The HYDRA-modules

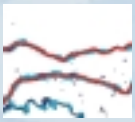
Hydra-0 for insight in the physics of water levels and waves

The main function of Hydra-0 (zero) is checking the physics of a probabilistic Hydra calculation for the "IJssellake area, the lower reaches of the Meuse and Rhine branches and the Vecht". It is also possible with Hydra-0 to assess the crest levels in the upstream sections of the Rhine and Meuse rivers. For this part of the river only one stochastic function is of importance, namely the discharge. The design windspeed and direction have been pre-determined for these areas. Furthermore Hydra-0 could be a part of the new prediction methods for the upstream areas of the Rhine and Meuse rivers.

Input A

Wave run-up predictions at highwater on rivers

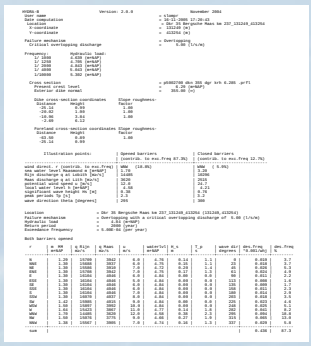
Windspeed and direction prediction per river branch



Predicted 10 minute or hourly water levels at the axis of the river, 1d-model, river axis

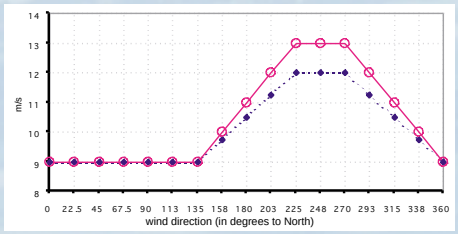
Input B

Instrument to check physics of Hydra-models



Input C

Assessing crest levels in the upstream rivers Hydra-0 model



Design wind speeds as a function of wind direction, 16 wind directions

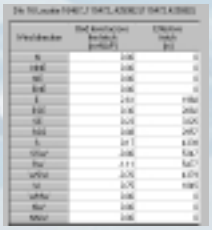
The following physical operations can be done with Hydra-0:

- Translation of the water level data from the middle of the river to the toe of the dike
- Determining effective fetch lengths
- Translation of potential wind velocity to an open water magnitude
- The wave growth modeling according to Bretschneider, Wilson or Young and Verhagen
- Wave reduction by dams and forelands
- Wave run-up and wave overtopping on a dike with "PC-Overslag" or the run-up module from the Hydra models

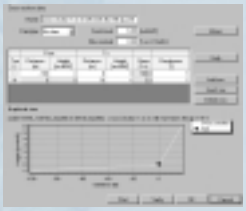
Input A

Input B

Input C



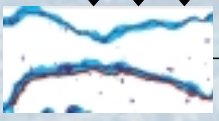
Average bottom depth and effective fetch



Dike cross-sections generated from Fli-Map or official list of constructions data

Information about the critical overtopping discharge

Sheetpiling profile



Water level bank location

Wave growth modeling with Bretschneider for 16 wind directions

Wave transformation and wave run-up;
Dam module;
Foreshore module;
Run-up module;
determining necessary crest levels

Output B

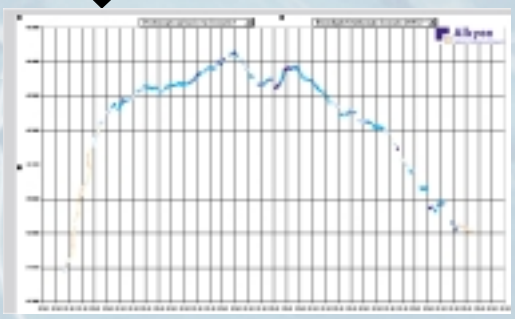
Checking all output after each individual process

Output A / C

Confrontation actual crest levels with required levels;
Determining the dike length with shortage of crest level

Hydra-0 uses ASCII-files for input and output. If used in a prediction model, pre-processing for example reading a water level prediction, and post processing of the results from Hydra-0 to GIS or excel figures can easily be done with other existing programs.

The result of the dike assessment and wind wave prediction is a comparison between the necessary crest level and the actual existing level of the dike crest. The difference between dike assessment and prediction is that with dike assessment the wave load from 16 directions has to be calculated. With the prediction only one or several sectors of the windrose have to be calculated.



Dikes to be strengthened at high water and storm;
Dike ring 41, Land van Maas en Waal – South easterly wind

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