ABSTRACT

High-resolution precipitation data validation for climate-resilient water management

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Ongoing climate change poses increasing challenges for irrigated agriculture. Both heavy precipitation events as well as droughts can severely impact growing conditions and irrigation and fertilization requirements. To optimally use the available water transparency across the whole water value chain is needed. This is addressed in the Horizon 2020 project WaterSENSE and its successor REINFORM, a Horizon Europe initiative, in which tools for Earth Observation (EO) based water monitoring were build, tested in Australia and advanced for optimized resource management.

As part of these research projects a strategy to obtain high quality precipitation data was needed that accounts for the heterogeneous data availability in Australia. Station data and radar data operated by the Australian Weather service, the Bureau of Meteorology (BoM), are generally of good quality, but focus on the more densely populated coastal areas. For other areas satellite-based precipitation can offer an alternative. To achieve optimal data quality in focus areas of the projects radar data of three radar locations was analyzed, corrected and adjusted with rain gauge measurements. The result is a dataset on a regular grid with good spatial representation of precipitation patterns and good quantitative precipitation estimates achieved by the gauge adjustment. This data was used to evaluate several satellite-based precipitation products and is available for further validation.

For the first period the validation data includes polar volume data of BoM from the radar location Namoi and for a second period the locations Hillston and Yarrawonga were added. This data is combined into a single product on a cartesian 2D grid (Figure 1) with the following properties:

- Period: Namoi for October 2020 until present
  Hillston and Yarrawonga for January 2023 until present
- Temporal resolution 5 minutes
- Spatial resolution 1x1 km
- Adjusted with up to 800 rain gauges

Early work concentrated on evaluating different satellite-based precipitation products and an attempt to infer precipitation from EO inferred soil moisture (Strehz and Einfalt, 2021; Strehz et al 2023). Ultimately the goal is to integrate different data sources into a single product, where the radar data benefits from the combination with satellite and station data and satellite data is used where no other data is available. Here we focus on products from the Himawari 9 satellite of the Japan Meteorological Agency and a precipitation estimate provided by BoM which applies the CRRPh algorithm, developed by EUMETSAT in the NWC SAF context, to Himawari 9 data.

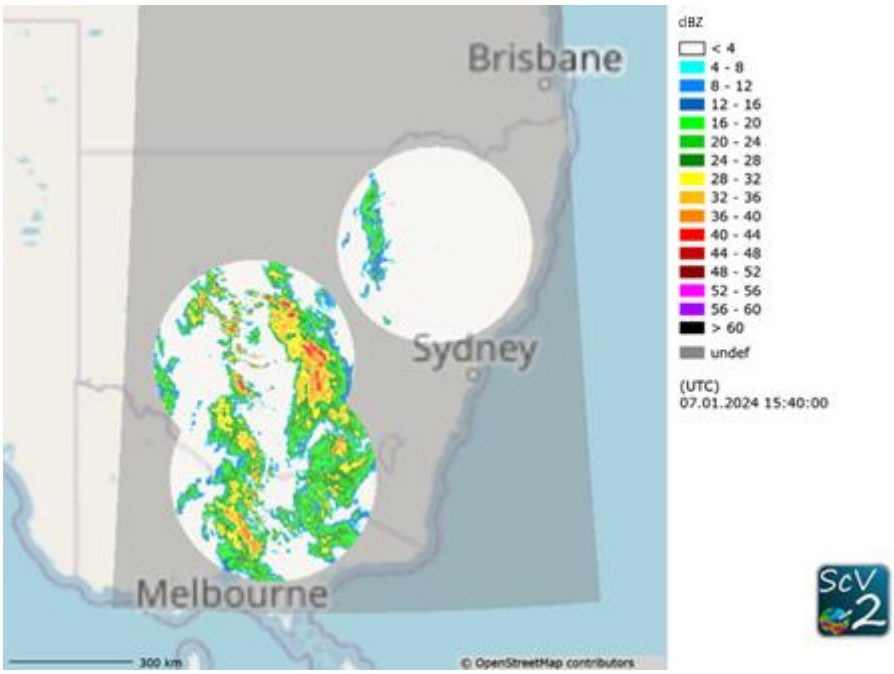

Figure 1: Example of a radar composite of the locations Hillston, Yarrawonga and Namoi which forms a validation dataset for satellite-based precipitation estimates.