Annual Report 2009

Coastal Engineering and Port Development Core

Head of Core: Prof. J.A. (Dano) Roelvink PhD

1 Core staff as of 31 December 2009

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>Appointment (fte)</th>
<th>Research input (fte)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professors</td>
<td>Jan Adriaan (Dano) Roelvink</td>
<td>0.8</td>
<td>0.4</td>
<td>Zero appointment</td>
</tr>
<tr>
<td></td>
<td>Han Ligteringen</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Associate Professors</td>
<td>Dr. Rosh Ranasinghe</td>
<td>0.5</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Frank van der Meulen</td>
<td>0.4</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Senior Lecturers</td>
<td>Mr. Mick van der Wegen</td>
<td>0.8</td>
<td></td>
<td>Senior Lecturer since 1st of Feb 2010</td>
</tr>
<tr>
<td></td>
<td>Mr. Hendrik Bijnsdorp</td>
<td>0.8</td>
<td>0.6</td>
<td>Left the core since 1st of Jan 2010</td>
</tr>
<tr>
<td></td>
<td>Mr. Ali Dastgheib</td>
<td>1.0</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>4.3</td>
<td>2.0</td>
<td></td>
</tr>
</tbody>
</table>

2 Research and educational profile

2.1 Research lines

- Integrated modeling of coastal processes and evolution. The objective of this research line is develop knowledge and modelling tools to predict hydrodynamic and morphological phenomena in the coastal zone, as a result of natural processes and human interference, directly and through climate change impacts. The focus is on improving long-term predictions of coastal morphology and on developing open-source software for predicting coastal behavior, for instance for hurricane impacts on coasts.

- Performance and reliability of flood defense systems. Here the objective is to improve the understanding, models and techniques for the performance of coastal structures under variety of loading conditions and of flood defense systems including natural and man-made defences.

2.2 Educational programme/specialisation for which the Core is responsible

- MSc Programme of Water Science and Engineering
  - Coastal Engineering and Port Development specialisation

3 Major achievements

3.1 Research

- 2 PhD researchers graduated (Giles Lesser, Rafael Almar – Bordeaux University)
- Roshanka Ranasinghe was awarded a UPARF Cat 2 research grant to undertake a benchmark study on climate change impacts on tidal inlets in Sri Lanka and Thailand (CC-SIOTI)
- Roshanka Ranasinghe’s research resulted in the development of an innovative process based, probabilistic model to estimate coastline retreat due to sea level rise
- Mick van der Wegen extended his collaborative research with USGS into the San Joaquin/Sacramento Delta by developing an unstructured grid model for the area in collaboration with Deltares, which will be a basis for integrated, interdisciplinary modeling in the coming years
- Dano Roelvink contributed heavily to further development of XBeach and its acceptance as an advanced tool for predicting storm impacts in complex situations

3.2 Education
• Graduation of 7 MSc students in the specialisation Coastal Engineering and Port Development.
• Contribution to the supervision of many other MSc students in other programmes.
• Roelvink co-organizer of NCK Summerschool, Texel.
• Van der Meulen co-organizer (with Dept ER) of the international short course on Climate Change in Integrated Water Management and invited contributor/resource person to the international course on Flood Hazard Mapping at ICHARM, Japan.

3.3 Advisory/Capacity building projects

• Support of field research and morphological modeling at University of Ghana, funded by US Office of Naval Research in framework of Africa Partnership Station
• Proposal submitted to DUPC and seed funding allocated for the development of a Centre for Excellence in Adaptation to Climate Change in Sri Lanka (maybe this should go under a seperate Cap dev section a la the HWR report).
• Pre-proposal for the initiation of a Double Degree (MSc) program between Univ. of Peradeniya and IHE prepare in collaboration with the SE core submitted to the IHE rectorate (Cap dev section)
• In PMR (project mainport Rotterdam) Van der Meulen was advisor to Rijkwaterstaat in the construction of new dunes in front of the Delfland coast, a coastal engineering work that was done to compensate the loss of valuable dune habitats as a result of MV2 (harbour extension Rotterdam). He was also chairman of the commision that had the quality control over the report that gives the plan of action for future long term monitoring of the dunes in the context of PMR, and editor of the final report, in cooperation with Deltares.
• Van der Meulen advisor for Rijkwaterstaat to the governments of Mozambique, Swaziland and South Africa in DGIS project on integrated transboundary river basin management of the Incomati and Maputo Rivers.

