

Figure 1. Geographical setting of the island of Cyprus and WRF-Hydro study area with the 22 target watersheds. For watershed short names refer to Table 1.



Figure 2. Schematic illustration of the model structure used in this study, including the coupling between WRF, the Noah Land Surface Model and WRF-Hydro routines (modified after Gochis et al., 2015).



Figure 3. Boxplots of the sensitivity of the modelled streamflow to perturbations (x-axis) in REFKDT (infiltration partitioning scaling coefficient), Soil Depth, OVRGH (overland roughness factor), K_S (saturated hydraulic conductivity), and SLOPE geo (deep drainage parameter defined based on slope terrain and geology) relative to a defined reference scenario (SLOPE terrain represents the slope parameter defined based on slope terrain only, as in Silver et al., 2017).



Figure 4. Hydrographs obtained at three different watersheds for OVRGH values of 0.1 (flow ovrgh 0.1), 0.5 (flow ovrgh 0.5), and 1.0 (flow ovrgh 1.0), in comparison to observed flow (flow obs). For watershed short names refer to Table 1.



Figure 5. Performance indices (NSE, Nash-Sutcliffe Efficiency; mNSE, modified Nash-Sutcliffe Efficiency; KGE, Kling-Gupta Efficiency; BIAS; MAE, Mean Absolute Error) calculated on daily streamflow resulting from observed rainfall for the 22 watersheds using the calibrated set of parameters for both Jan 1989 (cal) and Nov 1994 (val). For watershed short names refer to Table 1.



Figure 6. Observed daily hydrographs (flow obs) and hydrographs obtained with the calibrated WRF-Hydro model (flow mod) forced with observed rainfall (rain obs) and with WRF modelled rainfall (rain wrf) for the Jan-1989 calibration event, for 11 representative watersheds (see Table 1 for watershed short names).



Figure 7. Observed daily hydrographs (flow obs) and hydrographs obtained with the calibrated WRF-Hydro model (flow mod) forced with observed rainfall (rain obs) and with WRF modelled rainfall (rain wrf) for the Nov-1994 validation event, for 11 representative watersheds (see Table 1 for watershed short names).



Figure 8. Performance indices (NSE, Nash-Sutcliffe Efficiency; BIAS; MAE, Mean Absolute Error) of daily WRF-modelled rainfall over the 22 watersheds both Jan 1989 (J-89) and Nov 1994 (N-94) events. For watershed short names refer to Table 1.



Figure 9. Performance indices (NSE, Nash-Sutcliffe Efficiency; mNSE, modified Nash-Sutcliffe Efficiency; KGE, Kling-Gupta Efficiency; BIAS; MAE, Mean Absolute Error) calculated on daily streamflow resulting from WRF-modelled rainfall for the 22 watersheds using the calibrated set of parameters for both Jan 1989 (J-89) and Nov 1994 (N-94) events. For watershed short names refer to Table 1.



Figure 10. Observed hourly hydrographs (flow obs) and hydrographs obtained with the calibrated WRF-Hydro model (flow mod) forced with observed rainfall (rain obs) and with WRF-modelled rainfall (rain wrf) for both Jan 1989 (left) and Nov 1994 (right), for three watersheds (see Table 1 for watershed short names); modelled flow performance indices (NSE, Nash-Sutcliffe Efficiency; KGE, Kling-Gupta Efficiency; BIAS) are shown as well.



Fig. S1. Simulated flow (flow mod) - with baseflow component (bflow mod) - in comparison with observed flow (flow obs) obtained forcing the model with observed rainfall (rain obs) for the 22 watersheds and Jan-1989 event. For watersheds short names see Table 1.



Fig. S1 - Continue



Fig. S2. Simulated flow (flow mod) - with baseflow component (bflow mod) - in comparison with observed flow (flow obs) obtained forcing the model with observed rainfall (rain obs) for the 22 watersheds and Nov-1994 event. For watersheds short names see Table 1.



Fig. S2 - Continue



Fig. S3. Simulated flow (flow mod) - with baseflow component (bflow mod) - in comparison with observed flow (flow obs) obtained forcing the model with modelled rainfall (rain wrf) for the 22 watersheds and Jan-1989 event. For watersheds short names see Table 1.



Fig. S3 - Continue



Fig. S4. Simulated flow (flow mod) - with baseflow component (bflow mod) - in comparison with observed flow (flow obs) obtained forcing the model with modelled rainfall (rain wrf) for the 22 watersheds and Nov-1994 event. For watersheds short names refer to Table 1.



Fig. S4 - Continue