EGU2020-13807
https://doi.org/10.5194/egusphere-egu2020-13807
EGU General Assembly 2020

Comparison of various X-band radar products over the Paris area

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Optimized management of storm water management in the Paris area is needed to both avoid urban flooding and maximize water depollution. Such management requires improving the ability to measure and model hydro-meteorological events at the highest possible resolution. Hence, the interest of meteorological radars, given their unique ability to measure rainfall in both space and time.

In this study, we focus on the data collected by a dual polarimetric X-band radar data operated by Ecole des Ponts ParisTech in the framework of the Fresnel Platform is used. The space resolution is of 250 m and the time one is of 3 min and 25 seconds. Seven rainfall events that occurred in 2018 are studied. They cover a wide range of meteorological situations, including hail. More precisely several products are compared; some relying on a simple Marshall Palmer power law relation between the measured reflectivity and the rain rate; and others using the dual polarization capabilities for heavy rainfall through a power law relation between the measured specific differential phase shift and the rain rate. Constant and varying parameters for these laws are tested. In addition, these radar products are compared with various products obtained with a C-band radar operated by Meteo-France and 8 rain gauges. Temporal evolutions of rain rates are compared and classical metrics (Nash Sutcliff, correlation...) are computed. In addition, outputs of hydro-dynamic models' simulations using this rainfall data are compared.

It appears that the results strongly depend on rainfall event, and even given peaks, with no clear tendency between the radar products. In addition, a strong dependency on the radar data processing, and especially the coefficients of the radar relation, is found. This suggests that further work should be done to improve their determination for this area and depending on the weather conditions. In addition, this study highlights the need to develop morphological comparison techniques that would be valid not only at a single scale but across scales.

Authors greatly acknowledge support of the chair Hydrology for Chair of Hydrology for Resilient Cities (endowed by Veolia) of the Ecole des Ponts ParisTech.