

International PhD Course and Workshop

Fiber Optic Distributed Temperature Sensing for Ecological Characterization

Time

June 29 – July 3, 2009

Venue

DANHOSTEL Køge

Lecturers

Professor John Selker, Oregon State University, USA

Professor Scott Tyler, University of Nevada, Reno, USA

Professor Nick van de Giesen, Technical University of Delft, the Netherlands



Summary

The temperature of standard fiber optic cables can be read each meter for up to 30 km as frequently as every 15 seconds using Distributed Temperature Sensing (DTS). With longer integration times, readings can have precision of up to 0.01 deg C, and has been demonstrated in numerous ecological applications. The technology to make these readings has recently become field-ready, with many instruments and sensing cables to choose from, with a wide range of prices and specifications. This workshop presents a complete introduction to the technique, including fiber and instrument selection, fiber placement, fiber repair, data acquisition, and data analysis. The participants will take part in the design, installation and analysis of installations to measure surface water-groundwater interactions and air-shed processes based on fiber optic temperature methods.

Program:

June 29, 2009 - Principles and applications to date

Arrival to workshop venue

- 9:30-10:00** Participant introductions
- 10:00-10:15** Introduction to the workshop (Selker)
- 10:15-11:00** Introduction to fiber-optic sensing - Part 1: The Physics (Tyler, Selker)
- 11:00-12:00** Installations to date – Part 1: streams and soil (Selker, van de Giesen)
- 12:00-13:00** Lunch
- 13:00-14:00** Visit to field site to discuss installations
- 14:00-15:00** Installations to date – Part 2: Boreholes, lakes, snowfields, caves (Tyler)
- 15:00-16:00** Introduction to fiber optic sensing – Part 2: instrumentation (Selker)
- Coffee break**
- 16:30-18:00** Introduction to fiber optic sensing – Part 3: fiber selection and calibration. Full team design of calibration experiment (Selker, Tyler, van de Giesen)
- 18:00-19:00** Dinner
- 19:00-22:00** Industrial demonstrations: Real-time calibration

June 30, 2009 - Practicum: Physical installations in stream and soil

- 7:30- 8:30** Breakfast
- 8:30-9:00** Introduction to fiber optic sensing – Part 4: installation and power (Selker, Tyler)
- 9:00-10:00** Objectives, experimental design, plan of action
- 10:00-10:30** Team briefings: cautions and activities
- 10:30-11:00** Team discussion of work plans
- 11:00-12:30** Installation of fibers
- 12:30-13:30** Lunch
- 13:30-18:00** Installation of fibers, connection of instrumentation and power-up
- 18:00-19:30** Dinner
- 19:30-22:00** Repairing fiber: hands-on use of fusion welders

July 1, 2009 - Practicum: Lessons from the field and calibration

- 7:30- 8:30** Breakfast
- 8:30-10:00** De-brief of field experiences
- Coffee break**
- 10:00-12:00** Teams visit field sites to gather first night data set, field discussion of installations
- 12:00-13:00** Lunch
- 13:00-17:00** Practicum: Calibration (Tyler, van de Giesen)
- 17:00-18:00** Care and maintenance, data QA/QC – Industrial discussion of long term performance
- 18:00-19:00** Dinner
- 19:00-22:00** Poster session: Installations to date and dreams for the future (participants)

July 2, 2009 - Synthesis: Data analysis, presentation, discussion

- 7:30- 8:30** Breakfast
- 8:30-10:30** Teams visit installations, download data, break-down installations.

Coffee break

- 10:30-12:30** Teams take first look at their data
- 12:30-13:30** Working Lunch
- 13:30-15:00** The data so far: presentation, discussion
- 15:00-17:00** Second round of data analysis
- 17:00-18:30** Team presentations
- 18:30-19:30** Keynote by Mahmoud Farhadiroushan: Dreams for the Future.
- 19:30-20:30** Dinner

July 3, 2008

- 7:30- 8:30** Breakfast
- 8:30 -12:00** Wrap up, miscellaneous topics, workshop evaluation
- 12:00-13:00** Lunch
- 13:00** Departures

Organizer

John Selker, Oregon State University (selkerj@engr.orst.edu)

Background of participants

Participants are expected to have a basic understanding of hydrological processes.

