Geophysical Research Abstracts
Vol. 17, EGU2015-11617, 2015
EGU General Assembly 2015

Global discharge modelling experiments with the TIGGE archive

Ervin Zsoter (1), Paul Smith (1,2), Emanuel Dutra (1), Florian Pappenberger (1,3), Fredrik Wetterhall (1), Konrad Bogner (4,1), Gianpaolo Balsamo (1), David Richardson (1), and Francesca Di Giuseppe (1)

(1) European Centre for Medium-Range Weather Forecasts, (2) Lancaster Environment Centre, Lancaster University, UK, (3) College of Hydrology and Water Resources, Hohai University, Nanjing, China, (4) Swiss Federal Research Institute WSL, Birmensdorf, Switzerland

In this study we derived and analysed global ensemble discharge forecasts for TIGGE (THORPEX Interactive Grand Global Ensemble) models using the modelling and technical infrastructure available at ECMWF. We focussed on the global characteristics of discharge with special emphasis on the analysis of errors stemming from different segments of the production system and also on the post-processing possibilities of the data.
The modelling work was based on the HTESSEL (Hydrology-Tiled ECMWF Scheme for Surface Exchange over Land) land-surface model used operationally at ECMWF. The offline version of HTESSEL was extended to accommodate ensemble forecast runs from TIGGE and the climate and initial conditions were taken from ERA Interim. Finally the model output runoff was coupled to the CaMa-Flood distributed global river routing model to provide river discharge. The initial state of the river network for the routing was provided by 30-year ERA Interim HTESSEL integration coupled with CaMa-Flood. The production of the daily discharge forecasts up to 10 days covered the period 2008-2013 for four TIGGE models (ECMWF, UKMO, NCEP and CMA) for about 400 global river catchments with upstream area over 40000 km2.
The impact of the HTESSEL atmospheric forcing on the discharge was investigated as it played a crucial role in the experiments. The sensitivity analysis to the forcing parameter choices showed some interesting behaviour in the impact of wind, radiation, temperature, humidity and precipitation on the global discharge forecasts. The positive influence of the improved ERA Interim precipitation forcing (GPCP v2.0 corrected) on the quality of the initial river flow in the forecast routing was also highlighted.
To help interpreting the discharge performance two of the HTESSEL atmospheric forcing parameters, 2m temperature and 24-hour total precipitation were verified and the performance characteristics explored using four TIGGE models and the equal weight multi-model combination.
The performance of the TIGGE discharge forecasts was investigated by quantifying the potential benefits of combining and calibrating these predictions. Several post-processed forecast versions were generated and analysed. In addition to the sample mean error correction and the initial time correction (shifting all the predictions by the error of the ERA Interim derived initial time discharge) an equal weight multi-model combination, the Bayesian Model Averaging and the Extreme Forecast Index concept were all applied using the four TIGGE models.
The results highlighted the general behaviour and the error structure of the discharge forecasts and emphasised the importance of doing post-processing on this globally produced data set. The work has also given some insight into the different possibilities to correct the errors highlighting the superiority of the Bayesian model averaging and also exploring the application of the Extreme Forecast Index.