News of the German Coastal Engineering Research Council

KFKI aktuell

Shaping the future in response to climate change

Climate change is not a new phenomenon. The climatic history of our planet – primarily reconstructed on the basis of core samples of deep sea sediment and continental ice masses (800,000 years are documented) – indicates a high variability of our climate. As documented in the 4th and most recent report of the Intergovernmental Panel on Climate Change (IPCC), the speed of global warming in recent decades has accelerated unusually, and an anthropogenic component of this development is undisputed. The recent major expert appraisal "The World in a State of Change: Safety Risk of Climate Change" of the Governmental Scientific Advisory Board for Global Changes comprehensively describes the possible consequences of global warming. On the basis of a simulation calculation up to the year 2050 the German Institute of Economic Research (DIW) predicts climate-related adaptation costs of 800 billion Euros for Germany, which will affect almost all spheres of life.

The political response to these findings, which demand decisive action, consists in various initiatives and measures. On the one hand, it is hoped that a reduction in emissions will serve as a preventive measure to slow down global warming and its negative effects (climate protection), while on the other hand, it is proposed to react as soon as possible to the unavoidable consequences of climate change (climate adaptation).

In the spring of last year the European Council of Country Leaders and Heads of Government under German presidency hence set the course for an integrated European climate and energy policy. This includes ambitious climate protection targets (a limitation of warming in Europe to 2° C) as well as targets for the development of renewable energy sources and an increase in energy efficiency. Following the Meseberg Agreement of August 2007 for an integrated energy and climate programme, the German government intends to realise the European Road Map decisions on a national level by a concrete programme of measures. The implementation of the energy and climate programme will be oriented to the climate targets in a continuous process up to 2020. According to the climate protection high-tech strategy (2007), the German government is intent on combining the research and innovative potentials of industry and science in Germany more intensively to meet these targets.

In conjunction with the latter, processes for developing adaptation strategies have already been initiated on a European as well as on a national level. On 29 June 2007 the European Commission passed a Green Paper outlining a strategy for adaptation to climate change in Europe [KOM (2007) 354]. The commission's Green Paper clearly indicates that the EU Commission is still in the initial stages of the process for this type of strategy in many respects. With regard to content, the aim is to identify regional effects of climate change, to recognise deficits in scientific knowledge and to develop technical solutions for adaptation measures. Within this framework the German Government has set upon the task of developing a German adaptation strategy to counteract climate change (DAS), which is intended to set a course for the step-by-step development of adaptation measures in Germany.

On the basis of the initiative "Shaping the Future in Response to Climate Change - Inland Shipping and Waterways in Germany" of the German Federal Ministry of Transport, Building and Urban Areas (BMVBS), the BMVBS, in a first step, has commissioned its technical authorities, the German National Meteorological Service (DWD), the Federal Maritime and Hydrographic Agency (BSH), the Federal Institute of Hydrology (BFG), and the Federal Waterways Engineering and Research Institute (BAW), to analyse the basics of climate research, evaluate their findings with regard to the possible effects on maritime and inland shipping, and to pinpoint recommendations for action. The BMVBS has compiled this inventory in an information document (***http://www.bmvbs.de/Anlage/original_1028117/Schifffahrt-und-Wasserstrassen-in-Deutschland-Zukunft-gestalten-im-Zeichen-des-Klimawandels.pdf).***

With regard to the basics of climate projections and coastal and inland waterways in Germany this document is of multi-sectoral importance and is hence also of interest to coastal research in a broader sense. The topic of climate change, which is widespread in the media and accompanied by a great deal of emotion in many cases, generates a demand for action which does not always take sufficient account of the basic scientific findings of the Intergovernmental Panel on Climate Change (IPCC). It is undoubtedly advantageous if this pressure evokes rapid changes in public awareness ("consumers"), thereby resulting in a more effective climate protection and resource-saving attitude as soon as possible. At the same time, it is also necessary to reduce the large gaps in knowledge and uncertainties revealed by the IPCC by basic scientific research in such a way that future-oriented decisions and investments necessary for adaptation to climate change on a broad front are realizable. Concrete scientific research will make it possible to embark on the next steps without curbing the already initiated and foreseeable demands. The key to rapid success in research lies in the improved networking of national and international cooperation between experts in an atmosphere of mutual trust.

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German Federal Ministry of Transport, Building and Urban Areas | Technical Division WS 14: Climate, Environmental Protection of Inland Waterways, Hydrology | Robert-Schuman-Platz 1 | 53175 Bonn

ICCE 2008 – Preparatory status

> Prof. Dr.-Ing. Holger Schüttrumpf
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The deadline for submitting abstracts ended on 15 July 2007. In total, 980 abstracts were submitted by authors from 45 countries. Germany tops the list with 143 contributions. In this respect the local organising committee (LOC) would like to thank all German scientific colleagues for their commitment. Japan occupied second place on the list with a total of 123 submitted abstracts. This was followed by the USA (115), England (86), The Netherlands (78), Spain (62), Italy (60) and France (32). From the total of 980 abstracts, 470 were selected for a presentation and 80 for a poster. The posters will also be presented within a framework of short lectures and published in a special conference volume. The abstracts were jointly selected by the Coastal Engineering Research Council (CERC) and the paper selection committee. The LOC is hereby represented with one vote.

The participation fees for the ICCE 2008 were decided upon at the last meeting of the LOC. These amount to 750 € for a normal participant, 390 € for students and 270 € for accompanying persons if registrations are made before 1 April 2008. Increased participation fees will apply after 1 April 2008. Further details may be found in the Internet at: ***http://icce2008.hamburg.baw.de.*** Besides the scientific programme, the ICCE 2008 also offers a wide-ranging accompanying programme. This includes the ice-breaker party on 31 August 2008 (Sunday), the opening event on 1 September 2008 with various celebratory presentations, technical excursions, and the closing banquet on Friday evening (5 September 2008).

In this connection it is pointed out that all authors (papers and posters) must register before 1 April 2008. Lectures or poster presentations and the publication of contributions are only possible provided conference participants register before 1 April 2008 and that the contribution has been presented at the conference. This new regulation introduced by the LOC of the ICCE 2008 is aimed at avoiding financial losses on the part of the event organiser, the Port Engineering Society (HTG). With regard to your registration we should also like to draw your attention to the sponsorship possibilities for young members offered by the HTG within the framework of the Goedhardt Foundation.

A total of four scientific excursions are planned. The first excursion is a visit to the Dyke Construction Museum as well as the Experiences Centre "Blanker Hans" in Büsum. In the second excursion a trip is planned to visit places of interest in the Port of Hamburg. The third excursion is a trip to the Airbus construction grounds, the DASA Extension Area as well as the Elbe Estuary. In the fourth scientific excursion a trip is planned to visit the flood protection structures in and around Hamburg.

Finally, we would also like to draw your attention to two short courses on the Sunday prior to the conference. International experts in the fields of wave overtopping and morphodynamics will report on these two themes within the framework of full-day courses. Online registration via the internet is now possible. Take advantage of the early registration rebate before 31 March using the online registration form:

http://icce2008.hamburg.baw.de/registration.html

Further information may be obtained from:
Prof. Dr.-Ing. Holger Schüttrumpf | Tel.: +49 (0) 241 – 80 2 52 62 | icce2008@hamburg.baw.de

New Head of the Institute of Hydraulic Engineering and Water Resources Management at RWTH Aachen University

With effect from 1 October 2007, Professor Dr.-Ing. Holger Schüttrumpf will take up the post of Professor of Hydraulic Engineering and Water Resources Management at RWTH Aachen University. Professor Schüttrumpf thus takes over head of the Institute of Hydraulic Engineering and Water Resources Management from Professor Dr.-Ing. Jürgen Köngeter, who has been head of the Institute since 1994.

Professor Schüttrumpf studied Civil Engineering at the Technical University of Brunswick as well as at the Institute Nationale Politechnique de Grenoble. After completing his studies, he took up the post of scientific assistant in the field of hydromechanics and coastal engineering at the Leichtweiß Institute of Hydraulic Engineering at the Technical University of Brunswick. The focal point of numerous national and international research projects at the Leichtweiß Institute of Hydraulic Engineering concerned investigations relating to coastal and flood protection. Under the supervision of Professor Dr. Hocine Oumeraci, he gained his doctorate degree in 2001 based on his thesis "Experimental and Theoretical Investigations of Wave Overtopping Flow". He then took up an appointment at the Federal Waterways Engineering and Research Institutes (BAW) in Hamburg. A summary of his dissertation received the International De-Paepe-Willems Award of the International Navigation Association (PIANC) in 2003.

