

# Versatile Hydrodynamics

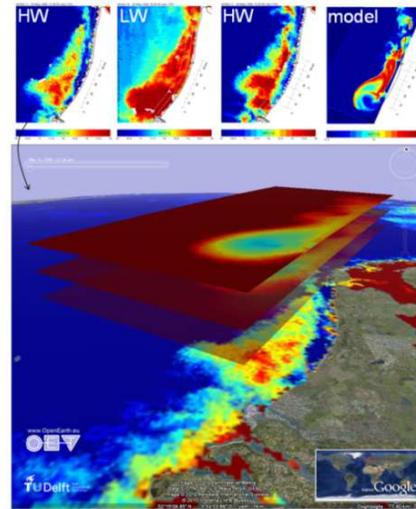
We are looking for a PhD to work on the Versatile Hydrodynamics project recently funded by TTW.

The overarching objective of Versatile Hydrodynamics is to develop a hydrodynamic model properly embedded in the regional observational network that allows accurate, seamless forecasting of total water depths in the Dutch North Sea. The model needs to resolve all the dominant physical processes in the North Sea, including the coastal waters; it will exploit tide gauge and radar altimeter water levels, in-situ temperature/salinity profiles, and remotely sensed sea surface temperature data in the framework of data assimilation; and its output is complemented by a realistic accuracy description. The project involves 3 PhD's working together. Here we are looking for a PhD for sub-project 2. The position is for 4 years.

We seek a candidate with experience in physical oceanography, math, physics and/or acoustics to carry out research in sub-project 2 which addresses key physical processes near the mouth of the Rotterdam Waterway. Here freshwater discharges into the coastal sea and forms a major river plume. In the vicinity of the river mouth we find a significant freshwater jet that forms a tidal plume front each tidal cycle, that then interacts with previous freshwater lenses and the background river plume. Here we will investigate how these processes interact and compete with one another. To do this we will use a combination of modelling and data; where for the first time we will invert multi-beam echosounding data to unravel the fascinating plethora of processes dominating the water column.

If you are interested in this position, please email [J.D.Pietrzak@tudelft.nl](mailto:J.D.Pietrzak@tudelft.nl) / [M.Snellen@tudelft.nl](mailto:M.Snellen@tudelft.nl) for further information.

The appointments will start between April and June, or as soon as possible.



Successive KNMI NOAA SST satellite images on May 3rd 1990 (blue=10°C, red=14°C) and temperature calculated at HW with an idealized model set-up of Delft3D of the Rhine ROFi. Below the 1st image is shown again in the Google EarthTM mapping service panel. The cold band (blue) along the Dutch coast at high water is caused by upwelling induced by tidal straining. Overlaid are model results of the 3D salinity structure.

Image courtesy Gerben de Boer.

# PhD in Versatile Hydrodynamics Project

**Faculty/department** Faculty Electrical Engineering, Mathematics and Computer Science  
**Level** Master degree  
**Maximum employment** 38 hours per week (1 FTE)  
**Duration of contract** 4 years  
**Salary scale** €2222 to €2840 per month gross

## Faculty Electrical Engineering, Mathematics and Computer Science

The Faculty of Electrical Engineering, Mathematics and Computer Science (EEMCS) is known worldwide for its high academic quality and the social relevance of its research programmes. The faculty's excellent facilities accentuate its international position in teaching and research. Within this interdisciplinary and international setting the faculty employs more than 1100 employees, including about 400 graduate students and about 2100 students. Together they work on a broad range of technical innovations in the fields of sustainable energy, telecommunications, microelectronics, embedded systems, computer and software engineering, interactive multimedia and applied mathematics.

The Versatile Hydrodynamics project is a joint project of three faculties of TU Delft, the German Federal Agency for Cartography and Geodesy (BKG, Frankfurt), and Deltares. It aims at the development of tomorrow's marine navigation products. The development of a hydrodynamic model which resolves all relevant 3D physical processes is a key element of the project. This model will be linked to a strong and extended observational network that allows accurate, seamless forecasting of total water depths in the Dutch North Sea. Please check <http://versatile-hydrodynamics.nl> for more information.

## Job description

The project is organized along three interrelated sub-projects. In subproject P1, we will develop a new technique to transfer heights over large water bodies in order to realise a height system that covers the whole model domain and meets the required accuracy. This realisation serves as the unified height datum to which both observed and modelled water levels will refer. In subproject P2, we will develop a model that resolves the fronts, freshwater lenses, and baroclinic effects, that are characteristic features in the Dutch coastal waters, at high resolution. To validate/calibrate this model, we will use salinity/temperature profiles derived from multibeam echosounding data. **The position we offer is for subproject P3. In P3, we will develop new and operational techniques to 1) assimilate full water levels (in particular those provided by satellite radar altimeters), and 2) describe the accuracy of the model forecasts. Together with the contributions from P1 and P2, this enables us to build a prototype of the seamless forecasting system for total water depths in the Dutch North Sea. Building and validating this prototype is also part of P3.** For more information about the project as a whole and the three subprojects, we refer to <http://versatile-hydrodynamics.nl/>.

## Requirements

Applicants should have the following qualifications:

- Ability to cooperate with both scientific and industrial partners;
- Proven programming skills;
- Keen interest in data analytics;
- Good proficiency in spoken and written English.

Specific requirements P3:

- MSc degree in mathematics;
- Knowledge of data assimilation, stochastic processes, probability theory, statistics, and system and control;
- Strong affinity with numerical modelling.

### **Conditions of employment**

The TU Delft offers an attractive, customisable compensation and benefits package, including a discount for health insurance and sport memberships, and a monthly work costs contribution. Flexible work schedules can be arranged. An International Children's Centre offers day care, before- and after-school care and an international primary school. Dual Career Services offers support to accompanying partners. Salary and benefits are in accordance with the Collective Labour Agreement for Dutch Universities.

As a PhD candidate you will be enrolled in the TU Delft Graduate School. The TU Delft Graduate School provides an inspiring research environment; an excellent team of supervisors, academic staff and a mentor; and a Doctoral Education Programme aimed at developing your transferable, discipline-related and research skills. Please visit [www.tudelft.nl/phd](http://www.tudelft.nl/phd) for more information.

### **Information and application**

For more information about position P3, please contact M. Verlaan (M.Verlaan@tudelft.nl). To apply, please e-mail a detailed CV, proof of English language proficiency, the abstract of your MSc thesis (one page), two references, your preferred position, and a letter of motivation in a single PDF file by 31 May 2018 to M.Verlaan@tudelft.nl and D.C.Slobbe@tudelft.nl. Please refer to vacancy number EW12018.31