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The National Danish Water Resources Model – using an integrated groundwater – surface water model for decision support and WFD implementation in a changing climate

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Integrated and sustainable water resources management and development of river basin management plans according to the Water Framework Directive is getting increasingly complex especially when taking projected climate change into account. Furthermore, uncertainty in future developments and incomplete knowledge of the physical system introduces a high degree of uncertainty in the decision making process. Knowledge based decision making is therefore vital for formulation of robust management plans and to allow assessment of the inherent uncertainties.

The Department of Hydrology at the Geological Survey of Denmark and Greenland started in 1996 to develop a mechanistically, transient and spatially distributed groundwater-surface water model – the DK-model – for the assessment of groundwater quantitative status accounting for interactions with surface water and anthropogenic changes, such as extraction strategies and land use, as well as climate change. The model has been subject to continuous update building on hydrogeological knowledge established by the regional water authorities and other national research institutes. With the on-going improvement of the DK-model it is now increasingly applied both by research projects and for decision support e.g. in implementation of the Water Framework Directive or to support other decisions related to protection of water resources (quantitative and chemical status), ecosystems and the built environment. At present, the DK-model constitutes the backbone of a strategic modelling project funded by the Danish Environmental Protection Agency, with the aim of developing a modelling complex that will provide the foundation of the implementation of the Water Framework Directive.

Since 2003 the DK-model has been used in more than 25 scientific papers and even more public reports. In the poster and the related review paper we describe the most important applications in both science and policy, where the DK-model has been used either directly or as an important starting point for assessing the impact of climate change on the quantity and quality of groundwater and surface water e.g. in relation to changes in water tables, runoff, nutrient loadings, flooding risks (coastal and hinterland), irrigation demands, sea level rise and seawater intrusion or to assess where geology or climate change create the largest uncertainty for evaluation of the development of water resources quantity and quality.