At the Federal Waterways Engineering and Research Institute Professor Schüttrumpf played a key role in the wide-ranging hydronumerical investigations relating to the approval procedure for the Jade-Weser Port project as well as in the investigations of dyke safety within the framework of the approval procedure for the project "Adaptation of the Navigation Channel of the Lower and Outer Elbe to Container Shipping".

Professor Schüttrump is a member of the Executive Board of PIANC, a member of the Working Committee for Coastal Protection Structures of the HTG and the German Geotechnical Society (DGGT) as well as head of a PIANC Commission, head and a member of additional scientific groups of the HTG and PIANC as well as co-author of the "European Overtopping Manual". Also worthy of mention is his function as organiser of the 31st International Conference on Coastal Engineering (ICCE), which will take place from 31 August to 5 September 2008 in Hamburg.

The Institute of Hydraulic Engineering and Water Resources Management (IWW) of RWTH Aachen University, which ranks among the few elite universities in Germany, has a tradition spanning more than a century in the fields of hydraulic engineering and water resources management for solving scientific problems in river engineering, flood protection, risk management, waterways engineering and groundwater management. The Institute has been scientifically involved in numerous large hydraulic engineering projects.

In order to solve such problems the IWW has a wide range of hydrodynamic modelling methods at its disposal for simulating free-surface and groundwater flow processes, the breaching behaviour of flood protection structures including flood modelling as well as river quality simulations. The IWW is also in command of a wide range of methods for the probabilistic dimensioning of hydraulic structures as well as risk-management. The different numerical methods are continuously developed at the IWW and inter-coupled as required. Moreover, the IWW possesses a fully-equipped hydraulics laboratory with a wide range of measuring devices for measuring highly-complex hydraulic processes and their effects on sediment dynamics, river quality, etc. The centrepiece of the hydraulics laboratory is a climate chamber with a circular channel for investigating the sediment dynamics of cohesive and non-cohesive sediments under consideration of biological and chemical processes.

The available hydraulic engineering methods in combination with the experience of a 13-strong team of highly-qualified scientists at the present time enables us to solve interdisciplinary and complex scientific problems in coastal regions, estuaries, rivers and lakes as well as in canals. Further information on the Institute of Hydraulic Engineering and Water Resources Management of RWTH Aachen University may be obtained at the following address:

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The Hamburg Storm Surge Warning Service – WADI –

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Hamburg Port Authority

"According to the law of maximum conceivable nastiness, storm surges mostly occur at night and at weekends."

Introduction

At a distance of almost 110 km from the North Sea, Hamburg lies in the zone of tidal influence of the Elbe Estuary. Following the disastrous storm surge of 1962 with a high water level of NN + 5.70 m (NN + = above MSL), public flood protection was considerably improved by raising the height of flood protection structures to about NN + 7.20 m. The port, which suffered almost no damage due to its staggered raised levels and quays with heights of about NN +5.50 m and more, was not included in the public protection measures.

30-year anniversary of the Hamburg Storm Surge Warning Service

The storm surge of 3 January 1976, with a highest high water level HHThw on record of NN +6.45 m, had a severe impact on the Port of Hamburg. In response to this catastrophic event, work began immediately on the construction of private flood protection structures (harbour polders) with 75% funding by the Central German Government and the State of Hamburg. Because, for operational reasons, the harbour polders contain over 1000 gates and openings with low sill levels of NN +5.00m upwards, it was already realized in 1976 that a separate storm surge warning service must be established for Hamburg, independent of the water level and storm surge warning service of the Federal Maritime and Hydrographic Agency in Hamburg (BSH), which is responsible for the entire North Sea and Baltic Sea coast. Since September 1976 the Hamburg Storm Surge Warning Service – WADI – has been in operation in the premises of the former River and Harbour Construction Authority, nowadays known as the Hamburg Port Authority.

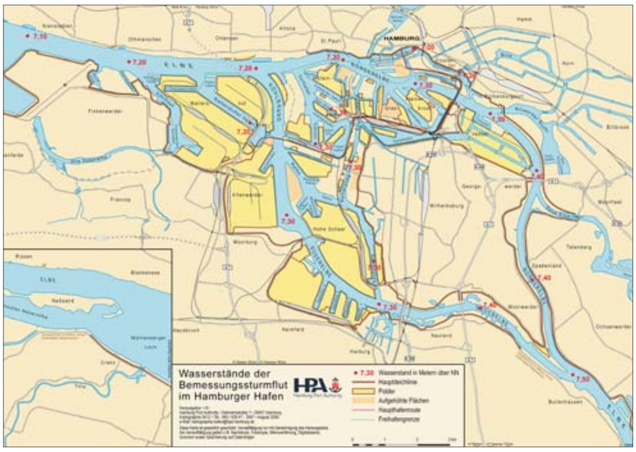

Figure 1: Design storm surge water levels in the Port of Hamburg

The tasks of the WADI include:

- A refinement of the BSH predictions for Hamburg based on its own computations of water levels and times of occurrence, especially at different locations in the port
- the issue of a warning to all persons affected in the port and
- the issue of a warning to the city's inhabitants via the Central Disaster Service Team of the Hamburg Ministry of

Internal Affairs

The WADI forecasts are indispensable as a working basis for the port staff and the polder task groups. The warnings issued by WADI are conveyed by radio to special report recipients as well as via a public telephone recorded message.

During the storm surge high-risk period from 1 September to 30 April, four groups of the WADI are on scheduled duty. These groups consist of task coordinators, computers, radio operators and IT specialists. Where necessary, e.g. in the event of summer storm surges, task groups comprised mainly of part-time WADI staff members are formed pursuant to prior consultation.

WADI III Method

The principle of the storm surge forecasting method of the Hamburg Storm Surge Warning Service was tested by Professor Siefert in 1973 and officially introduced in 1976. The presently implemented WADI III method is a further development of the latter, in which the underlying statistical data are continuously updated. The method is based on an empirical-statistical evaluation of storm surges, recorded water levels at Terschelling, Borkum, Cuxhaven and Hamburg as well as the corresponding wind data from Terschelling and Scharhörn. This method takes advantage of the astronomical time dependencies between the tidal curves recorded by the different tide gauges. The computational method takes account of the development of the respective wind setups as well as wind speeds and wind directions during the 1 ½ hour period prior to the forecast. By means of a graphical method combined with so-called "wind coefficients", which model the influence of wind development (changes in intensity and direction) on wind setup, the tidal levels and times of occurrence at the Borkum, Cuxhaven and St. Pauli tide gauges are

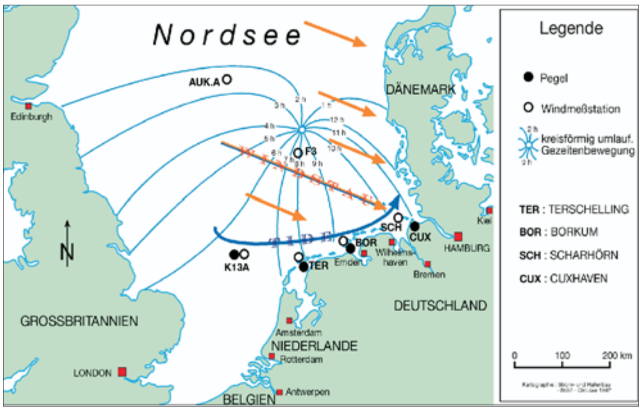

Figure 2:
Legend of the North Sea

determined in relation to the actual tidal rise. For control and assurance purposes the calculations are performed manually (graphically) as well as by an IT method.

Response to forecasts

Storm surge operations are initiated about 11.5 hours prior to the astronomical time of high water in Hamburg. At this earliest time, corresponding to about two hours before astronomical low water in Cuxhaven, a check is made to ascertain whether the pertaining conditions might result in a very severe storm surge with water levels above NN + 5.60m. By these means, an attempt is made to ensure that the time required for evacuation and countermeasures in storm surge risk areas in Hamburg is complied with.
The first computations using the WADI III method commence following astronomical low water Tnw in Cuxhaven, i.e. at least 9 hours before astronomical high water Thw in Hamburg. The computations are thereafter repeated at half-hour intervals.
Reports are subsequently issued on the hour or at half-hour intervals. Operations terminate at the time of high water Thw in Hamburg. The next task force takes over operations in the event of follow-up storm surges.

