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# Requirements of Climate and Hydrological Applications

### SUMMARY

This document provides information on the particular requirements of climate and hydrological applications on weather radar data. It is based on requirements that have been formulated at the Exeter 2013 workshop (Ref. 1, Ref. 2) and the activities taken up by the GCOS Atmospheric Observation Panel for Climate (AOPC, Ref. 3, Ref. 4) later on.

Almost all digital weather radars in operational use have been designed and operated first of all for weather forecast and warning services only. The use case for hydrological applications has joined almost a decade later when online-calibration with direct measurements from automated gauges became feasible. The climate use of radar data is still a requirement or use case that appears to be rather surprising to the community of radar operators that raise the data. However, making the analogy to the data and information from satellite platforms is worthwhile. Nowadays generation of Climate Data Records (CDR’s) from satellite data is a well-accepted approach and has boosted the knowledge of the community on the trends and variabilities of a number of so-called Essential Climate Variables (ECV), a short list of the most critical and measurable variables in the context of climate monitoring.

Meanwhile the time coverage of weather radar networks (alike NEXRAD in the US, or the German network) approaches the bi-decadal times scale and it is high time to gather and implement the requirements for climate and hydrological applications, so we have a chance to create radar based global scale CDR’s within the next 10yrs when the coverage reaches the climate relevant 30yrs threshold.

However, in contrast to satellite data, the situation in terms of ownership, formats and geo-temporal homogeneity is by far more challenging compared to satellite borne data. In addition even the nowadays coverage with radar systems features substantial gaps so a global coverage is not available even for the most recent years.

Therefore the requirements for climate and hydrological applications as described in Ref.1 and Ref.2 remain valid, and first activities of AOPC to address those have been taken up in the action plan adopted by the 21st Session of AOPC, 5-8 April, Asheville, NC, United States (Ref.3, Actions 21/28 and 21/29), namely to establish a task team to consider the way forward for using precipitation radar data for climate monitoring and introduce relevant activities for the AOPC work plan, and to propose the way forward (Ref.4).

Issues to be tackled towards public available weather radar based CDR’s are manifold: Demanding climate requirements in terms of geo-temporal homogeneity, limited storage capabilities, lack of world-wide applied standard formats, integration of existing archives, quality assurance and control through calibration against rain gauge data, scope of storage, unrestricted international exchange of radar data. This mountain of challenges should not discourage activities, but a prioritization is needed. For radar based CDR’s, the geo-temporal homogeneity and stability, and the assistance to those weather radar data operators that struggle with the long-term storage of radar data are of primary importance

On the other hand, only radar based precipitation monitoring are capable to provide the clue to observe and resolve the accelerations the global water cycle due to global warming and to provide the communities with heavy precipitation climatology at decision relevant (e.g. urban scale) horizontal resolutions. An example for the city of Cologne, Germany shall be presented.

Finally the community should be made aware of the comparatively little additional effort to save also the highly beneficial climatological information of weather radar data in view of the substantial efforts taken anyway through their operation for real time weather forecasting and warning services.

ISSUES TO BE DISCUSSED:

### Prioritize activities towards long term weather radar data storage and rescue to facilitate weather radar based CDR’s.

Show case weather radar based climate and hydrological applications to demonstrate the strategic value of radar data.

### REFERENCES:

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