

## The Development and Testing of WMO-SPICE Tipping Bucket Precipitation Gauge Adjustments

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### ABSTRACT

Even though many solid precipitation measurements are recorded using heated tipping bucket gauges, the performance of these gauges for the measurement of solid precipitation has not been well characterized. Tipping-bucket gauges can suffer from significant measurement delays, as precipitation accumulated in the gauge funnel must be melted in sufficient quantity to trigger a full tip before being measured. In addition, underestimates of precipitation may be worse for tipping-bucket snowfall measurements than for weighing gauges, as both evaporation and wind may remove precipitation from a gauge funnel before it can be measured. Five different types of heated tipping-bucket gauges were evaluated at six different sites for the World Meteorological Organization Solid Precipitation InterComparison Experiment (WMO-SPICE). These results were used to develop and evaluate adjustments for the undercatch of solid precipitation. New methods to optimize and test precipitation adjustment transfer functions were developed to address challenges specific to tipping bucket measurements. These new methods may also be applicable to other types of precipitation gauges. The new transfer function development methods were compared to more traditional catch efficiency type methods. In addition, a more general, multi-gauge, multi-site transfer function was developed. This new transfer function is more generally applicable for many types of heated tipping bucket gauge measurements.

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