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## New pathways for high-resolution weather radar products in the Hamburg metropolitan region

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The University of Hamburg operates a single-polarized X-band weather radar to investigate small scale precipitation in Hamburg's center since 2013. This weather radar provides a temporal resolution of 30 s, a range resolution of 60 m, and a sampling resolution of 1° within a 20 km radius. The X-band observations refine the coarse measurements of the German nationwide C-band radars. On the one hand, the resolution enables new capabilities in research and detection of extreme events, e.g. flash floods or tornadoes in rain events. On the other hand, with the single polarization and small wavelength, attenuation, noise, and non-meteorological echoes become a challenging issue. How can we derive products from disturbed weather radar observations?

We demonstrate new methods to process X-band weather radar observations effectively using synthetic and real data. Firstly, we present our python package for local weather radars. This package combines all steps of processing our measurements and includes well-established algorithms of image processing and radar meteorology. Secondly, we study machine learning as a new and potential method for our weather radar products. The developed neural network uses raw reflectivity measurements as input and results in data, which is free of noise and non-meteorological echoes. We outline assets and drawbacks of both methods and show possible connections.

Further X-band weather radar systems are planned for 2020 to monitor precipitation for the Hamburg metropolitan region in a networked environment. The high-quality and -resolution weather radar products will be provided for urban hydrology research within the Cluster of Excellence CLICCS - Climate, Climatic Change, and Society.