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An automated method for the evaluation of the pointing accuracy of sun-tracking devices

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The accuracy of measurements of solar radiation (direct and diffuse radiation) depends significantly on the accuracy of the operational sun-tracking device. Thus rigid targets for instrument performance and operation are specified for international monitoring networks, such as e.g., the Baseline Surface Radiation Network (BSRN) operating under the auspices of the World Climate Research Program (WCRP). Sun-tracking devices fulfilling these accuracy targets are available from various instrument manufacturers, however none of the commercially available systems comprises a secondary accuracy control system, allowing platform operators to independently validate the pointing accuracy of sun-tracking sensors during operation. Here we present KSO-STREAMS (KSO-SunTRackEr Accuracy Monitoring System), a fully automated, system independent and cost-effective method for evaluating the pointing accuracy of sun-tracking devices. We detail the monitoring system setup, its design and specifications and results from its application to the sun-tracking system operated at the Austrian RADiation network (ARAD) site Kanzelhöhe Observatory (KSO). Results from KSO-STREAMS (for mid-March to mid-June 2015) show that the tracking accuracy of the device operated at KSO lies well within BSRN specifications (i.e. 0.1 degree accuracy). We contrast results during clear-sky and partly cloudy conditions documenting sun-tracking performance at manufacturer specified accuracies for active tracking (0.02 degrees) and highlight accuracies achieved during passive tracking i.e. periods with less than 300 W m^{-2} direct radiation. Furthermore we detail limitations to tracking surveillance during overcast conditions and periods of partial solar limb coverage by clouds.