Assessment and experiences

The WADI storm surge forecasts have proven their worth in Hamburg, especially during the very severe storm surges in the early ninety's of the past century. If weather conditions are stable, the empirical-statistical WADI III method yields very precise forecasts. In the case of unstable or variable weather conditions the experience of the task coordinator plays an important role regarding an assessment of

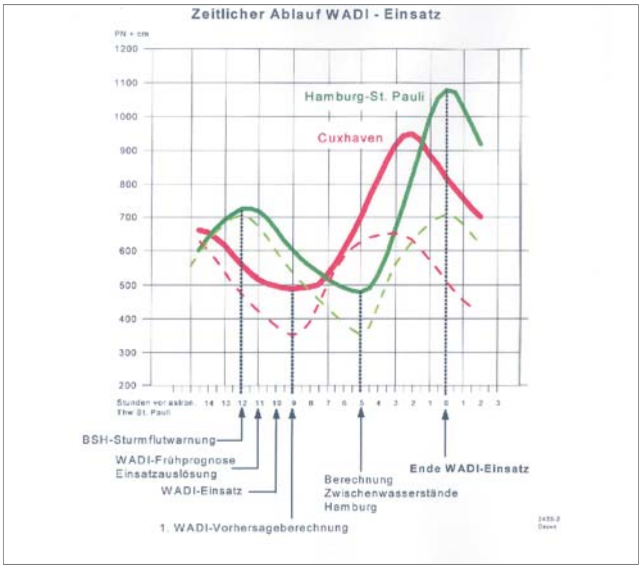

Figure 3:
Scheduling of WADI I operations

the results. Of special importance is the early recognition of particular storm surge characteristics and weather developments, e.g. an abrupt change in wind direction, which causes a storm surge to collapse. A disadvantage is the fact that it is not possible to implement forecasted developments in the computational method at the present time. The quality standard of the forecast is guaranteed today by close and well-coordinated teamwork and communication between the WADI and the maritime meteorologists of the German National Meteorological Service and the Water Level Prediction Service of the the Federal Maritime and Hydrographic Agency.

Future perspectives

The Hamburg Storm Surge Warning Service is greatly interested in the development and knowledge gained from extended weather and water level prediction models. The KFKI-Project OPTEL has attracted a great deal of attention in this respect. It is expected that the development of an operative tidal model of the Elbe for water level predictions will lead to an improvement in storm surge forecasts.

Abbreviations
Thw tidal high water
HHThw Highest high water level
Tnw tidal low water

"Aims of the IKÜS-Project and homogenious evaluation of eight years´ GPS observations"

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The aim of the IKÜS Project (IKÜS-Development of an integrated level surveillance system in coastal regions by the combination of height-relevant sensor devices) is to combine the measuring techniques of levelling, satellite positioning, gravity measurements and water level logging based on measurements along the German North Sea coast, which date back many decades in some cases. As a result of the investigation it is hoped to determine height levels and especially level changes with improved spatial and a temporal coverage as well as improved accuracy and reliability.

In addition, special tools (database, software) will be developed and made available for including further measurements by the different techniques as well as for computing improved overall solutions in the future.

Following an initial analysis of the available height-relevant measurements, the aim of the planned project was to process these data. This also involves the definition and realization of the database and interfaces necessary for the computation. It is planned to carry out initial test evaluations for a part of the project before Autumn 2007 in order to subsequently perform the overall evaluation based on the experiences gained.

A key focal point of the work in progress at the Institute of Geodesy at the Dresden University of Technology is the homogeneous re-evaluation of the 8-year time series of GPS observations, which were collected especially by the Lower Saxony Institute of Ordnance Surveying and Spatial Base Information (LGN) within the framework of SAPOS (Satellite Positioning Service of the German State Survey). Data sets provided by the Ordnance Surveying Office of Schleswig Hostein, the German Federal Agency for Cartography and Geodesy (BKG) and other institutions within the scope of international geodetic services will also be taken into consideration in the evaluation.

The main problems relating to the processing of GPS raw data concern the frequently erroneous or unclear entries of the GPS antenna type and to some extent also the antenna height 2 in the observed data files. In the years prior to 2000 the files available to the LGN were of a lower quality than has been achievable in recent years. This means that very time-consuming correction of the files is necessary in many cases in order to finally permit automatic data processing.

In order to process the complete set of available data in the IKÜS project, the required computational time would amount to about 5-7 days on a normal PC. In order to arrive at optimum results, a repeated computation is performed with different programme settings.

The time series of the three-dimensional coordinates of the GPS permanent stations cover 8 years or more in some cases. The results for the years prior to 1999 are thus of significantly lower quality. This may be explained by the poor quality of the receivers implemented at that time.

A major problem regarding the time series of heights results from a change in the GPS receiver antennas. Although antenna calibration values have been introduced, jumps in the time series of up to several millimetres are still evident. These jumps are mainly explained by different sensitivities of the antenna types to signal multi-path effects. It has not yet been possible to develop a method to prevent these apparent changes in coordinates.

A further problem concerns local station movements, e.g. due to the instability of the building on which the antenna is mounted. These effects must be known and appropriately accounted for in the overall evaluation of all sensors. A combination of levelling with satellite positioning may play a decisive role in recognizing such local effects and increase the reliability of a combined solution of height determination.

Height sensor levelling and the development of the IKÜS database

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In order to realise the aim of the IKÜS Project, namely the derivation of exact heights and height changes on the North Sea coast, different height-relevant measuring methods are combined on the basis of measurements which in some cases date back many decades. Owing to the length of the available time series, height sensor levelling plays an important role in this respect. The subproject IKÜS-D deals with the processing and analysis of the available levelling data. It is additionally planned to develop a database structure for all project-relevant data and derived information as well as an interface for including data provided by a third party.

The levelling procedure involves a determination of the height differences between marked points. The specification of an absolute height for these points is only possible using one or more reference points to which a height has been assigned, e.g. by measurements referred to a tide gauge. The derivation of height changes from repeated measurements is possible provided the same reference points have been selected in each case. The determined height changes only represent the actual changes in the levels of the fixed points provided the reference points may be assumed to be stable.

For the area considered in the IKÜS Project, five measurement epochs from about 1912 to 1987 are available for evaluation. Besides the data sets of past epochs, information generated during the course of the project is also taken into account.

Of special importance in this respect are the measurements made during the ongoing measurement survey (2006 to 2011) for upgrading the German Main Net of Heights (DHHN). Preliminary evaluations of new measurements indicate that local height changes in the decimetre range have occurred since the DHHN85 surveying campaign.

In order to interlink the height nets, identically measured levelling points are necessary. Owing to the different numbering conventions used by the various surveying institutions, however, the identification of these points is very time-consuming.

It is also necessary to take account of the fact that the height reference of the levelling nets was realised in different ways during the course of time. When deriving height changes from the heights of the levelling nets, this results in computed changes which may be traced back to system-related differences. These differences would be erroneously interpreted as height changes, hence leading to false results. For this reason the measured relative height differences are used as raw observations for levelling data in the IKÜS Project.

Because raw observations were not available for all levelling nets, it was necessary in some cases to derive these from available heights. The following working steps were adopted for this purpose:

- determination of the height differences between neighbouring levelling points,
- back-calculation of the applicable compensation improvements,
- back-calculation of the applicable reductions and
- back-calculation of the applicable corrections (apart from instrument and levelling staff corrections).

The raw observations of the levelling survey are subsequently converted by the IKÜS software into geopotential levels for a joint evaluation using data from other sensors. The geopotential levels are determined from a combination of levelling observations and gravity measurements. Geopotential levels are especially suitable for this method, as they are independent of the levelling distance, are determinable without reliance on a hypothesis, and also permit the derivation of any height system.

The raw observations of the levelling survey are subsequently converted by the IKÜS software into geopotential levels for a joint evaluation using data from other sensors. The geopotential levels are

determined from a combination of levelling observations and gravity measurements. Geopotential levels are especially suitable for this method, as they are independent of the levelling distance, are determinable without reliance on a hypothesis, and also permit the derivation of any height system.

Various partners in the IKÜS Project are working jointly on the development of an integrated method for the determination and monitoring of heights with full-area coverage in coastal regions. In order to combine data from different sources and with different characteristics in a mathematical model, standardised access to the data is a basic precondition. In order to realise this standardised access it is necessary to develop a database as well as a concept to provide an internet-based database link for potential users in the field of coastal monitoring.

Owing to the requirements posed by the extensive data inventory and the possibility of extending the system and providing an internet link, an ORACLE®-Database is implemented in the IKÜS Project. The ORACLE®-Database also includes a wide-ranging safety concept for the administration and transferral of rights, which is indispensable for online access.

In order to describe all IKÜS data in the form of a conceptual model, the Entity Relationship Model (ERM) is implemented. The ERM is the most well-known and most widely-applied graphical tool for database design. A basic feature of the model is the characterization of objects and their relationships to one another. This information provides a direct means of deriving the database structure. The generated tables are subsequently filled with the processed data in the IKÜS-D subproject.

