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Comment on "Discussions on common errors in analyzing sea level accelerations, solar trends and global warming" by Scafetta (2013).

R. E. Benestad

Norwegian Meteorological Institute, Oslo, Norway

Correspondence to: R. E. Benestad (rasmus.benestad@met.no)

Scafetta (2013; hereafter S13) presented a discussion of "common errors" in applying regression models and wavelet filters, based on a review of Benestad and Schmidt (2009; BS09) about the effect of solar forcing on the global mean temperature. One of the conclusions of his analysis was that "the solar activity increase during the 20th century contributed at least about 50 % of the 0.8 °C global warming observed during the 20th century instead of only 7–10 %". This conclusion is in error because it is based on a misrepresentation of the previous work.

The regression analysis discussed in BS09 is misrepresented in the papers of S13, however. In the abstract of BS09, it is stated that "We demonstrate that naive application of linear analytical methods such as regression gives nonrobust results". The paper iterates this point further: "The regression analysis ... should in this context be regarded as a naive approach that is prone to yielding biased results, and we caution against using such techniques without a critical interpretation". To reiterate this point for the third time, BS09 reads: "Here we use the regression to demonstrate how spurious results may arise from colinearity and 'noise' by examining the variability in the coefficients".

The very same demonstration referred to above was presented in the papers of Scafetta (2013; S13): "An improper application of the multilinear regression method is found in Benestad and Schmidt (2009), indicated herein as BS09". S13 further misrepresented BS09 by stating, "The first way BS09 multi-linear regression fails is mathematical. The predictors of a multilinear regression model must be sufficiently linearly independent, i.e. it should not be possible to express any predictor as a linear combination of the others" without pointing out that this was exactly the point made in BS09 too.

While the purpose of BS09 was to show why such methods fail, S13 turned this around and accused BS09 of inappropriate use of this method. Hence, the way Scafetta refers to BS09 is incorrect, and the readers should read the original paper and make up their own mind[1].

Moreover, S13 did not give BS09 the credit for using the regression coefficients as a means for evaluation of the method, or what Scafetta referred to as the "scaling factors". BS09 examined their values and argued that values difficult to reconcile with physics provided an additional indication of flaws.

S13 misrepresented BS09 by giving the impression that a multiple regression with 10 covariates was used to estimate the solar contribution to the recent warming. The regression analysis in BS09 used for comparing climate models and observations only included two co-variates. S13 made no mention of this fact, and gave a false impression that a regression with 10 covariates was used for the comparison and the conclusion of a 7 % solar contribution.

The choice of boundary settings for the wavelet analysis discussed in S13 does not affect the conclusions of BS09, and the analysis has been repeated with the same settings as in Scafetta and West (2006). The reason for using different types of boundary conditions in BS09 compared to Scafetta and West (2006) was insufficient information about the details of the analysis. Furthermore, the analysis not only used wavelets for band-pass filtering, but also included other approaches, and the conclusions were not sensitive to the choice of filtering strategy, as explained in BS09. Moreover, BS09 argued that the problem was something

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[1]Freely available from NASA: http://pubs.giss.nasa.gov/abs/be02100q.html

else: "taking the relative magnitudes between two band-passfiltered signals, does not identify a true connection between the two". Scafetta and West (2006) had estimated the effect of solar variability on earth's temperature by first band-pass filtering over 14.7–29.3 yr (in addition to 7.3–14.7 yr), and then by taking the ratio of the standard deviation $\sigma_{\text{temp}}/\sigma_{\text{sun}}$ for the band-pass filtered series as a measure of the response. By adopting this ratio, Scafetta and West (2006) implicitly and incorrectly assumed that no other factors were involved with timescales of 7.3–29.3 yr, and that all of the temperature changes with those timescales were due to changes in the sun.

Likewise, S13 lacks information about how the regression model was calibrated, which makes his claim difficult to verify (he argues that the solar contribution of the global warming between 1900 and 2000 is similar to the anthropogenic forcings). It seems that the calibration over such a short interval of 1980–2003 ("when the data are more accurate") is likely to miss the long-term changes due to changes in the greenhouse gas concentrations, masked by the short-term fluctuations.

S13 further made reference to "outdated hockey-stick paleoclimatic temperature graphs" with no factual support. Contrary to the assertions made in S13, the "outdated hockey-stick paleoclimatic temperature graphs" were presented in the most recent IPCC assessment report (Solomon et al., 2007). S13 also made a number of statements about the sea level; however, this aspect is not considered here in this comment.

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