (Lecture + exercises)
18:00 - 17:30	Labs tour
20:00	Get together
Wednesday 11.04.2012	
09:15 - 12:30	Measurement techniques (Lecture + exercises)
12:30 - 14:30	Lunch
14:30 - 17:45	Remote sensing (Lecture + exercises)
18:00 - 17:30	Free choice
20:00	Dinner
Thursday 12.04.2012	
09:15-10:30	Meeting (Rudamas, Ladstätter, etc.)
10:30 - 13:00	Laboratory in Computer Lab
13:00 - 14:30	Lunch
14:30 - 17:45	Results of Measurements -Interpretation (Lecture + exercises)
17:45 -	Free choice
Friday 13.04.2012	
09:15 - 12:30	Laboratory in Computer Lab
12:30 - 14:30	Lunch
15:00 - 18:00	Final lecture with open discussion
18:00 -	Free choice



Descripción de las conferencias (Description of the Lectures)

Lecture I: Environmental Physics

The course starts with a description of the Earth atmosphere and its evolution. Next the present atmosphere and key processes will be discussed which drive not only the "weather machine" but also determine the global atmospheric temperature structure and the distribution of trace gases such as stratospheric ozone. This includes a discussion on the role of water and its thermodynamic properties in the atmosphere, global circulation pattern, and also covers issues like the microphysics of cloud formation.

Closely related to the atmosphere is climate, after all the green house effect is responsible for a mean temperature suitable for the biosphere to develop into its present state. A very basic introduction to climate and climate change will be given.

Bibliography:

- 1) "Atmospheric Science, an Introductory Survey", J. M. Wallace and P. V. Hobbs, Academic Press, 1977
- 2) "Earth under Siege, from Air Pollution to Global Change", R.P. Turco, Oxford University Press, 1997

Lecture II: Environmental Chemistry

Environmental chemistry represents a combination of various fields within chemistry as well as physics. In the recent past human activities have led to significant changes in biogeochemical cycles and have caused numerous ecological changes and problems. Many of the questions related to these problems can be interpreted by applying fundamental laws of chemistry. Mostly, however, chemical processes in the global laboratory of our environment are much more complex and dynamic compared to those in a chemical laboratory or to specific chemical processes in chemical plants. The reactions in our environment take place in open systems which in the majority of cases combine many reactants and which are coupled to physical and biological processes.

The lecture "Environmental Chemistry" will give an overview over the environmental areas air, water and soil as well as about properties, reactions, sources and sinks of substances relevant for the environment and about analytical methods for the determination of such substances.



Bibliography:

- 1) "Environmental Chemistry", Colin Baird, Freeman and Company, ISBN 0-7167-2404-9
- 2) "Atmospheric Chemistry and Global Change", Eds Guy P. Brasseur, John J. Orlando and Geoffrey S. Tyndall Oxford University Press, ISBN 0-19-510521-4

Lecture III: Introduction to Environmental Measurement Techniques

The creation of accurate and complete data sets on the state of surface, ocean, ice and atmosphere is an essential part of environmental physics. A broad range of instruments and techniques is available for these measurements, including both in-situ measurements and remote sensing from the ground, ship, aircraft, balloon or satellite platforms. The lecture combines classroom and laboratory hours (is it possible?). Relevant measurement techniques are presented and practiced, and the underlying physical and chemical concepts are discussed.

Lecture IV: Remote Sensing

This course is a continuation of the course Introduction to Environmental Measuring Techniques where a brief review of both remote and in situ methods has been presented. During the last decades remote sensing has developed to one of the most important tools to collect the data on our environment necessary to get a better understanding of the state of our environment and its change. This rapid progress was possible due to the technological improvements in sensor performance, and the availability of Earth or-biting platforms (satellites) offering global coverage in short time intervals at reasonable cost. With very few exceptions remote sensors make use of the electromagnetic spectrum over the wavelength range extending from MW to UV. The course will introduce the theoretical background like interaction of electromagnetic radiation with matter (Spectroscopy), radiative transfer and data processing.

Bibliography:

- 1) "Introduction to the Physics and Techniques of Remote Sensing", C. Elachi, Wiley, 1987
- 2) "Remote Sensing of the Lower Atmosphere", G. L. Stephens, Oxford University Press, 1994



Lecture V: Results of Measurements – Interpretation

Pollution events caused by urban pollution, biomass burning, biogenic emission, lightning or by long range transport processes lead to an increase of emission of atmospheric trace gases. The topics will be documented and illustrated by current data from satellite based instruments SCIAMACHY (Scanning Imaging Absorption Spectrometer for Atmospheric CHartographY) and GOME (Global Ozone Monitoring Experiment). Retrievals of trace gases from SCIAMACHY and GOME measurements and model studies were combined to interpret the results of these data sets.



Datos adicionales e Inscripción:

La inscripción al taller es gratis.

Los idiomas oficiales del taller serán Castellano e Inglés por lo que se requiere un nivel aceptable de inglés para poder comunicarse con la conferencista y los asistentes en las discusiones que se realicen.

Para tomar parte en el taller se debe rellenar el formulario de inscripción que se encuentra en el sitio web de la Facultad de Ciencias Naturales y Matemática (bajo la sección ENLACES):

<http://www.cimat.ues.edu.sv/>

y adjuntar su hoja de vida (CV). Estos dos documentos debe enviarlos a la siguiente dirección electrónica:

fisicayquimicaambiental@gmail.com

a más tardar el Miércoles 28 de Marzo de 2012 en horas del mediodía.

El jueves 29 de Marzo se les comunicará oficialmente, por correo electrónico, a las personas que han sido seleccionadas (y también a las que no lo han sido).

Para cualquier otra información por favor no dude en ponerse en contacto con los organizadores del taller al email: fisicayquimicaambiental@gmail.com

Solicitudes de inscripción de estudiantes y docentes de otras instituciones educativas y/o investigación salvadoreñas y de la región centroamericana son bienvenidas. A las personas, nacionales de otros países, interesadas en asistir al taller, los organizadores les pueden ayudar en la búsqueda y reservaciones de hoteles.