In developing the IKÜS database, standardised exchange formats are specified for the individual data from the height-relevant sensors, provided these exist for the IKÜS-relevant information. Alternatively, data formats are supplemented by additional information or newly defined as an IKÜS format. By this means an open database is realised for new measured data in the future. For Global Navigation Satellite Systems (GNSS) an internationally applied interface is implemented and extended to include IKÜS-relevant information. For levelling observations a national standardised exchange format introduced in the DHHN in 2006-2011 is specified as the interface, thereby ensuring the use of a format also supported in the future.

Medium-term wave modelling in the research project MOSES

Results for the Norderney tidal inlet

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Introduction

Within the framework of the BMBF-financed KFKI research project MOSES ("Modelling of the Medium-Term Wave Climate in the German North Sea Coastal Zone" 03 KIS 041) the medium-term wave climate was determined on the basis of wind, water level, flow and wave data sets compiled over a 45-year period in the EU Project HIPOCAS ("Hindcast of Dynamic Processes of the Ocean and Coastal Areas of Europe", (Weiße, Feser, Günther 2003). These data sets were obtained by means of numerical modelling in three selected coastal zones (the Dithmarschen Bight, mouth of the Elbe estuary, drainage area of the Norderney tidal inlet). Medium-term time series in coastal zones permit a more precise estimation of the frequencies of occurrence of characteristic wave parameters in the coastal zone and the permanent loading of structures as well as a reconstruction of the wave climate of past storm surges on the coast. The data sets may also serve as a starting point for investigations relating to a morphodynamically representative wave climate.

Tide and wave modelling in the Norderney tidal inlet

Modelling in the drainage area of the Norderney tidal inlet was carried out in the Coastal Research Division using the hydrodynamic model Delft3D (Delft Hydraulics 2003) and the Spectral Wave Model SWAN (Booij, Ris, Holthuijsen 1999). Within the scope of preliminary work relating to the project, the code of the new parallel version of the SWAN model (TU-Delft 2004) was modified (optimization of input/output routines etc.) in order to achieve the required efficiency of the model for medium-term modelling. In a test period lasting several months (September – November 2002) the modelling results were compared with the measured data as well as with the time series determined by the GKSS Research Centre using the k-model. By this means it was shown that both models are capable of realistically reproducing the most relevant wave parameters in the investigated areas.

In accordance with the funding proposal, the project was essentially focussed on the afore-mentioned 40-year data sets. Owing to a very high spatial and temporal resolution, as is necessary for tide and wave modelling in the Norderney tidal inlet investigation area, as well as the expected high redundancy, modelling of the complete 40-year time series using the Delft3D/SWAN hydrodynamic and wave model was not attempted. Instead, a method was developed to determine the complete time series by means of major component analysis and neural networks based on the modelled data sets for 4 years and the HIPOCAS boundary conditions. Extensive controls and statistical analyses demonstrated that the method developed in the project is reliable and may also be applied in other research projects (Hermann et al. 2007 a,b).

Results

- The HIPOCAS data set serves as a solid basis for medium-term statistical wave investigations in the nearshore zone of Norderney. The data set also provides suitable boundary conditions for corresponding small-scale wave modelling in the coastal zone.
- The SWAN wave model is able to reliably reproduce the temporal and spatial variability of the wave climate in the drainage area of the Norderney tidal inlet with its complex topography and high exposure to wind and tidal action. By means of the Delft3D hydrodynamic model it is possible to realistically simulate typical water exchange phenomena in the drainage area of the Norderney tidal inlet.
- On the basis of the HIPOCAS boundary conditions and the DWD wind atlas data it is possible to generate a statistically representative wave climate for the sea and tidal flat area of Norderney by means of coupled SWAN/Delft3D modelling.
- The method developed within the framework of the MOSES project for generating the 40-year data sets of water levels, currents and wave parameters (significant wave heights, energy periods and mean wave directions) is able to very efficiently reproduce the results of the Delft3D and SWAN models with high accuracy. By means of the method it is possible to determine with sufficient accuracy the data necessary for the time periods for which numerical modelling could not be undertaken due to lack of time. These numerical simulations are essential for realising the aims of the research project, namely medium-term statistical investigations of the flow and wave climate in the Norderney tidal inlet and its surroundings.
- It was shown that the MOSES data set represents a valuable data inventory for morphodynamic modelling in the investigation area. The statistical distribution of numerous useful wave parameters for morphodynamic modelling (e.g. Hs/h or orbital speeds at the bed) was determined for each point.
- From a consideration of past storm surges it was found that the MOSES input data were unable to provide a concrete basis for the reconstruction of storms, water levels, currents and waves for extreme events. For the reconstruction of extreme events it is necessary to seek other data sources as boundary conditions.

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http://dx.doi.org/10.1016/j.coastaleng.2006.10.003

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Herman, A., Kaiser, R., Niemeyer, H. D., 2007a. Modelling of a medium-term dynamics in a shallow tidal sea, based on combined physical and neural network methods. Ocean Modelling, Volume 17, Issue 4, 277-299.
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MUSTOK subproject MUSE (Baltic Sea)

Model-backed investigations of storm high water levels with very low probabilities of occurrence on the German Baltic Sea coast (MUSTOK)

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Introduction

In recent decades the high water levels of storm surges along the German Baltic Sea coast have hardly exceeded 2 mNN (NN=MSL). According to the definition adopted, this means that none of these storm surges rank as severe storm surges. Along many stretches of the Baltic Sea coast, coastal protection is oriented to the catastrophic storm surge of November 1872 in which water levels of e.g. 3.16 mNN and 2.83 mNN were measured in Travemünde and Wismar, respectively.

In a number of publications, return periods of T = 150 to 500 years are assigned to this event [1]. The aim of the subproject MUSE Baltic Sea in the KFKI joint project MUSTOK is to improve estimates of the probabilities of occurrence of extreme storm water levels on the German Baltic Sea coast. For this purpose a suitable model chain is used to determine storm surge weather conditions which could result in extreme water levels along the German Baltic Sea coast. This involves a statistical extreme value analysis of these data in combination with observed and historical data.

Methods

The method used to determine possible extreme water levels consists of 3 basic steps. In the first step, weather conditions which could lead to potentially high water levels are filtered from the data archives of the European Centre for Medium-Range Weather Forecasts (EZMW1). Weather conditions were considered in which cyclones over the Baltic Sea with a strength of at least 7 on the Beaufort Scale (14m/s) occurred in the reanalyses. Selected weather conditions were recomputed using the current version of the EPS1 of the EZMW, thereby permitting an estima-

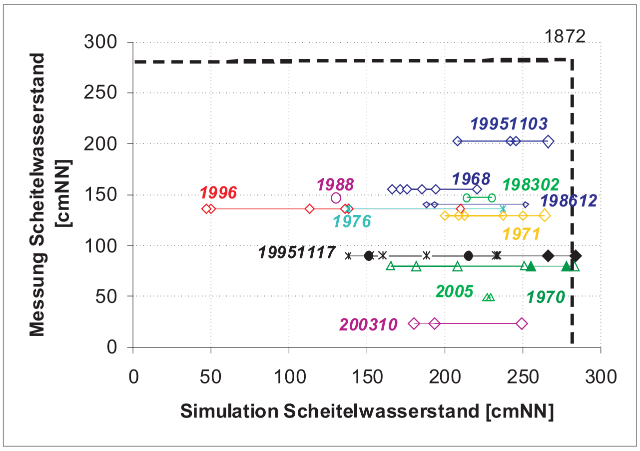

Figure 1:
Measurement and simulation of peak water levels at the Wismar tide gauge at selected times with a high storm surge potential; simulations using the FTZ ocean model were instigated by members of the EPS (2).

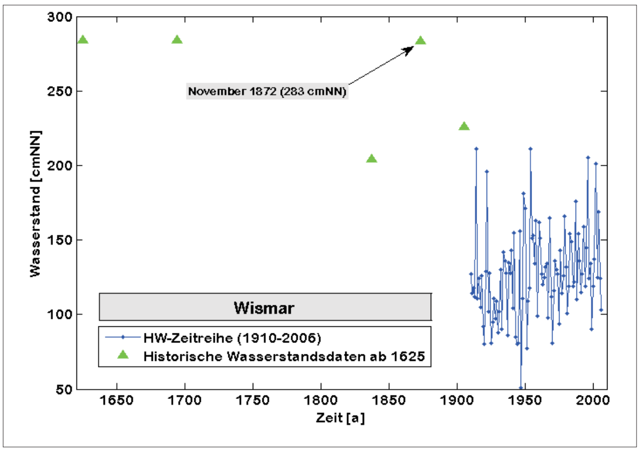

Figure 2:
Yearly high water time series (HW) at the Wismar tide gauge from 1910 to 2006 with historical water level recordings from 1625 onwards.

tion of physically realistic limit states. Higher resolution of the data may be achieved by a follow-up computation with COSMO1. With the aid of a special method for analyzing the translatory speed of their cyclones, these weather conditions may be optionally varied within physically realistic limits at the GKSS. This analysis might possibly result in higher water levels. By means of high-resolution hydrodynamic models these weather conditions are finally translated into water levels at the FTZ1 (Research and Technology Centre Westcoast) and the BSH. From a combination of extreme water levels provided by models, observed data and historical water level recordings it is possible to obtain more reliable predictions of the probabilities of occurrence of extreme storm high water levels along the German Baltic Sea coast.

