

ICTP-University of Trieste Winter short course on

## **Modelling mixing and transport in lakes, harbors and estuaries**

Local organizers: Dr. J.Niemela (ICTP); Prof. V. Armenio (University of Trieste)

*Location:* Leonardo Building, The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy

*Time:* 10-12 of February 2014

*Duration:* 3 days, 15 hours

### *Abstract*

A reliable modelling of hydrodynamics and transport of substances in closed and semi-closed basins, such as lakes, lagoons and embayment, is typically a difficult task because of the intermittent external forcing (mainly wind), the internal stratification (usually due to the vertical distribution of temperature and/or salinity), the possible onset of internal waves, and the complex diffusion processes that characterize these environments. In particular, simulating the mixing associated with turbulence requires suitable models, which vary from very simple algebraic empirical closure for the eddy diffusivity, to more elaborate systems of differential equations for the transport of the turbulence properties, up to complex and computational demanding Large Eddy Simulations that are nowadays becoming a viable option also to study real problems. This course aims at providing the basic background on the boundary conditions and the physical processes in lakes, reservoirs and semi-enclosed basins as well as the modelling tools to understand and exploit the recent developments in this field. The course is intended for researchers and practitioners willing to become mature and aware users of the commercial software available in the environmental fluid dynamics engineering community.

### *Topics and lecturers*

1. **Physics of lakes** – 4 h  
Alfred Johny Wüest (EPFL and EAWAG, Switzerland;  
[http://www.eawag.ch/about/personen/homepages/wuest/index\\_EN](http://www.eawag.ch/about/personen/homepages/wuest/index_EN),  
<http://people.epfl.ch/alfred.wueest>)
2. **Numerical modelling of transport and mixing in lakes and estuaries** – 4 h  
Hans Burchard (Leibniz Institute for Baltic Sea Research, Germany; <http://www.io-warnemuende.de/hans-burchard-en.html>)
3. **Large eddy simulation in closed and semi-closed basin** – 4 h  
Vincenzo Armenio (University of Trieste, Italy;  
<http://www.units.it/data/curricula/4391.pdf>)
4. **Simple models for lake dynamics** – 3 h  
Marco Toffolon (University of Trento, Italy;  
<http://webapps.unitn.it/People/it/Web/Persona/PER0003456#INFO>)

### *Logistic*

The course will be held at Euler Lecture Room, ICTP, Leonardo Building (Main Building of the ICTP)

A limited number of rooms has been reserved at Adriatico Guest House (ICTP) for participants

<http://www.ictp.it/visit-ictp/accommodation/guesthouses.aspx>.

Detailed maps and information on how to get there are

<http://www.ictp.it/visit-ictp/transportation.aspx>

Useful info are available at <http://www.ictp.it/visit-ictp/about-trieste.aspx> and <http://www.ictp.it/visit-ictp/pre-arrival-guide.aspx>

The early registration fee is 350 EU (by January 15) and it covers course material, coffee breaks, 3 lunches and course dinner. Late registration fee is 450 EU

**Payments should be made exclusively by bank transfer**

Please, complete the attached [registration form](#) and return it by email to:  
[armenio@dica.units.it](mailto:armenio@dica.units.it)

You can download **registration form here [registration-form\(link\)](#)**