3.4 Society

• Core members are active members of a number of professional organisations such as NCK, PIANC
• Ranasinghe member of National Committee of Coastal and Ocean Engineering Australia
• Ranasinghe professional member of Engineers Australia
• Core members provided a number of peer reviews for reputable journals and wrote book reviews
• News paper article Roelvink in NRC 2009/07/11 Dano Roelvink about danger of rip currents for swimmers
• Key note lecture Roelvink at International Coastal Symposium, Lisbon, April 2009
• Roelvink participated in invited EU-COST workshop on Coastal Model Validation
• Roelvink gave invited seminars at Nanjing Normal University and Nanjing Hydraulics Research Institute, November 2009
• Key note speech Roelvink at Bangladesh Institute of Engineers, on climate change and sea level rise, lessons from the Netherlands and other experiences, December 2009; wide media coverage on TV and in newspapers
• Prof. Roelvink is one of international experts in possible 1,500 km² land reclamation project in Jiangsu Province, China
• Van der Meulen invited chairman in one of the sessions of the Policy Day on Water and Climate Change, organised by the University of Amsterdam.
• Van der Meulen member of the advisory committee of 2 large Management Authorities that manage the dunes of South- and North Holland Provinces.
4 Research

4.1 Research projects initiated during 2009

- UPARF project CC-SIOTI in collaboration with CSIRO (Australia), Deltares, Univ. of Peradeniya and Univ. of Moratuwa (Sri Lanka), and AIT (Thailand).
- Morphological upscaling with the MORFAC approach (MORFAC). Project funded by Deltares involving personell from Deltares, IHE and TUD. Currently 1 MSc at IHE and 1 MSc at TUD.
- Climate change impacts on the offshore wave climate off New South Wales, Australia (CC-Waves). Project funded by The Dept. of Climate Change, Australia
- Modeling of infragravity waves on coral reefs, funded by Deltares, in collaboration with Univ. of Western Australia
- Operational modeling of nearshore hydrodynamics and swimming safety, funded by Deltares
- Modeling long waves in harbors, funded by Deltares
- Predicting wave attenuation and morphological development at Corte Madera salt marsh, San Francisco Bay funded by USGS
- Proposal currently being prepared in collaboration with Glasgow University (UK) to investigate inverse vs process based modeling of decadal morphodynamic evolution of large tide dominated environments.

4.2 On-going research projects/activities (indicating partners, budget and funding source)

- UpARF project Research on Sediment from Upstream to Estuary (ReSedUE), a collaborative project between CEPD and HERD, involving Deltares, 5 Chinese partners and HRI-Egypt.
- Climate Change Impacts on Australian coasts, funded by Australian government (visiting postdoc research)
- Long-term morphological modelling of Marsdiep inlet, funded by Deltares (PhD work Dastgheib) in framework of project ‘Coastline maintenance’.
- Hurricane impact modelling (XBeach), with Deltares, TUD, Univ. Miami, funded by Deltares, USGS and EU-MICORE
- Long-term morphological modelling San Pablo Bay, funding by USGS
- Community Sediment Transport model, with USGS, Woods Hole Oceanographic Institute, funding by US Office of Naval Research (ended 30 September 2009)
- Impact of sea level rise on tidal inlets, funded by Delft Cluster
- Generic Morphological Model, funded by Deltares
- MOULIT-RELIEFS, French research project on modelling of coastal morphology, with Univ. of Bordeaux and several other institutes; funding by SHOM