Preliminary results

The results obtained so far indicate that extreme water levels along the German Baltic Sea coast not only depend on the parameters wind speed, wind direction, fetch length and effective duration but also on an above-average water volume in the Baltic Sea. An above-average water volume may make a decisive contribution but need not necessarily play a part in the development of extreme water levels. This is demonstrated by the example of the Wismar tide gauge. In the analyses carried out so far, an EPS realisation of the storm weather conditions of November 1995 resulted in the highest modelled water levels at the Wismar tide gauge. At 2.84 mNN these water levels are only slightly above the maximum historical value of November 1872 (Fig. 1). A simultaneous evaluation of the water levels at the Landsort tide gauge (Sweden) indicates the absence of a significant above-average fill volume (overfill) at this point in time. This confirms that even without overfill, which was present in 1872, higher water levels than in 1872 are possible at the Wismar tide gauge.

Besides the observed and modelled data, historical water levels recorded at the Wismar tide gauge since 1625 (Fig. 2) are also included in an integrated statistical extreme value analysis. A comparison of the statistical analysis, based solely on the observed data and the above-mentioned integrated extreme value analysis, is shown in Figures 3 and 4. In formal terms the integrated analysis shows a better match and is not only based on a mathematical extrapolation in the domain of very infrequent events but also on physical assumptions (extreme water levels from

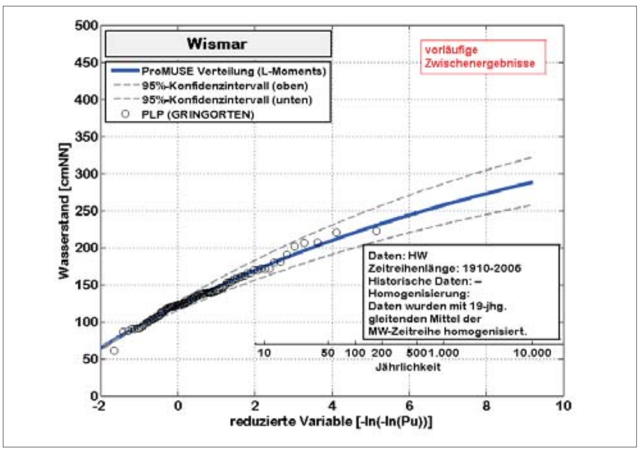

Figure 3:
Extreme value statistics of the HW time series at the Wismar

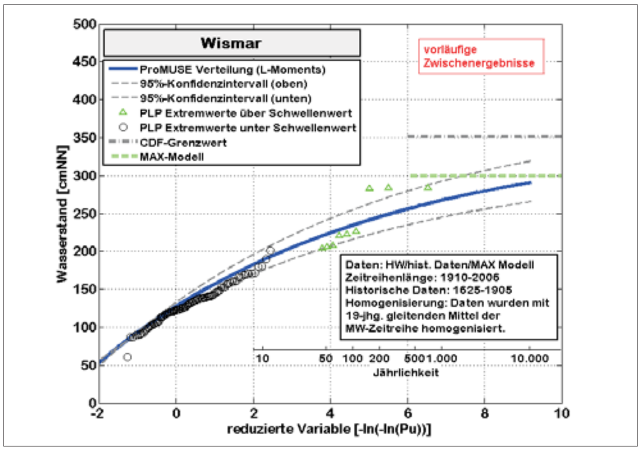

Figure 4:
Integrated extreme value statistics of the HW time series from 1910 to 2006 at the Wismar tide gauge, historical water level data and modelled extreme value (approx. 300 cmNN; provisional).

model scenarios). By means of this integrated extreme value statistical analysis it is possible to predict the probabilities of occurrence of extreme events along the German Baltic Sea coast with greater reliability.

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[2] Schmitz, R. (2007): Abschlussbericht Verbundvorhaben MUSTOK – Teilprojekt MUSE Ostsee Aufgabengebiet DWD - Entwurf

Abbreviations

DWD – German National Meteorological Service

EZMW – European Centre for Medium-Range Weather Forecasts
BSH – Federal Maritime and Hydrographic Agency in Hamburg
GKSS - GKSS Research Centre in Geesthacht
fwu – Research Centre for Water Management and the Environment, University of Siegen
FTZ – Research and Technology Centre Westcoast, University of Kiel
EPS - Ensemble Prediction System of the EZMW
COSMO – Local Weather Model of the DWD (formerly known as LM, LME)

MUSTOK subproject SEBOK-A

Determination of design parameters for coastal protection structures along the German Baltic Sea coast based on scenario simulations

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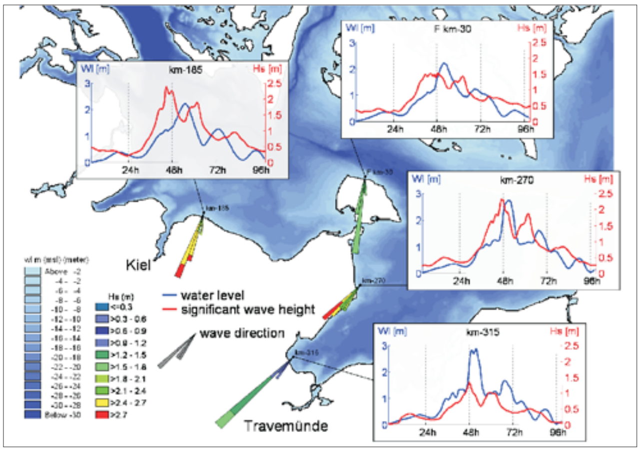
Introduction

Design parameters for coastal protection structures along the German Baltic Sea coast at the present time are still mainly based on the extreme storm high water event of 1872 [1][2][3]. The duration and relative time of occurrence of high water and high waves are not properly accounted for in the latter. The aim of the subproject Sebok-A is thus to develop a method for obtaining more realistic estimates of design parameters. The preliminary results strongly indicate that a consideration of the overall chronology of scenarios rather than single constant values is necessary for design purposes. The proposed strategy combines meteorological storm scenarios generated by an Ensemble Prediction System (EPS) with numerical ocean simulations of water levels and waves.

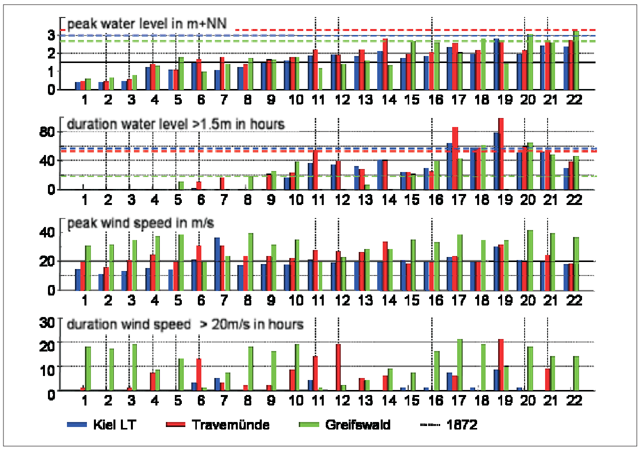
Method

The strategy basically consists of 3 steps. In the first step, a large number of physically consistent weather conditions were generated by the EPS of the European Centre for Medium-Range Weather Forecasts in Reading [4] based on the initial states over the past 50 years. These approx. 30,000 scenarios were then investigated by the Schmager method [5] in order to determine their potential for generating high water levels on the German Baltic Sea coast.

The approx. 80 selected scenarios with a high storm surge potential were then used to estimate the generated water levels and wave heights along the entire coast by means of high-resolution flow and wave models. The final selection of scenarios suitable for design purposes was based on their effects on the morphology of the stretch of coastline under consideration. One-dimensional profile models which permit a computation of topographical changes were implemented for this purpose. Local geological conditionswere hereby taken into consideration. In addition, the temporal and spatial variation of water levels and wave heights along these profiles were computed by means of a phase-resolving Boussinesq wave model [6] with a spatial resolution of 1m. This permits a good estimation of wave dissipation throughout the scenario.



1a:
Peak water level and duration as well as peak wind and duration at 3 stations for 22 simulated scenarios compared with the measured values of 1872.



1b:
Temporal variations of water level and significant wave height as well as run-up direction at 4 stations for an extreme scenario.

