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Authors' reply — Bunde *et al.* argue that, by not accounting for long-term persistence in the Byrd temperature time series, we underestimated the uncertainty of the temperature trends and thereby overestimated the statistical significance of the warming. Below we lay out the reasons why we disagree with their comment.

First, we point out that considering time series as first-order autoregressive processes (as we did), and thus accounting only for short-term persistence, is a commonly used approach in the peer-reviewed climate literature. It is the method employed in the Intergovernmental Panel on Climate Change Fifth Assessment Report (Chapter 2) for estimating trend significance. It is also important to note that we do not draw any conclusion regarding the attribution of the warming to either natural or anthropogenic causes — an issue still largely unresolved in West Antarctica — whereas the question of attribution is at the core of many studies on long-term persistence in geophysical records. In our study, 'statistically significant' should be understood as 'exceeding the range of the interannual variability characteristic of Byrd temperatures during 1957–2011'. Analyses of ice-core temperature proxy records from West Antarctica emphasize the importance of placing West Antarctic temperature trends in the context of past centuries and millennia[1,2].

Second, Bunde *et al.* fail to acknowledge the uncertainty surrounding the value of the Hurst exponent (α, which they assume to be 0.65) that they use to quantify long-term persistence in the Byrd record. Although this value may be 'typical for continental surface air temperatures' in lower latitudes, it is not clear whether it is also typical of continental Antarctica. To shed light on this question (within the limited scope of this reply), we applied the DFA2 method used by Bunde *et al.* to other long-term Antarctic temperature records (obtained from the Antarctic READER archive[3]). We found an α-value of 0.65 in the Byrd data set (with both the original and revised versions of the record; see end of text), as reported by Bunde and colleagues. For the other two continental stations (South Pole and Vostok), however, we found lower α-values (of 0.51 and 0.56, respectively), closer to white noise, and indicative of the absence of long-term persistence, characterized by an α-value of 0.5. This raises several questions. Is the higher α-value at Byrd 'abnormal' in the context of Antarctica? Does it stem from a real contrast in long-term persistence between East and West Antarctica, as has been previously suggested[4]? Or does it simply result from the non-linearity of the temperature trend at Byrd (the apparent 'plateau' since the early 1990s) to which DFA2 is known to be sensitive[5]?

We expanded this short analysis by applying DFA2 to the monthly mean near-surface temperature output of ~150-year long simulations (historical experiment, run 1) from two global climate models (MPI-ESM-MR and HadGEM2-ES) that formed part of the Coupled Model Intercomparison Project Phase 5 (CMIP5)[6]. At Byrd's location, α = 0.53 in the two models — again, a value that is close to that of white noise. This estimate of α is lower than suggested in a previous one-model study[4]. By no means do we claim that the two CMIP5 simulations provide the best estimate of long-term persistence at Byrd. They simply further underscore the fact that the α-value for this particular site is poorly constrained, that the 'true' value may be lower than 0.65, and therefore that ignoring long-term persistence in the trend estimates may be appropriate.

In summary, although accounting for long-term persistence in the Byrd temperature record is certainly desirable[7], we believe that it is premature at this point, given the uncertainty surrounding its quantification. Our decision not to account for long-term persistence in the error bars of the temperature trends reflects the understanding (or lack thereof) of West Antarctic climate variability. These error bars are certainly not final and may be revised as understanding progresses. Regardless, we are pleased to see that our reconstructed Byrd record can foster investigation of this important issue, to which the comment of Bunde *et al.* undoubtedly contributes. We thank these authors for their interest.

Finally, we wish to draw attention to the revised version of the Byrd record that was recently released[8]. These revisions, however, have no bearing on the arguments discussed here. ❐

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