Work load and credit points

Approximately 125 hours in total including lectures and exercises during the course and preparatory reading before and during the course.

The work load corresponds to 5 ECTS.

A course diploma will be issued upon satisfactory completion of the course.

Study material

Notes and copies of references papers will be provided during the course.

What to bring

Boots, field clothing (plan on rain), laptop computer, poster, bed linen, and towel.

Registration and admission

Registration on FIVA's website: www.fiva.dk.

Deadline: April 1, 2009.

Information on admission to the course will be forwarded shortly after including request for transfer of registration fee. In order to be accepted on the course FIVA must have received the fee no later than May 1, 2009. Please take into account that international money transfers can take several weeks.

The total number of participants is limited to 35. PhD students are given first priority but depending on the number of registrants we also welcome post-graduate participants.

Fee

PhD students enrolled at universities are charged a fee of Euro 300 (DKK 2.250), which includes meals, accommodation in Køge, and materials.

International students are requested to provide a very short description of their research interests and background when they register. Additionally, a letter of recommendation needs to be forwarded from the research advisor.

Post-graduate participants are charged a fee of Euro 750 (DKK 5.600) which includes meals, accommodation in Køge, and materials.

Payment instructions

Payment from Denmark

Transfer to: Danske Bank

Reg. nr. 3001

Account no.: 4310337668

Transfer text: 05003,yourlastname

Payment from a European country and certain countries around the Mediterranean

Transfer to: Danske Bank, Holmens Kanal 2, 1090 Copenhagen K, Denmark

SWIFT: DABADKKK

IBAN DK92 3000 4310 3376 68

Transfer text: 05003,yourlastname

Account Holder:

University of Copenhagen, Nørregade 10, 1017 Copenhagen K, Denmark

Payment from outside Europe

Transfer to: Danske Bank, Holmens Kanal 2, 1090 Copenhagen K, Denmark

SWIFT: DABADKKK

Account No. 3001 4310 3376 68

Transfer text: 05003,yourlastname

Account Holder:

University of Copenhagen, Nørregade 10, 1017 Copenhagen K, Denmark

NB! You will not be registered if the transfer text is not correct!

Please be aware that international transfers can take several weeks and that your registration is not valid before payment is received (no later than May 1, 2009)

Venue

DANHOSTEL Køge, Vamdrupvej 1, 4600 Køge, Phone: +45 56 67 66 50
www.danhostel-koege.dk

Please do not bring a sleeping bag. Please bring bed linen and a towel or rent it in the reception for DKK 50.

No smoking in the hostel.

Participants arriving from abroad are advised to be in Copenhagen at least one day before the course in Køge starts. You can book a hotel at your own expense. Hotel suggestions - Copenhagen:

1. CAB INN Scandinavia (cheap)

<http://www.cabinn.com/english/kbh/scandinavia/sca.html>

You could take the metro from the airport to “Forum metro station”

2. Comfort Hotel Østerport (a little more expensive)

<http://www.choice.no/html/da247048.jsp>

You could take the regional train from the airport to Østerport station. Order a superior room if you are sensitive to the sounds of the railway tracks.

Transportation from Copenhagen to hostel

The trip from Copenhagen to DANHOSTEL Køge will take 1½-2 hours by train and bus.

1. Take the S-train from Copenhagen to Køge station.

2. Take bus 210 from Køge Station. Ask the driver to drop you off close to the corner of Agerskovvej and Ølbyvej. Walk to the hostel (see map). The bus departs from Køge station once every hour.

Walking from Køge Station to the hostel would take approx. 30. min. You may also take a taxi from Køge station.

Co-sponsors:

Center for Hydrology – HOBE –A hydrological observatory, Denmark

Terrestrial Environmental Observatoria –TERENO, Germany

The Consortium of Universities for the Advancement of Hydrologic Sciences – CUAHSI, USA

Hydrologic Measurement Facility (HMF), USA

The National Science Foundation, USA

Oregon State University and University of Nevada Reno, USA

Further information

Please contact the course organizer, Karsten H. Jensen (khj@geo.ku.dk) or Frederik Uldall (email: fu@geo.ku.dk, phone: +45 3532 2414).