4.4 OPERATIONAL HYDROLOGICAL MODELLING OF SMALL WATERSHED USING QPE FROM DUAL-POL RADAR IN BRAZIL

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Among other applications, radar-rainfall (RR) and QPE (Quantitative Precipitation Estimation) based on radar reflectivity, dual polarization variables and multi sensor information, provide important information for land surface hydrology, such as flood forecasting. The Marrecas River watershed (335 km2) is a headwater catchment of the Iguazu river, located at southwest of Parana state, in southern Brazil. The watershed is predominantly covered by agriculture land, but it was severely channelized close to Francisco Beltrao City where significant flash floods occur during rainfall periods. Historical records indicate that once a year Francisco Beltrao has a flash flood after 5-6 hours of extreme rainfall. Therefore, SIMEPAR (Parana Meteorological Service) developed a flood alert system using rainfall-runoff model forced with RR and QPE, and tipping-bucket observations to forecast river water levels (using rating-curves). In this study, we used hourly dataset from a S-Band dual polarimetric radar with two tropical R(Z) relations based on climatology and distrometer data, a polarimetric R(Z,ZDR) algorithm from the literature and a multi-sensor approach using radar, satellite and rain gauge. Two hydrological models (Sacramento Soil Moisture Accounting, SAC-SMA; IPH-II model) were used and calibrated with the Shuffle Complex Evolution (SCE-UA) using observed discharge time-series. Although our previous studies indicated accurate RR-based simulations, in some cases small floods were not detected when using catchment-lumped rainfall derived from multi-sensor QPE. In this study we advance further in this subject using improved R(Z,ZDR) relations and QPE for the period of 2016-2017, but also different approaches for the rainfall-runoff calibration. In a first step, we evaluate model optimization for high flows thresholds and flood events. The Marrecas River has two tributaries in the upper reaches and a major contribution from the Quatorze River in the lower reaches, but all these catchments are ungauged. Hence, the development (and timing) of floods in the Marrecas River can be complex and strongly related to storms spatio-temporal distribution. To explore this aspect, we also perform a first analysis in using RR in rainfall-runoff model calibration with a semi-distributed catchment discretization, which will be presented in this conference.