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# Is the storminess in the Twentieth Century Reanalysis really inconsistent with observations? - A reply to the comment by Krueger et al. (2013)

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In a recent study of trends and low frequency variability of extra-tropical cyclone activity in the ensemble of Twentieth Century Reanalyses, we concluded that "For the North Atlantic-European region and southeast Australia, the 20CR cyclone trends are in agreement with trends in geostrophic wind extremes derived from in-situ surface pressure observations". This conclusion has been challenged by Krueger et al. (2013), because a recent study (doi:10.1175/JCLI-D-12-00309.1, by the same lead author) comparing annual 95th percentiles (P95) of geostrophic wind speed (geo-wind) derived from surface pressure observations and from the 20CR found that "20CR-geostrophic storminess deviates to a large extent from the observation-based curve" in the period prior to 1950.

In this reply, we show that our conclusion is valid; and we clarify that several factors contribute to the reported inconsistencies between the 20CR and observation-based geo-wind extremes. These include the choice of index that is used to represent time variation in extremes (e.g., annual versus seasonal percentiles), the use of different sampling intervals (6-hourly versus 3-hourly), and some very large errors in the observations that were not identified, nor corrected or excluded in any of the previous studies of observation-based geo-wind extremes. We show that the time series of consecutive seasonal P95 geo-winds derived from the observations and from 20CR are in good agreement all the way back to about 1893, with some deviation in the pre-1893 period for which the observations (especially digitized data) remain limited and are more uncertain. The correlation between the 20CR and observation-based geo-wind extremes (P95) time series for the whole 134-yr period is highly significant statistically, with and without the correction or exclusion of the newly identified erroneous SLP values. The agreement between 20CR and observations is further improved after the correction or exclusion of the newly identified erroneous SLP values.