4.3 List of on-going and new PhD research projects

<table>
<thead>
<tr>
<th>PhD fellow, country</th>
<th>Promotor(s)</th>
<th>Title research project</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Mick van der Wegen</td>
<td>J.A. Roelvink, H.H.G. Savenije</td>
<td>Long-term morphodynamic equilibrium in alluvial estuaries</td>
</tr>
<tr>
<td>2 Pushpa Kumara Dissanayake</td>
<td>J.A. Roelvink</td>
<td>The role of tidal inlets in coastal erosion</td>
</tr>
<tr>
<td>3 Qinghua Ye</td>
<td>J.A. Roelvink</td>
<td>Development of a Generic Geomorphological Model with applications to Tidal Sand Bank Behavior</td>
</tr>
<tr>
<td>4 Ali Dastgheib</td>
<td>J.A. Roelvink</td>
<td>Long-term interaction of morphological changes in a multi-inlet tidal system: The Dutch Wadden Sea</td>
</tr>
<tr>
<td>5 Wan Yuanyang</td>
<td>J.A. Roelvink</td>
<td>Sedimentation processes Yangtze estuary</td>
</tr>
<tr>
<td>6 Guo Leicheng</td>
<td>J.A. Roelvink</td>
<td>Morphodynamic modeling of the Yangtze Estuary</td>
</tr>
</tbody>
</table>
4.4 Research output

1. PhD theses

2. Academic publications

Journal papers published/accepted in 2009


Callaghan D, Ranasinghe R, Short AD. Quantifying the storm erosion hazard for coastal planning. COASTAL ENGINEERING Volume: 56 Pages: 90-93


Harley M., Turner IL, Short AD, Ranasinghe R. Inter-annual variability and controls of the Sydney wave climate. INTERNATIONAL JOURNAL OF CLIMATOLOGY DOI: 10.1002/joc.1962


Simanjuntak TDYF, Boeriu P, Roelvink JA. Consideration on the sedimentation process in a settling basin. JOURNAL OF HYDROLOGY AND HYDROMECHANICS Volume: 57 Issue: 1 Pages: 16-25


Book chapters published/accepted in 2009

X. Bertin, A-B. Fortunato, D. Roelvink. Morphodynamic Modeling of tidal inlets and embayments
In: Geomatic Solutions for Coastal Environments, Editors: M. Maanan and M. Robin, Nova Publishers

Journal papers under review


Dissanayake, D. M. P. K., R. Ranasinghe and J. A. Roelvink. The morphological response of large tidal inlet/basin systems to relative sea level rise, Climatic Change (in review)

Harley, M., I. Turner, A. D. Short and R. Ranasinghe. Assessment and integration of conventional, RTK-GPS and image-derived beach survey methods for daily to decadal coastal monitoring, Coastal Engineering (in review)


Van der Wegen, M., Bruce Jaffe, Ali Dastgheib, Dano Roelvink, Generation of initial bed composition for morphodynamic hindcasting of hydraulic mining deposits in San Pablo Bay, California, oral presentation at INTERCOH, Rio de Janeiro, Brazil (submitted to special issue of Ocean Dynamics).

Van der Wegen, M., Bruce Jaffe, Dano Roelvink Process-based, morphodynamic hindcast of decadal deposition patterns in San Pablo Bay, California, 1856-1887. submitted to JGR ESP

Proceedings international conferences


Jaffe, B., Theresa Fregoso, Amy Foxgrover, Mick van der Wegen, Dano Roelvink, , Neil Ganju, Kate Dallas, Patrick Barnard, Dan Hanes, John Chin, Don Woodrow, Mary McGann, Lynn Ingram, Shawn Higgins, Mark Marvin-DiPasquale and Elena Nielsen, Morphological change of the San Francisco Estuary, 90th Annual Meeting of the Pacific Division of the American Association for the Advancement of Science (AAAA), San Francisco, CA


Ofori, Komla W., Mick van der Wegen, Dano Roelvink and John de Ronde, Investigating the trends of import and export of sediment in the Western Scheldt estuary, the Netherlands - by a process-based model, RCEM conference, Santa Fé, Argentina.


