



Integrating meteorological information and uncertainty into flood forecasting – the FLOODRELIEF decision support system

M. B. Butts (1), A. Klinting (1), M. Ivan (1), J. K. Larsen (1), J. Brandt (2), J. H. Christiansen (2), C. A. Skjoeth (2), L.M. Frohn (2), C. Geels (2), H-T. Mengelkamp (3), J. Pestel (3), K-P. Johnsen (3), I. D. Cluckie (4), D. Han (4), Y.Q. Xuan (4), A. Dubicki (5), A. Slomska (5), W. Szalinska (5,8), K. Strońska (5), T. Zawisław (5), A. Lewandowski (6), T. Olszewski (6), T. Kolarski (6) D. Cadman (7), D. Price (7).

(1) DHI Water & Environment, Agern Alle 5, DK 2970 Horsholm, Denmark, (2) National Environmental Research Institute, NERI, Frederiksborgvej 399, P.O. Box 358, DK 4000, Denmark, (3) GKSS, Forschungszentrum Geestacht GmbH, Max-Planck-Strasse D-21502 Geestacht, Germany, (4) Water & Environmental Management Research Centre, University of Bristol, Bristol BS8 1UP, United Kingdom, (5) Instytut Meteorologii i Gospodarki Wodnej, IMGW-Wroclaw, P.O. Box Wroclaw 12, Parkowa 30, 51-616 Wroclaw, Poland, (6) Geoscience and Marine Research & Consulting Co., Ltd., GEOMOR, ul. Kosciarska 5, 80-328, Gdansk, Poland, (7) Environment Agency, Anglian Region, Kingfisher House, Goldhay Way, Orton Goldhay, Peterborough PE2 5ZR, England, (8) Meteo France, Centre de Meteorologie Radar, Direction des Systemes d'Observation 7, rue Teisserenc-de-Bort, 78195, Trappes, France. (mib@dhi.dk/Fax: +45 4516 9292)

For operational flood forecasting and operational decision-makers ready access to current and forecasted meteorological conditions is essential for initiating flood response measures and issuing flood warnings. Effective flood forecasting systems must provide reliable, accurate and timely forecasts for a range of catchments; from small rapidly responding urban areas, to large, more slowly responding fluvial systems, often within the same region. Using meteorological observations and quantitative precipitation forecasts to produce hydrological flood forecasts provides valuable increases in lead-time that can be exploited to mitigate the effects of a flood event. However while the value of accurate meteorological forecasts is widely recognised, to have real value, real-time flood management decisions must be based on an understanding of the uncertainties and associated risks. It is therefore critical for effective flood management

tools to provide reliable estimates of the forecast uncertainty. Only by quantifying the inherent uncertainties involved in flood forecasting can effective real-time flood management and warning be carried out

The need to address these requirements has led to the development within EU 5th framework project FLOODRELIEF of an internet-based decision support system to provide highly accessible real-time flood management tools. This decision support system has been designed together with FLOODRELIEF forecasting end-users to provide flood management and forecast information in a flexible, efficient and easily understood manner to operational users and decision makers. Comprehensive facilities for accessing and presenting both meteorological observations and numerical weather forecasts are available. The system has been integrated with a highly portable, low cost operational numerical weather forecasting system. This weather forecasting system has been developed within the FLOODRELIEF project to provide quantitative precipitation forecasts at different resolutions using dynamical downscaling. Ensemble forecasting using different forecasting inputs provides a flexible method of estimating uncertainty. For example rainfall forecasts using meso-scale meteorological forecasts, downscaled meteorological forecasts, radar forecasts, best case and worst case forecasts can be used by operational forecasters to models to estimate an uncertainty range. In this manner a direct and intuitive estimate of forecast uncertainties can be achieved to address the issue of how ensemble results can be communicated to flood managers and decision-makers. This decision support system is applied to regional flood forecasting in the UK, in the FLOODRELIEF study catchment, the Welland and Glen.