Long Range Transport of abiotic and biotic Nano- and Microparticles via the Atmosphere

Field trip for participants of the Microbial Evolution and Ecology Course and guests

Location International High Mountain Research Station Jungfraujoch

Date Thursday, November 6, 2003, all day. Preparations during the course hours on Wednesday afternoon, November 5.

Contents Microscopically small droplets containing dissolved and particulate material, among them microorganisms, can be transported via the atmosphere over long distances. They originate from continental agricultural soils, from traffic, from industrial activities, from forest fires, from desert sand storms or from ocean surfaces. It is said that wind blows more than a billion tons of dust around the globe annually and that this amount is increasing due to accelerated desertification, droughts and water shed drainage worldwide (Sci.Am. July 2003, pgs.10-11). Even strange outbreaks of diseases have been linked to long-range dust and droplet transport. In the air particles and droplets can be carried to high altitudes where they are transported in clouds over long distances. They are deposited again by rain and snow or as dry deposits anywhere.

Water droplets in the atmosphere may contain dissolved ions and organic compounds, and particulate dust may carry these constituents adsorbed to its surfaces. Much is known about the effects on climate of particluates and droplets in atmosphere and about pollutants which are transported this way but little quantitative knowledge exists about trophic effects of dissolved and particulate air constituents. Even less is known about the microorganisms which are disseminated via the atmosphere inspite of the fact that their spreading via the atmosphere was recognized at the beginning of the 19th centrury. Can microorganisms transported this way act as inocula for newly evolving ecosystems? How can they survive the extremes of radiation, temperature, desiccation and nutrient deprivation in the atmosphere and in snow and ice at high altitudes? Are there conditions under which infectious pathogens could be carried in dust clouds over long distances and constitute health risks or biohazards?

From an ecological perspective, it is of interst to study the kind and magnitude of chemical constituents and organisms which are spread via the atmosphere. How many nutrient-type chemicals and which ones are transported? Can we detect them in the air, in rain and in deposited snow? What are the trophic effects? Do the deposits constitute a major fertilizing source for remote areas, in particular for high mountain terrestrial and aquatic ecosystems? What kind of microorgansims can be transported via the air to remote areas and how steady is the supply to guarantee continuous inoculation?

We will study some of these questions during the field trip, measure particle concentrations at the JFJ site, aseptically sample air and snow and later analyze the samples for their contents of culturable and non-culturable microorganisms in the lab.

Reading Griffin D.W., Chr.A.Kellogg, V.H.Garrison, E.A.Shinn. „The Global Transport of Dust.“ An intercontinental river of dust, microorganisms and toxic chemicals flows through the Earth’s atmosphere. American Scientist, 90 (2002)228-236.

Links to Internet resources:
http://www.americanscientist.org/articles/02articles/griffin.html
and course folder on OLAT http://www.olat.unizh.ch/rebuild/index.html

Programm

06:00	Zürich HB dep. (trains via Bern, Interlaken (dep. 08.35), via Lauterbrunnen, Kleine Scheidegg to Jungfraujoch)
10.53	Jungfraujoch arr. **Introduction and assignment of group work** at the Jungfraujoch Research Center (Kurt Hanselmann, Helmut Brandl)
11:20-11:40	**UV-Radiation at high altitudes**. Mario Blumthaler and Roland Silbernagel, University of Innsbruck
11:40-12.30	**Execution of group work and installation of instruments**: Particle counting (Dominique Bloch, SKAN AG, Basel), particle sampling (Hans Zingre, MBV AG, Stäfa and Ralf Kägi, EMPA Dübenbdorf, Helmut Brandl, UNI Zürich), snow core drilling and sampling (Kurt Hanselmann)
12:30-13:45	Lunch and free time for touristic needs: view, picture taking, writing post cards etc.
13:45-15:30	**Continue group work**: Particle counting, particle sampling, snow core drilling
15:45	**Summary** at the Jungfraujoch Research Center
16:10	dep. Jungfraujoch (trains via Kleine Scheidegg, Grindelwald, Zweisimmen, Interlaken, Bern to Zürich)
20:56	arr. Zürich

Clothing Please wear warm clothes and sturty, warm boots. Outside temperatures might be below freezing. The excursion will take place regardless of the weather forecast.

Health We will travel from 400 m a.s.l. to 3500 m a.s.l. in 5 hours and experience a rather dramatic pressure change. Please be aware that your body might react to the pressure change and take the necessary medication if you think you will need them. It is recommended that you have enough to drink with you.

Equipment We will take collecting instruments for air particles, snow and microorganisms and assign responsibilities at the site. Please take your camera if you intend to take pictures of the working procedures.

Tickets For registered course students who signed up for the field trip in class, a group ticket will be purchased. Please have your half-tax card or your general abonnement with you, if you have one.

Costs Travel and lunch will cost Fr. 98.50 on the group ticket. We are able offer travel stipends and can cover part of the costs for immatriculated students. Guests are asked to buy their own tickets from Zürich to Jungfraujoch round trip.

Insurance is the responsibility of the participant. The organizers cannot be held liable for damages or lost items.
Please do not leave your working group on Jungfraujoch since you might get lost or get yourself into danger. For sampling snow and ice do not get off marked paths without being secured by safety ropes. We will have the necessary equipment with us.

Signing up There are 12 places available. Please sign up as soon as possible during class or via e-mail to hanselma@botinst.unizh.ch . If you are a student who would like to profit from the travel subsidy, please mention any travel benefits (GA, 1/2-Tax, etc.) in your application and mention your immatriculation number.
If you are not a student registered in the MICROBIAL EVOLUTION AND ECOLOGY COURSE, please print and fill in the application form below and send it by fax or as an attachment.
Should you be prevented from attending, please let us know before Wednesday noon (November 5). Fees already paid by the organizer minus an administrative fee of Fr. 20.- will be reimbursed if your reserved ticket can be passed on to a person on the waiting list.

Information Kurt Hanselmann, Institute for Plant Biology / Microbial Ecology Group, University of Zürich Zollikerstrasse 107, 8008 Zürich. Tel. 01/ 6348284 or 01/6348211.
Please also consult the Group News for last minute changes under http://www.microeco.unizh.ch/cgi-bin/microeco/ultimatebb.cgi?ubb=forum&f=6

Field trip for participants of the **Microbial Evolution and Ecology Course**, and guests

on
Thursday, November 6**, 2003**

I would like to participate at the field trip to the Jungfraujoch Research Station, on

Long Range Transport of abiotic and biotic Nano- and Microparticles via the Atmosphere

Last Name .....

First Name .....

Affiliation .....

E-mail address .....

I am an immatriculated student at the University of Zürich and would like to apply for a travel subsidy

yes ..... no .....

Immatriculation number (only for students applying for travel subsidy) .....

Would you like us to order a ticket for you ? yes ..... no .....

I have a GA: ..... a 1/2-Tax-Abonnement: ..... do not need a train ticket: .....
(Remember: GA and 1/2-Tax-Abonnement are not completely valid for the Jungfraubahn)

Your application will be confirmed by e-mail.