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Impact of measurement deficiencies on quantification of cold season precipitation and its trends over Northern Eurasia

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Instead of "ground truth" precipitation, rain gauges at meteorological stations estimate a function of several variables. In addition to precipitation, these variables include temperature,wind, humidity, gauge type, state of the gauge exposure, and observational practices. Their impact and changes hamper our efforts to estimate precipitation changes alone. For example, wind-induced negative biases for snowfall measurements are higher than for other precipitation types and a redistribution of these types during regional warming can cause an artificial increase in MEASURED precipitation. In such conditions, the only way to properly estimate actual climatic changes of precipitation would be a use of precipitation time series that are corrected for all known systematic biases. Methodology of such corrections has been developed and recently implemented for Northern Eurasia for the past 50+ years (up to 2010). With the focus on Russia, we assess differences that emerge when officially reported precipitation in the cold season is compared to corrected precipitation time series at the same network. It is shown that conclusions about trend patterns over Russia are quite different when all sources of inhomogeneity of precipitation time series are removed and impact of all factors unrelated to the precipitation process are accounted for. In particular, we do not see statistically significant increases of the cold season precipitation over most of the Russian Federation and in the Far East Russian Arctic it significantly decreases.