

R&D Technical Summary FD0705 Approach (1)

Shingle Beach Transport Project

Background to R&D project

Effective shoreline management is dependent on understanding beach morpho-dynamics and an ability to predict both longshore and cross-shore sediment movements over time periods ranging from single storms to decades. Much of the existing scientific and engineering literature on littoral processes concentrates on sand beaches due to their international importance. Around the UK coarse grained beaches are of equal importance to sand beaches, but the ability to predict responses has been less well developed. More recent research has attempted to improve this situation through development of physics based approach to transport modelling that gives specific consideration to coarse grained transport processes. Recognition of the weaknesses of this and earlier work provided the incentive for renewed effort.

The Shingle Beach Transport Project grew from the recognition that numerical model development should not proceed without a database of quality field measurements that confirmed fundamental processes and could provide verification of predictions. Although field data are available from a number of sources, the measurements are not co-ordinated or directed towards the specific requirements of model development. The Project was proposed with the stated aims of developing improved techniques for the prediction of beach transport and long term morphological development where coarse grained sediment forms a significant proportion of the beach material. The main objectives were:

- to process and analyse short term sediment transport data obtained from a co-ordinated series of field experiments, and to use this data to verify and/or develop existing or new transport models for shingle beaches
- to obtain, process and analyse data relating to long term, large scale morphological developments of a range of shingle beach situations, to compare this long term data with the short term data obtained from the field experiments and to develop predictive techniques for application by beach managers.

The Shingle Beach Transport Project was set up as a collaboration between several research groups, each with existing programmes of coastal research and each able to contribute unique expertise to the field experiments. The organisations and researchers included:

- HR Wallingford
- University of Portsmouth
- University of Brighton
- University of Plymouth
- University of Southampton

The research programme was planned to make best use of the available time and resources through a division into three main stages. The first of the three years was given to planning and implementing field experiments on an open shingle beach site. Successful completion of this work led to the second year experiments on a recently recharged and groyned shingle beach. The final year was then devoted to analysis of the data and development of predictive techniques.

Ongoing work throughout the project included critical analysis of existing numerical modelling and field measurement techniques, regular surveys of the field sites to determine seasonal development trends and preparation of progress reports for internal review.

Results of R&D project

Full details are presented in the final Technical Report for the project (TR 29B, 1999 from HR Wallingford. All of the field data recorded is held in a database at HR Wallingford and discussed in detail in the final project report. Access to this database is open to other researchers interested in coarse grain beaches or nearshore wave transformations.

From the results of these reviews the project team began the development of several new modelling methods. Plymouth University developed a vector based total transport (longshore and cross-shore) model that includes swash zone processes. HR Wallingford developed an extension to the existing ANEMONE overtopping and run-up model suite. The new HR Wallingford approach includes beach porosity, plus new friction and threshold of motion terms.

R&D Outputs and their Use

The project has resulted in:

- an extensive database of field measurements, available to other research projects from HR Wallingford
- a comparison of existing equations used in numerical prediction models
- development of a new conceptual longshore transport model
- initial development of a physics based cross-shore model, including the effects of a permeable beach on wave run-up and an improved representation of bottom friction
- new guidance on the use of field equipment, including the use of GIS to form digital ground models for use in transport calculations
- guidance on the analysis or prediction of long term/large scale shoreline change.

This R&D Technical Summary relates to R&D Commission FD0705 Approach (1) and the following R&D outputs:

- **R&D Technical Report - *Shingle Beach Transport Project***

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