Figure 8. Upper panel: Time series of snowfall rates retrieved from ACR reflectivities and observed. Lower panel: Corresponding time series of ACR reflectivities. Each time index indicates a 2.8 s observation by the ACR. Snowfall rates retrieved for the ACR used the reflectivity in the range bin nearest the surface, at 197 m AGL.

h⁻¹, 50% for rates up to 0.5 mm h⁻¹, and 30% for rates larger than 0.5 mm h⁻¹ by Wood et al. (2014) based on comparisons against a Precipitation Occurrence Sensor System.

To evaluate the importance of each source of uncertainty, variances from each of the sources from Eq. (19); (retrieved state, microphysical parameters, fallspeed parameterization, or exponential distribution) were extracted separately, then fractions of total variance were calculated. To allow the trends in each source to be shown as a function of snowfall rate (Fig. 11), the fractions were binned by snowfall rate and averaged. As snowfall rates increase up to 0.5 mm h⁻¹, the variance due to the retrieved state becomes a more significant contributor to the total variance, while the contributions from the other sources diminish. The contribution due to the assumed exponential PSD shape is not significant.

The instantaneous uncertainties for snowfall rate include uncertainties due to random errors and biases in the retrieval components and observations. For accumulations or mean rates evaluated over longer time periods, errors due to random sources may be reduced and remaining errors can be more representative of biases in the retrieval. The reductions in random errors depend on their correlations in time, however (e.g., Taylor, 1997). When random errors within events are assumed perfectly positively correlated, end-of-event $P_{ACR}$ accumulations have fractional uncertainties from 1.5% to 52.4% (Fig. 12). In actuality, the random error sources likely decorrelate with increasing separation in time. While the scales for these decorrelations are not known, with even a modest amount of decorrelation in the errors the uncertainties are reduced substantially. After applying a negative exponential decorrelation model with a decorrelation scale of 0.5 hour to intra-event errors, the fractional uncertain-