February 20, 2007

Position as “Experienced Researcher” for
Study of freak wave formation and propagation, and quantification of wave runup on a beach
available at the Institute of Cybernetics (IoC) at Tallinn University of Technology, Estonia

Whom we look for
IoC offers a position for a qualified person (holding a PhD or an equivalent degree) with background in general wave theory and/or wave statistics, and with extended experience in tsunami or freak wave studies.
The goal of the position consists in consolidation of the existing knowledge of freak-wave-like events in shallow water (including small-scale phenomena such as meteorological tsunamis, squall line waves and solitonic waves from fast ferries) and identification and quantification of specific threats connected with such phenomena.
The duration of the appointment is 12 months.

Skills
The successful candidate will work predominantly in the field of theoretical analysis of wave phenomena in the framework of nonlinear shallow water equations. He/she should have a strong background in partial differential equations and the relevant numerical methods, and good computer skills necessarily including experience of writing code in FORTRAN, Matlab or in similar environments.

Motivation
Particularly high and steep (freak or rogue) waves on the sea surface are observed much more frequently than it might be expected from surface wave statistics. Such waves serve as a specific source of danger in shallow areas through their impact on ships and offshore structures. In certain cases, long (freak or tsunami) wave runup may be the decisive factor of the magnitude of destructions and loss of life.

A comprehensive picture about such phenomena is still missing even in one of the simplest frameworks - the (nonlinear) shallow-water theory. For example, the shape of the waves plays at times a larger role than the wave height. It is thus extremely important to understand whether there exist any universal features that govern the freak wave phenomena and wave runup properties in the coastal zone. A potential source of information form waves from fast ferries that serve as models of small-scale freak waves and tsunami-like phenomena.

The successful candidate is expected to carry on studies in a selection from the following areas: analysis of the freak wave statistics, numerical and theoretical analysis of freak wave generation in the framework of two-dimensional nonlinear shallow water equations having exact soliton solutions (e.g. the Kadomtsev-Petviashvili equation), numerical simulation of the runup of various incident wave shapes and of irregular waves with various statistics.
Application of the obtained results for the analysis of the solitonic and freak waves generated by fast ferries is desirable.
The training of the candidate and the mutual interaction with the scientists from IoC in the general surface wave theory and coastal processes is expected; and training in methods of measurement and analysis of transient wave groups can be provided.

**Institute of Cybernetics** at Tallinn Technical University was founded in 1960 as an institute of Estonian Academy of Sciences and was associated with Tallinn University of Technology in 1997. The academic staff of IoC currently consists of 6 DSc, and the equivalent of 25 PhD. The institute hosts the Centre for Nonlinear Studies (CENS, Estonian Centre of Excellence in Research from 2003) that was founded in 1999 to promote interdisciplinary studies of complex nonlinear processes that stem from solid mechanics, fluid dynamics, fractality of nature etc.

**Working group**
The successful candidate will join the IoC-based SEAMOCS team – the group of water waves (led by Prof Dr Tarmo Soomere) within CENS. The team carries expertise in analysis of long transient waves, in multi-nested modelling of wave conditions areas with complex geometry, in mathematical description of extreme wave mechanisms, in numerical wave modelling, in wave and wind climatology, and in the interaction of waves and coastal processes.

**SEAMOCS**
SEAMOCS (Applied stochastic models for ocean engineering, climate and safe transportation) is a Marie Curie Research Training Network (RTN) financed by the EU. The SEAMOCS initiative links meteorology and statistics with ocean and coastal engineering. The overall goal of research and training is increased marine safety and reduced capital and operational costs of sea transport and major off-shore installations. The consortium consists of three university research groups in ocean and coastal engineering, three university research departments in applied probability and statistics, and three public and private organizations engaged in activities to increase the safety of marine operations. The chosen candidate will have the opportunity to take part in courses and training programs offered by the SEAMOCS partners, and to take advantage of other SEAMOCS activities related to meteorology, statistics and marine safety. Resources are available within the SEAMOCS project for this exchange.

**Formal requirements**
One of the aims of the Marie Curie program is to promote mobility. To be eligible, the candidate must NOT have:
- the nationality of the host country (here Estonia), unless he/she has been living outside of the EU and the Associated Countries for at least four of the last five years,
- lived and/or worked in that country for more than 12 months during the last three years.
Additional information
• For more information, please contact: Tarmo Soomere, +373-6204167, soomere@cs.ioc.ee
• If you are interested, please send your application letter (incl. short description of the research plan), CV and 2 reference letters to Prof Dr Tarmo Soomere, Institute of Cybernetics at Tallinn University of Technology, Akadeemia tee 21, 12618 Tallinn, Estonia.
• Last day of application is 01 May 2007; for candidates who require work permit for Estonia – 31 March 2007; expected starting date is 15 August 2007.
• For citizens of non-E.U. or non-associated states, some restrictions apply.
• For information about Institute of Cybernetics, see http://www.ioc.ee
• SEAMOCS website: http://www.maths.lth.se/seamocs/
• Marie Curie opportunities website: http://cordis.europa.eu.int/mc-opportunities/