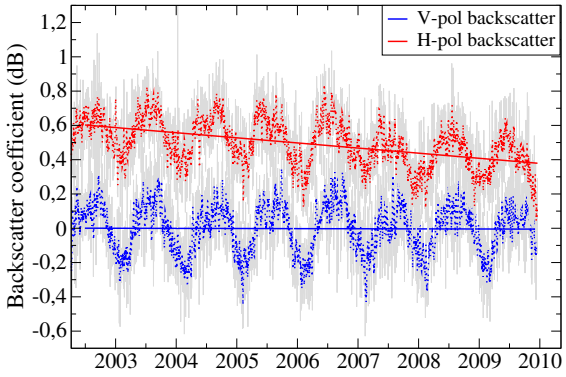
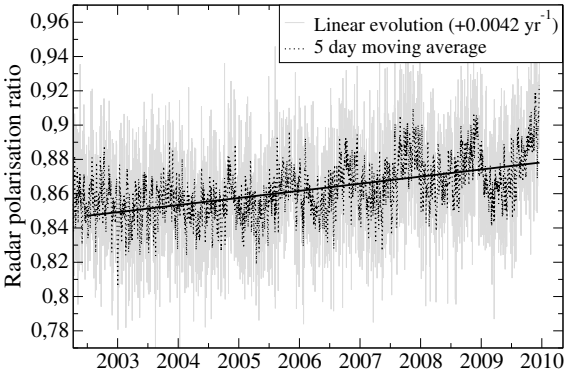


(a) Vertical and horizontal backscatter coefficient.



(b) Radar polarisation ratio.

Figure 7. Time series of the residual vertical and horizontal backscattering coefficients, and the radar polarisation ratio, from QuikSCAT at Dome C, Antarctica, from 18 June 2002 to 23 November 2009. Grey lines are the original data and red, blue and black dots are the 5 day moving averages. Note the different vertical axis scales for H-pol and V-pol.

5.5.1 Uncertainty assessment

We use here the signal-to-noise ratio (SNR) to characterize the significance of our results. SNR is the ratio between the mean of the observed data over the standard deviation of the background noise. In our time series of surface snow density, we assume that the standard deviation of quick variations as noise even though part of it may be a natural signal. That gives an upper limit of the noise. We found a SNR of 5.9. This value is high enough to conclude that a real signal emerges from the noise and thus the negative trend of surface snow density is significant at Dome C. Furthermore, the spatial variability of surface snow density (41.6 $\mathrm{kg\ m^{-3}}$) was measured near Concordia Station which is smaller than the standard deviation of the retrieved density (63.5 $\mathrm{kg\ m^{-3}}$). That indicates that variations of the retrieved density are not only due to the spatial variability. However, the spatial variability is not directly taken into account in the retrieved density. That results in uncertainties in the retrieved density (Brucker et al., 2011; Picard et al., 2014). In the last study, the authors found an alternation every 15–25 m of dense/hard snow and light/loose snow areas. They found smaller density variations at larger scales which indicate that the