Figure 1:
Results of the scenario simulation

Preliminary results

Figure 1a shows peak water levels and durations for the most severe scenarios. Approx. 5 scenarios locally attain and exceed the measured water levels of 1872. It is noticed that the spatial distribution of the peak water levels of 1872 is untypical in the scenarios. This would suggest that strong local winds combined with an increased degree of fill of the Baltic Sea were the reasons for the storm surge of 1872. Scenarios with prolonged strong NE winds over the central part of the Baltic Sea may, however, similarly lead to extreme water levels (see No. 20-22 in Figure 1b).

The temporal variations of water levels and wave heights at four selected positions in the Mecklenburg bight and the Kiel bight are shown in Figure 1b for an extreme scenario. The temporal and spatial variability of both parameters during the scenario are clearly evident. These results form a basis for a follow-up investigation of variations in the locally released energy as a combination of water level and wave energy.

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MUSTOK subproject SEBOK-B

Development of methods for determining governing hydrodynamic design parameters for coastal protection structures on the Baltic Sea coast

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Introduction

Input data for designing coastal and flood protection structures can only be defined in relation to a particular problem or location. Governing factors for the determination of these data include e.g. the location of the length of coastline to be protected as well as temporal changes in the relevant and event-related wind and water level conditions. The same applies to flood protection measures and structures for influencing sediment movement. In the end it is only possible to specify design parameters on the basis of statistical investigations in combination with economic viability considerations, an estimation of the failure risk (function, construction) to be defined locally, and the technical/administrative steps ensuing from the latter. It is also necessary to take into account the combined and partly statistically-dependent effects of hydrodynamic parameters. The aim of the investigations within the scope of the "SEBOK B" project is the development, verification and application of a method for determining all relevant hydrodynamic input data as a basis for the drafting and designing of coastal and flood protection structures along the German Baltic Sea coast.

Research strategy

Basically speaking, a variety of methodical approaches may be adopted for the determination of hydrodynamic design parameters. Within the framework of the "SEBOK B" research project the input data for dimensioning are determined on the basis of the most detailed time series available for the hydrodynamic parameters. As direct measurements for this purpose are available only in exceptional cases, the missing data (especially wave parameters) are determined by numerical long-term simulations based on the wind information available for prolonged periods.

Wave climate

In order to determine the hydrodynamic loading due to wave action, spatially superordinate sections of the coastline are first defined in the open region of the Baltic Sea. The local wave climate for these sections is then determined in deep water ($d \approx 10m$ to $15m$) from wave measurements and long-term numerical simulations. As a basis for comparison, empirical wave forecasting methods and wind-wave correlation calculations are also applied. The time period over which these data are determined should hereby (depending on the dimensioning problem) be as long as possible, and according to statistical considerations, should cover time periods of at least 20 years. In a second step, the wave climate input data necessary for designing protection structures along the spatially superordinate sections of the coastline are derived from the wave climate data base. These input data essentially consist of average wave statistics as well as extreme wave events with corresponding frequencies and probabilities of occurrence. In a third step, the dimensioning parameters for the superordinate coastal sections are appropriately transformed for application in shallow water.

Water levels

It is not possible to define design water levels in a general form without an element of doubt. The reason for this is that a verification of structural stability in most cases should take into account the maximum loading resulting from a particular water level combined with a concurrent wave event. Alternatively, ice loading may also be the governing factor. Statistical investigations of water levels should therefore also

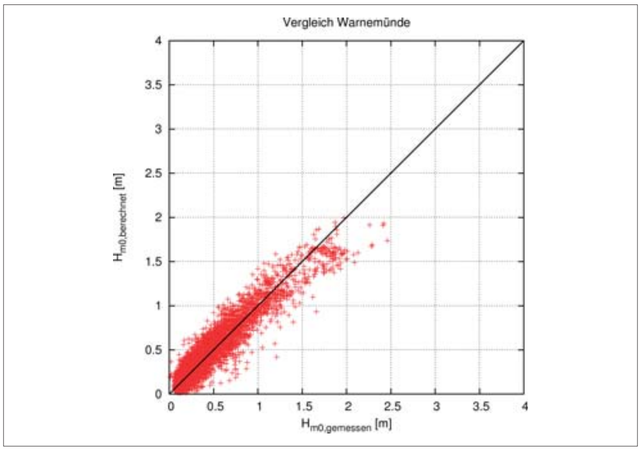

Figure 1:
Comparison of measured and computed wave heights in the proximity of Warnemünde

permit an assessment of the frequencies of occurrence of water levels below the design high water level. Local extreme water levels are thereby estimated by extrapolating the measured data or on the basis of physically possible extreme storm high water levels (from the MUSTOK subproject MUSE, Baltic Sea).

Correlation of water levels and wave heights

A combined consideration of alternating water levels and local wave heights is carried out on the basis of measured and/or extrapolated input data. These are correlated statistically, and depending on the particular problem concerned, are extrapolated to lower probabilities of occurrence as required. It is thereby necessary to separately investigate the most extreme wave events possible under the assumption of high water levels as well as the most extreme water levels possible under the assumption of high wave loading.

Intermediate results

The investigations were carried out in several working steps. Firstly, the base data were determined. This involved a detailed plausibility check of the available measured data (water levels, wave heights, wind) and a determination of their chronology in each case in order to specify the basis for the statistical investigations.

The required long-term wave models were developed on the basis of the SWAN model and verified in detail. Fig. 1 shows, for example, a comparison between measured and computed wave heights in the proximity of Warnemünde.

The spatially superordinate coastline sections were initially defined on the basis of coastal engineering considerations. The homogeneity of the sections with regard to wave data was specified as a criterion for the latter. This criterion was subjectively assessed initially and then verified in a second step by means of numerical simulation computations. Fig. 2 shows the 13 superordinate coastline sections defined along the coast of Mecklenburg-West Pomerania (A-) and the 11 superordinate coastline sections defined along the coast of Schleswig-Holstein (S-).

As the numerical long-term simulations have not yet been completed, it is not possible to determine the final design values at the present time. The statistical evaluations of water levels are currently being prepared.

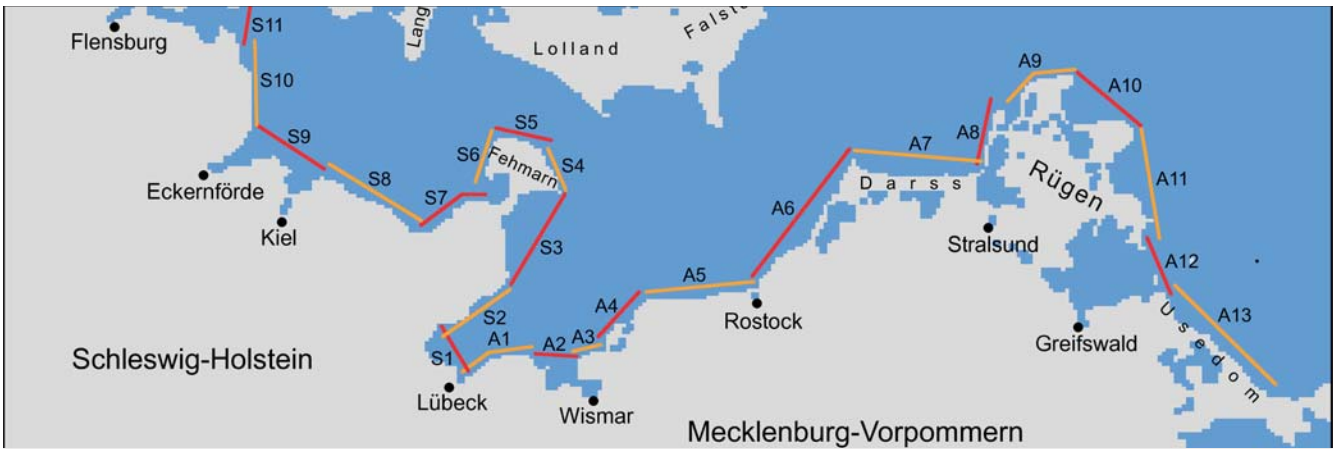

Figure 2:
Spatially superordinate coastline sections

Airborne Laser Scanning in near-coast vegetation zones

Error estimation and classification methods

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Leibniz University of Hanover, Institute of Photogrammetry and Geoinformation

For the authorities involved in coastal protection, accurate and reliable height information with wide area coverage forms one of the most important base data inventories for their routine daily work. Digital Terrain Models (DTM) derived from these data are necessary for a variety of applications such as, e.g. mass computations for dykes and dunes or flood simulations for risk assessment. With the aid of airborne laser scanning, this height information may be generated for large areas with relatively little time and effort. The accuracy and reliability of the recorded 3-D points greatly depend on the vegetation cover of the surveyed terrain. The different types of vegetation found along the German North Sea coast thus have a considerable influence on these criteria. A correct determination of the distance between the scanner and the ground surface can only be guaranteed provided the laser beam arrives at the ground surface without being affected by vegetation. This cannot be realised in practise, however, due to the relatively large diameter of the scanner beam at the ground surface in conventional systems (0.25m -1m at a flying height of 500-1000 m) and typical vegetation densities in the near-coast zone. Despite a fixed scan pattern, the recording method itself also results in a random distribution of the laser points in the global reference system. For this reason it is necessary to take account of the interaction of the laser beam with different vegetation layers when evaluating the data. In the case of low vegetation (plant height below the distance resolution of the laser scanner) or slight vegetation density (partial penetration of the laser beam) the last echo of the pulse frequently contains a mixed signal comprised of reflections from the terrain surface as well as from the vegetation. On the other hand, very dense and high populations may generate echoes that are completely reflected by the vegetation. In both cases the majority of the laser pulse energy is back-scattered above the ground surface, thereby leading to an underestimation of the distance between the scanner and the ground. The 3-D laser points measured in vegetation areas therefore often exhibit a positive height shift relative to the true terrain surface. In order to remove these so-called vegetation points from the data different filter algorithms have been developed which mainly make use of geometric properties such as slope and the height differences between neighbouring points.

