To keep up the competitiveness of the port of Hamburg time and again it is necessary to adapt its seawards access to the shipbuilding development. The last deepening of the fairway of the lower and outer Elbe to the requirements of the container ship navigation was carried out in 1999/2000. The adaptation of the port access always causes an interference with nature, not only changing the flora and fauna but also the dynamics of the tidal wave in the estuary. The modified fairway depths and cross-sections can influence the tidal water levels, and thus the tidal amplitude, the duration of the flood tide and the ebb tide as well as the flood and ebb flow velocities. To analyse these changes the evidence report of the last fairway deepening established an extensive monitoring program. Due to this the flow velocities of the lower and outer Elbe are measured permanently at 13 stations since 1997/1998.

The aim of this work is to process the existing data of the flow velocities and to analyse them with statistical methods regarding to permanent changes. Thereby changing boundary conditions (freshwater discharge and tidal influence) must be considered, so that different hydrological situations before and after the fairway deepening can be compared. Complex statistical analyses were developed and performed. Nevertheless a direct empirical correlation between tidal parameters, freshwater discharge and the flow velocities could not be established sufficiently. However it succeeded to recreate the full hydrograph of the tidal currents in good approximation by taking into account the preceded “history” of the water level gradient. Due to the inertia of the oscillating water body and reflection components there is a lag between the local change in the water level gradient and the reaction of the tidal currents at the same cross-section. This can be judged as a success because now it was possible to fill up data gaps and create velocity hydrographs for time periods when the flow velocity has not been measured.

These continuous time series of tidal currents and water levels in different crosssections enables the calculation of accumulated volume flow rates and makes it possible to balance the sediment transport capacity during the changeable hydrological season. This is very interesting, especially with respect to the different questions that come up with the matter of the up-stream transport of sediments in consequence of the tidal pumping. Due to the increasing amounts of dredged material in the Port of Hamburg a better understanding of the complex interrelations in the Elbe estuary is needed to reverse this phenomenon.

**SUMMARY**

To keep up the competitiveness of the port of Hamburg time and again it is necessary to adapt its seawards access to the shipbuilding development. The last deepening of the fairway of the lower and outer Elbe to the requirements of the container ship navigation was carried out in 1999/2000. The adaptation of the port access always causes an interference with nature, not only changing the flora and fauna but also the dynamics of the tidal wave in the estuary. The modified fairway depths and cross-sections can influence the tidal water levels, and thus the tidal amplitude, the duration of the flood tide and the ebb tide as well as the flood and ebb flow velocities. To analyse these changes the evidence report of the last fairway deepening established an extensive monitoring program. Due to this the flow velocities of the lower and outer Elbe are measured permanently at 13 stations since 1997/1998.

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