Van der Wegen, M., Zheng Bing Wang, Huub Savenije and Dano Roelvink, Process-based, long-term morphodynamic modelling to investigate conditions for equilibrium estuarine geometry, oral presentation, EGU, Vienna, Austria.

Van der Wegen, M., Bruce Jaffe, Dano Roelvink Process-based, morphodynamic hindcast of decadal deposition patterns in San Pablo Bay, California, 1856-1887 AGU fall meeting

5 Education

5.1 Modules of the Master programmes and specialisations coordinated by the Core
<table>
<thead>
<tr>
<th>Programme</th>
<th>Name of module</th>
<th>Date offered</th>
<th>Name of coordinator</th>
</tr>
</thead>
<tbody>
<tr>
<td>WSE-CEPD</td>
<td>All modules (# 3-15)</td>
<td>All year.</td>
<td>H. Bijnsdorp</td>
</tr>
</tbody>
</table>

### 5.2 Regular short courses coordinated by the Core in 2009

<table>
<thead>
<tr>
<th>Topic</th>
<th>Coordinator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online – course on Integrated coastal zone management</td>
<td>R. Ranasinghe</td>
</tr>
<tr>
<td>Integrated coastal zone management</td>
<td>M. van der Wegen</td>
</tr>
<tr>
<td>International port seminar</td>
<td>H. Bijnsdorp, A. Dastgheib</td>
</tr>
<tr>
<td>Morphological modeling using Delft3D</td>
<td>D. Roelvink, M. van der Wegen</td>
</tr>
</tbody>
</table>

### 5.3 MSc theses finalised during 2009

<table>
<thead>
<tr>
<th>Name student</th>
<th>Title thesis</th>
<th>Sponsor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duong Duc Toan</td>
<td>Morphodynamics of seasonal variation tidal inlet. A case study of the Tra Khuc inlet in the central coast of Vietnam.</td>
<td>CICAT</td>
</tr>
<tr>
<td>Nicholson Garae</td>
<td>Vanuatu tinter-Island Ports Infrastructure Analysis.</td>
<td>Lamminga / Vanuatu Port Authority</td>
</tr>
<tr>
<td>Davide Merli</td>
<td>Stability of wide-graded rubble mounds.</td>
<td>Hydrodynamic - Boskalis</td>
</tr>
<tr>
<td>Arman Bin Mokhtar</td>
<td>Coastal Response to submerged breakwaters and Shoreface Nourishments</td>
<td>Deltares</td>
</tr>
<tr>
<td>Nguyen Binh Minh</td>
<td>Prediction of storm track using empirical track models</td>
<td>USACE</td>
</tr>
<tr>
<td>Franto Novico</td>
<td>Morphological Evolution in San Pablo Bay under different Climate change Scenarios</td>
<td>USGS</td>
</tr>
<tr>
<td>Komla Wogbemase Ofori</td>
<td>Investigating the long Term Import - Export trends of the Western Scheldt</td>
<td>Deltares</td>
</tr>
</tbody>
</table>
5.4 Other educational activities (short courses, tailor made courses, refresher seminars, online courses, and invited lectures)

<table>
<thead>
<tr>
<th>Type</th>
<th>Topic</th>
<th>Lecturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Weeks tailor made course King Abdulaziz University, Kingdom of Saudi Arabia</td>
<td>Port planning and management</td>
<td>H. Bijnsdorp</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A. Dastgheib</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Guest Lecturers</td>
</tr>
</tbody>
</table>