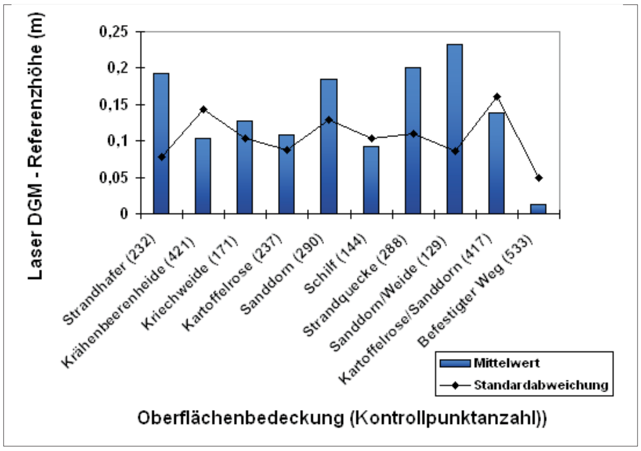

Figure 1:
Left: Accuracy of the laser data for different types of vegetation

It is thereby assumed that the lower laser points represent the ground surface in a defined area of influence. Within the dense vegetation along the shoreline, however, there are generally only a few terrain points in the laser data available for filtering. Moreover, the fact that plant populations are often located in depressions means that the surrounding terrain points are higher than the vegetation points.

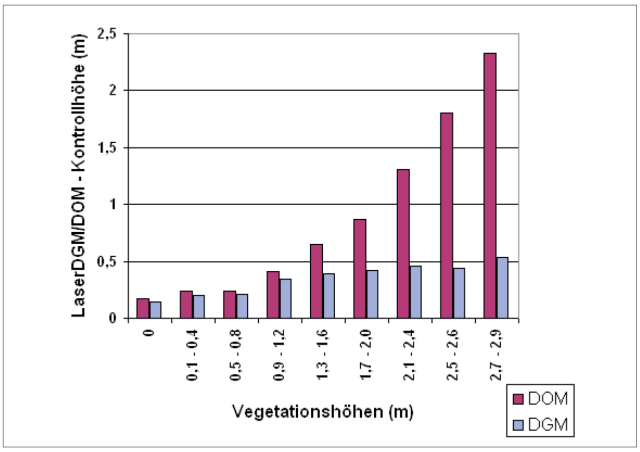

Figure 2:
Right: Accuracy as a function of vegetation height for a bush-covered area

These aspects often lead to a failure of the filter algorithms and hence to erroneous terrain models.

In the first phase of the subproject it was intended to investigate the height shift in the data for different types of vegetation on the basis of control measurements. The aim of the second phase was to automatically recognise vegetation areas in the data which exhibit a lower accuracy of individual points. Figure 1 shows the average height shift for different types of analysed vegetation, as obtained from the differences between terrestrially-determined heights and the laser data. Vegetation heights and densities were additionally determined in field studies in order to investigate their influence on the height accuracy of the laser scanner measurements. By restricting the analysis to a particular type of vegetation in each case, high correlations were obtained between vegetation attributes and the height shift (Fig. 2). In order to make use of these dependencies for an automatic classification of the laser data it is necessary to correlate vegetation attributes with particular characteristics of the remote sensing data. The variations in the z-coordinates of the laser points as well as the differences between the first and last echo of a laser pulse provide a suitable means of estimating the vegetation height, whereas the stored intensity values of the laser points and the frequency of multiple echoes provide a reference basis for the vegetation density. As the attributes as well as the characteristics are only significant for one type of vegetation in each case, a biotope type mapping is used to demarcate the investigation area.

Two different methods were developed at the institute in order to subdivide the laser data into accuracy domains on the basis of the above-mentioned characteristics. The first algorithm is based on the monitored classification of homogeneous regions or so-called segments, which are determined with the aid of a watershed transformation of the laser intensity image. In order to generate the training areas, difference models are computed between the terrestrial and the laser data. These are then subdivided into different accuracy domains with the aid of threshold values. After determining the characteristics for training areas and the segments to be classified, the former may be allocated to the respective accuracy classes, e.g. on the basis of the least distance between the characterisation vectors (Fig. 3). If the

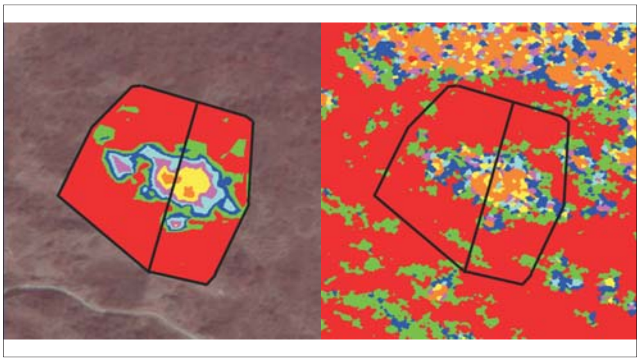

Figure 3:
Left: Training areas and classification according to accuracy domains

characteristics relating to the height shift exhibit a very high correlation, the accuracy may be estimated by means of a second developed method for larger regions as well as for each individual laser point.

For this purpose the characteristics of a particular laser point are computed using its neighbouring points. This is followed by a determination of the height shift of those laser points located in an area with terrestrial control measurements. In the next step the height shift is correlated with the characteristics by means of functions (Fig. 4). Based on the functional parameters and the characteristics of each individual laser point it is finally possible to estimate accuracies. The significance of the characteristics, however, vary considerably between different scanner and vegetation types. This means that the predictive capability of the characteristics must be checked prior to each classification in order to avoid incorrect estimates.

Acknowledgements

We wish to thank the partner authorities for their scientific and infrastructural support throughout the

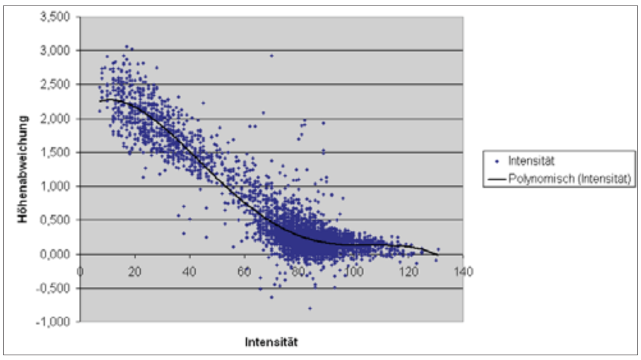

Figure 4:
Right: Correlation between intensity and height shift by means of a function

project, namely the Regional State Office for Rural Areas (ALR, now LKN) in Husum, the Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency (NLWKN) as well as the Federal Waterways and Navigation Adminis-tration, Northwest Directorate (WSD-NW). This KFKI research project was funded by the German Federal Ministry of Education and Research (BMBF) under the project reference number 03KIS050.

Verification of morphological changes in the Wadden Sea based on laser scanner measurements

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Due to the influence of tides, the Wadden Sea is subject to continuous morphological changes. Multifarious erosion and accumulation processes thus result in large-scale mass redistributions which affect the nature and form of the tidal flats and islands. With regard to an overall and sustainable guarantee of the ecological and economic functions of the Wadden Sea it is necessary to survey the tidal flats at regular intervals and determine deformations by means of time series analyses. Especially important in this respect is the protection of the local population as well as their basic life resources. Airborne laser scanning is chosen as the preferable method of measurement for this purpose due to the fact that this method permits highly accurate, dense and contactless surveying.

