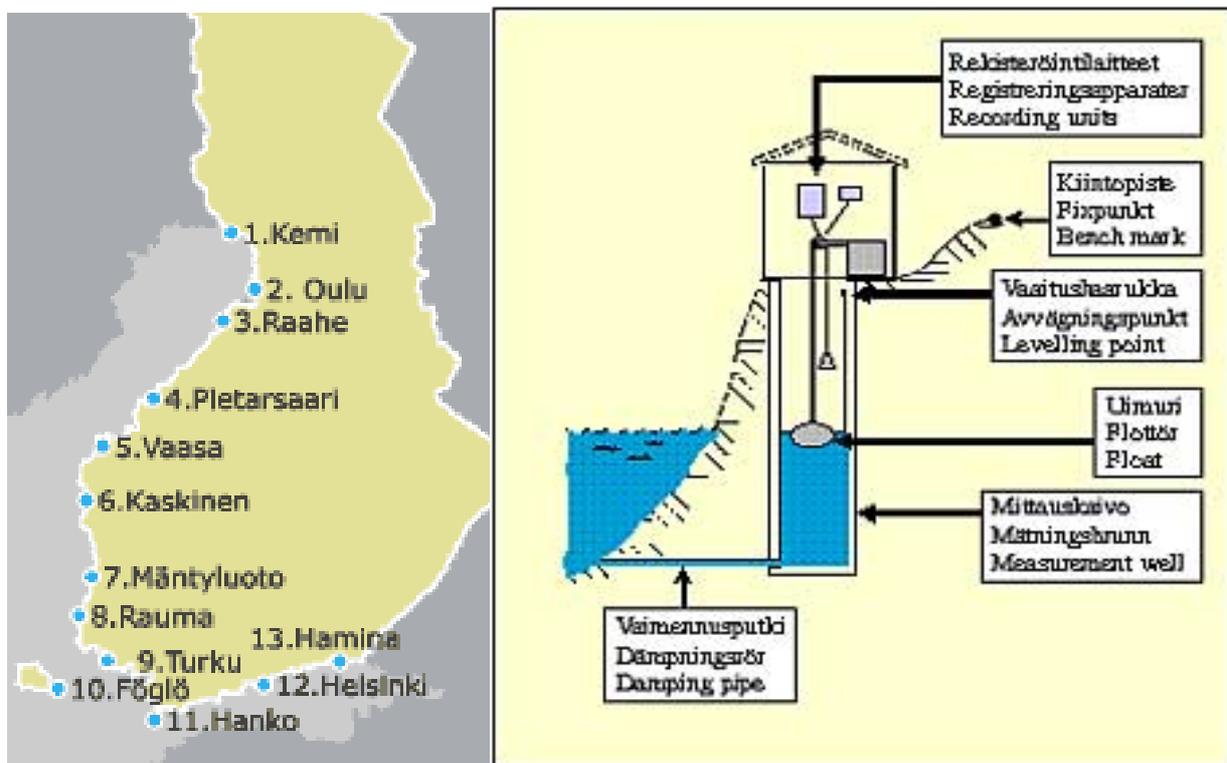


Real Time Water Level Information Services for Mariners by Finnish Maritime Administration

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The water level data for this information service is measured on the 13 mareographs of the Finnish Institute of Marine Research (FIMR). (www.fimr.fi)



The water level observation series of these mareographs are continuous for the last 80 – 120 years. These observations have been used for determining the zero level of the previous N60 height reference frame of Finland. N60 was created in 1965 but it will be replaced by N2000 since 2007. (The Zero level of N2000 is based on UELN zero, NAP). All these mareographs are connected via National First Order Levelling Network. Several of them have also been observation points for EUREF-GPS campaigns. One has to remember that the Scandinavian post-glacial rebound effects that both the heights of the earth crust and the mean sea level are epoch dependent on the Finnish coast.

Establishing FMA VTS-services on the Finnish coast required efficient data networks to distant locations on the coast and in the archipelago. Several government organisations are

participants of this common network. The Finnish Meteorological Institute and FIMR are among them.

The measured water level observations from all mareographs are continuously sent to FIMR in Helsinki. The validity of the data is checked in real time by automated processes and the data from all mareographs is sent in one simple data message to the VTS-services of FMA. This water level data as well as meteorological data will then be converted to graphic displays, which are selectable on computer screens on all VTS operators in all VTS stations via internet, although this not a public service. The network program is developed for the FMA by *Navielektro Oy*.

The VTS-operator may read the current water level and trend (if any) on any selected mareograph and inform the mariner via radio as well as prevailing weather conditions whenever the mariner likes to ask for this information. There have also been trials to broadcast water level data via AIS-messages, but this service requires further studies.

Because there is practically no tide and no tidal waves, the water level differs very seldom more than 20 centimetres between adjacent mareographs. This makes it possible to interpolate the water level value in case there would occur data transfer problems for one of the mareographs. Such interpolated value has always a special indicator of its origin.

This fast data transfer from mareographs to the FIMR does not serve at all the official water level recording of the FIMR. They have other data transfer arrangements for this. For instance the hydrographic survey vessels of FMA read and record the real time data for VTS from internet, but it is obligatory to check the value from the official observations list afterwards and before the final post processing of the survey data.

The FIMR has finished a study for FMA for interpolation of the water level on 14 selected locations on the coast, mainly the outer ends of the main fairways. In the nearest future these virtual observation points will also be available for VTS-operators via this same network service.

However we would like to enhance the reliability on this water level service with further studies on the following subjects

- the uncertainty estimation should be added and forwarded with the interpolated water level value, or a warning in case the uncertainty exceeds the predetermined safety limit
- FIMR will study the possibility to add a predicted value for the water with the real observation. The prediction span cannot be long in case an automated prediction method is used.

Water level predictions for several days are also possible. FIMR has achieved very promising results with these. However this service requires always a continuous human supervision and for the moment the FIMR has not resources for a 24h service.

The tight co-operation between FMA and FIMR has proved to be very useful for both organizations. The hydrographic department of the FMA has used for decades water level data of FIMR in hydrographic surveys. Information for mariners of all kind on environmental circumstances and especially water level will have an increasing value in the future and therefore we are happy to use the services of an efficient scientific organization.

One has to remember, the changes in the water level of the Baltic Sea are not very large when compared to the tide of oceans, only plus minus half a meter, more than one meter being exceptional. But there is one drawback – no tide tables are available.