Geophysical Research Abstracts
Vol. 19, EGU2017-1464-1, 2017
EGU General Assembly 2017

Hydrological Assessment of Model Performance and Scenario Analyses of Land Use Change and Climate Change in lowlands of Veneto Region (Italy)

Anton Pijl (1), Claudia Brauer (1), Giulia Sofia (2), Ryan Teuling (1), and Paolo Tarolli (2)

(1) Hydrology and Quantitative Water Management Group, Wageningen University and Research, Wageningen, Netherlands (anton.pijl@gmail.com, claudia.brauer@wur.nl, ryan.teuling@wur.nl), (2) Dept. of Land, Environment, Agriculture and Forestry, University of Padova, Legnaro (PD), Italy (giulia.sofia@unipd.it, paolo.tarolli@unipd.it)

Growing water-related challenges in lowland areas of the world call for good assessment of our past and present actions, in order to guide our future decisions. The novel Wageningen Lowland Runoff Simulator (WALRUS; Brauer et al., 2014) was developed to simulate hydrological processes and has showed promising performance in recent studies in the Netherlands. Here the model was applied to a coastal basin of 2800 ha in the Veneto Region (northern Italy) to test model performance and evaluate scenario analyses of land use change and climate change. Located partially below sea-level, the reclaimed area is facing persistent land transformation and climate change trends, which alter not only the processes in the catchment but also the demands from it (Tarolli and Sofia, 2016). Firstly results of the calibration (NSE = 0.77; year simulation, daily resolution) and validation (NSE = 0.53; *idem*) showed that the model is able to reproduce the dominant hydrological processes of this lowland area (e.g. discharge and groundwater fluxes). Land use scenarios between 1951 and 2060 were constructed using demographic models, supported by orthographic interpretation techniques. Climate scenarios were constructed by historical records and future projections by COSMO-CLM regional climate model (Rockel et al., 2008) under the RCP4.5 pathway. WALRUS simulations showed that the land use changes result in a wetter catchment with more discharge, and the climatic changes cause more extremes with longer droughts and stronger rain events. These changes combined show drier summers (-33% rainfall, +27% soil moisture deficit) and wetter (+13% rainfall) and intenser (+30% rain intensity) autumn and winters in the future. The simulated discharge regime –particularly peak flow– follows these polarising trends, in good agreement with similar studies in the geographical zone (e.g. Vezzoli et al., 2015). This will increase the pressure on the fully-artificial drainage and agricultural systems, that will need to adapt to prevent largescale floods or crop-failure. Additionally, simulations under 'business-as-usual' pathway RCP8.5 would likely amplify the polarising effects on the hydrological regime as presented here, further stressing the need for adequate adaptation.

The proposed presentation at EGU 2017 will contain clear visual results of the model and quantitative scenario simulations. These results are particularly interesting, firstly because they prove how a simple conceptual model can become a powerful tool in scenario analysis of future pathways. Furthermore, they clearly indicate major challenges that lowland areas are facing in modern times – not only the 46.000 km^2 Po valley, but all around the world where lowlands often host the centres of our societies and economies.

REFERENCES

Brauer, C., Teuling, A., Torfs, P., Uijlenhoet, R., 2014. The Wageningen Lowland Runoff Simulator (WALRUS): a lumped rainfall–runoff model for catchments with shallow groundwater. Geoscientific Model Development 7 (5), 2313–2332.

Rockel, B., Will, A., Hense, A., 2008. The regional climate model COSMO-CLM (CCLM). Meteorologische Zeitschrift 17 (4), 347–348.

Tarolli, P., Sofia, G., 2016. Human topographic signatures and derived geomorphic processes across landscapes. Geomorphology 255, 140–161.

Vezzoli, R., Mercogliano, P., Pecora, S., Zollo, A., Cacciamani, C., 2015. Hydrological simulation of Po River (North Italy) discharge under climate change scenarios using the RCM COSMO-CLM. Science of The Total Environment 521, 346–358.