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# Influence of ambient meteorology on the accuracy of radiation measurements: insights from field and laboratory experiments

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A precise knowledge of the surface energy budget, which includes the solar and terrestrial radiation fluxes, is needed to accurately characterize the global energy balance which is largely determining Earth's climate. To this aim national and global monitoring networks for surface radiative fluxes have been established in recent decades. The most prominent among these networks is the so-called Baseline Surface Radiation Network (BSRN) operating under the auspices of the World Climate Research Programme (WCRP) (Ohmura et al., 1998). National monitoring networks such as the Austrian RADiation Monitoring Network (ARAD), which has been established in 2010 by a consortium of the Central Agency of Meteorology and Geodynamics (ZAMG), the University of Graz, the University of Innsbruck, and the University of Natural Resources and Applied Sciences, Vienna (BOKU), orient themselves on BSRN standards (McArthur, 2005). ARAD comprises to date five sites (Wien Hohe Warte, Graz/University, Innsbruck/University, Kanzelhöhe Observatory and Sonnblick (which is also a BSRN site)) and aims to provide long-term monitoring of radiation budget components at highest accuracy and to capture the spatial patterns of radiation climate in Austria (Olefs et al., 2015). Given the accuracy requirement for the local monitoring of radiative fluxes instrument offsets, triggered by meteorological factors and/or instrumentation, pose a major challenge in radiation monitoring. Within this study we investigate effects of ambient meteorology on the accuracy of radiation measurements performed with pyranometers contained in various heating/ventilation systems (HV-systems), all of which used in regular operation within the ARAD network. We focus particularly on instrument offsets observed following precipitation events. To quantify pyranometer responses to precipitation we performed a series of controlled laboratory experiments as well as targeted field campaigns in 2015 and 2016. Our results indicate that precipitation (as simulated by spray-tests or observed under ambient conditions) significantly affects the thermal environment of the instruments and thus their stability. Statistical analyses during nighttime conditions showed that precipitation triggers zero offsets of 4 $W/m^2$ or more, depending on the HV-system and prevailing ambient conditions (i.e., air temperature, wind), indicating a clear exceedance of BSRN targets.

References:

McArthur L. J. B.: *World Climate Research Programme-Baseline Surface Radiation Network (BSRN) - Operations Manual Version 2.1*, Experimental Studies Division, Atmospheric Environment Service, Downsview, Ontario, Canada, 2005.

Olefs M., Baumgartner D. J., Obleitner F., Bichler C., Foelsche U., Pietsch H., Rieder H. E., Weihs P., Geyer F., Haiden T., Schöner W.: *The Austrian radiation monitoring network ARAD - best practice and added value*, Atmospheric Measurement Techniques Discussions, 8: 10663-10710, 2015.

Ohmura A., Dutton E. G., Forgan B., Frohlich C., Gilgen H., Hegner H., Heimo A., Stephens G. L., König-Langlo G., McArthur B., Müller G., Philipona R., Pinker R., Whitlock C. H., Dehne K., Wild M.: *Baseline surface radiation network (bsrn/wcrp): new precision radiometry for climate research*, Bulletin of the American Meteorological Society, 79(10): 2115-2136, 1998.