In order to recognise morphological changes in tidal flat areas it is common practice to generate a difference model from two digital terrain models (DTM) generated for different epochs. If random errors in measurement as well as interpolation effects are neglected, this results in height changes unequal to zero. Depending on the sign of the height change as well as an assignment of the epochs with regard to minuend and subtrahend it is possible to identify areas of erosion or accumulation. Generally speaking, however, a qualitative and quantitative analysis of the morphological changes proves to be difficult due to the fact that the differences are not related to real objects on the tidal flats but to individual terrain points which are not specified in detail. For this reason, colour-coded representations of the difference model are generally used to quantify changes.

An alternative approach, which is normally adopted for terrestrial measurements, is to consider the changes of objects such as tidal creeks in tidal flat areas. This involves the recording of clearly defined geometrical features (e.g. lines) for at least two epochs, which are subsequently compared with one another. Tidal creeks are especially suitable as clearly defined objects in the Wadden Sea. Two general methods of comparison are available (see Table 1).

In the first method it is possible to directly compare corresponding lines. By setting-off the points along a ridge at right angles it is possible to establish a reference to others. This is followed by a determination of the statistical parameters: mean value, standard deviation and minima and maxima of separation distances. It is also possible to determine the main directions of the position change by analysing the histogram of the direction angle from the respective perpendicular base point to the object point as well as line comparison parameters such as the Hausdorff and Fréchet distance. An alternative approach is to compare parameters which describe an object in relation to a significant change between two epochs. These parameters, which are derived from several object definition lines, include, for example, gulley width, height difference or volume.

Methode	Ziel
Vergleich korrespondierender Linien (z.B. Böschungsoberkante rechte Seite – Epoche 0 und Epoche 1)	Nachweis signifikanter Verschiebungen korrespondierender Linien – Betrag und Richtung
Vergleich von Objekteigenschaften (z.B. Graben- und Böschungsbreite, Höhenversatz etc.)	Nachweis signifikanter Veränderungen von Objekteigenschaften

Table 1:
Verification of morphological changes on the basis of homologous geometrical objects

An algorithm developed at the Institute of Photogrammetry and Geoinformation at the Leibniz University of Hanover for extracting 3-D structure lines (form lines as well as scarps) in the Wadden Sea from laser scanner data has been implemented in a computer program called "ExStruct". The developed method is based on a combination of digital image processing and surface reconstruction for deriving 3-D scarps. Based on a height grid interpolated from the laser scanner data, line-like approximation solutions are derived by means of ridge operators.

These are subsequently used to initialise the parameters required for the surface reconstruction. By

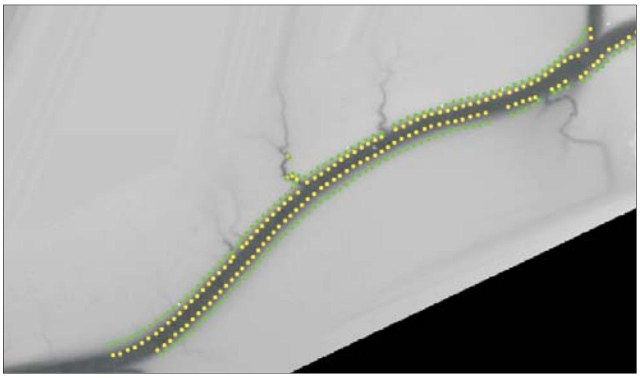

Figure 1:
Derivation of structure lines from the laser scanner data for a tidal creek

estimating suitable mathematical functions in the laser scatter plot it is finally possible to extract the required structure lines in the form of point chains (see Fig. 1).

Acknowledgements

We wish to thank the partner authorities for their scientific and infrastructural support throughout the project, namely the Regional State Office for Rural Areas (ALR, now LKN) in Husum, the Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency (NLWKN) as well as the Federal Waterways and Navigation Administration, Northwest Directorate (WSD-NW). This KFKI research project was funded by the German Federal Ministry of Education and Research (BMBF) under the project reference number 03KIS050.

News from the KFKI Head Office

> Dr.-Ing. Rainer Lehfeldt

German Coastal Engineering Research Council (KFKI)

Newly-elected chairman
Bernd Probst, Assistant Secretary of the Schleswig-Holstein Ministry of Agriculture, the Environment and Rural Areas, gave up the post of chairman of the KFKI in accordance with the rules of rotation at the end of 2007.
We wish to thank him for his successful work over the past two years and also for his valuable support in all matters of concern at the Head Office.
Dr. Klaus Schindel, Federal Ministry of Education and Research, Division "System Earth", will take over as chairman of the KFKI on 1 January 2008. Staff members of the Head Office wish him every success in his new engagement.

Head of Research of the "Küste" reinstated
Dipl.-Ing. Frank Thorenz, Regional Manager of the Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency in Norden (NLWKN), was reinstated as Head of Research of the "Küste" for a further five years at the last meeting of the KFKI. Since Frank Thorenz took up the position as Head of Research on 1 February 2003, 31 research and development projects in coastal engineering have been initiated. Research is currently being carried out in 13 joint projects with a total of 30 subprojects. In groups accompanying these projects, the status and progress of the research work are assessed by scientific experts who are not involved in the projects. New project ideas are submitted to the Head of Research, who then passes on recommendations for funding to the Council following a discussion with the KFKI Advisory Group. A further task is to advance the research concept of the KFKI under consideration of current problems.

"Die Küste"
For organisational and publishing reasons the completion of Editions 72 (2007) and 73 (2007) of the "Küste" has been somewhat delayed. This means that these editions will first appear in the Spring of 2008. To mark the occasion of the ICCE 2008 in Hamburg a special edition of the Küste is currently being prepared. This will provide a synoptic overview of the German coastal zone. The edition is subdivided into five sections dealing with the topics: physics, coastal protection on the North Sea and Baltic Sea coasts, coastal protection structures, estuaries and inland waterways, as well as harbours. This edition, which will appear in English, will be jointly produced by all governmental agencies involved in coastal engineering.

Reprinted version of the EAK
The reprint of the EAK 2002 (EAK: Recommendations for the Design of Coastal Protection Structures) in the corrected version of 2007 is now available for purchasing. You may order Edition 65/2007 through the Boyens book retailers using the Internet form: ***http://www.buecher-von-boyens.de/formular.html***, or by E-Mail at

buchverlag@boyens-medien.de and, of course, by telephone, fax, or by mail: Tel. (0481) 6886-162 | Fax (0481) 6886-467 | Boyens Buchverlag | Wulf-Isebrand-Platz 1-3 | 25767 Heide
at a cost of € 40. For orders exceeding 20 copies, a quantity discount of 20 % may be granted.

EurOtop

The final version of the European Overtopping Manual EurOtop is now complete and will appear in English in Edition 73 of the "Küste" (2007). This work replaces the content of the section "Computational Methods for Wave Overtopping" in the EAK 2002. A summary of EurOtop in German will appear in Edition 72 of the Küste (2007). Besides a full-day workshop on EurOtop at the ICCE 2008, additional introductory events are also planned. With funds provided by the Rijkswaterstaat in the Netherlands, the Environmental Agency in England and the KFKI, an online version of the Overtopping Manuals has been prepared which will offer examples of interactive computation: ***http://www.overtoppingmanual.com/calculation_tool.html.***
A short course on wave overtopping is also planned at the ICCE 2008.

Events

March 26-28, 2008	**3. Extremwetterkongress**, Hamburg, Germany info: http://www.extremwetterkongress.de
April 6,2 008	**Tagung des Franzius-Instituts 2008**, Hannover, Germany info: www.fi.uni-hannover.de
May 6-8, 2008	**4th International Symposium on Flood Defence**, Ontario, Canada info: http://www.flood2008.org/flood/
June 17, 2008	**Moderne Informationssysteme für eine moderne Gewässerkunde**, Illmenau info: http://www.baw.de/vip/veranstaltungen1.php.html
July 2-5, 2008	**CoastLab 2008 - Second International Conference on the Application of Physical Modelling to Port and Coastal Protection** info: http://www.coastallab08.com
August 31 to September 5, 2008	**ICCE 2008: 31st International Conference on Coastal Engineering**, CCH (Hamburg Congress Centre), Hamburg, Germany info: http://icce2008.hamburg.baw.de
September 8-9, 2008	**ICHE-2008: 8th International Conference on Hydro-Science and Engineering**, Nagoya, Japan contact: ttsujimoto@genv.nagoya-u.ac.jp
September 11, 2008	**Neue Konzepte, Entwicklungen und Ergebnisse im Küstenwasserbau**, Hamburg, Germany info: http://www.baw.de/vip/veranstaltungen1.php.html
February 12-16, 2009	**HIC Hydro-Informatics Conference**, Conceptión, Chile

Imprint

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