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Climate of the Past Discussions

Interactive comment on "Technical Note: Are large error bars desirable? A note on quantitative model-proxy comparison" *by* J. Liakka et al.

Anonymous Referee #2

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This note proposes the use of the overlap coefficient OVL to compare proxy-based and modeled distributions of a quantity of interest - let's call it temperature. There are a number of measures of the difference between two distributions - e.g., the Kolmogorov-Smirnov, Anderson-Darling, Cramer-von Mises statistics. Although these provide a basis for testing the null hypothesis that two samples arose from the same distribution, their values themselves are not useful as interpretable measures of the degree of difference. This is the main advantage of the OVL - it takes values between 0 (no overlap) and 1 (perfect overlap).

What is not so clear is whether the proxy-model agreement question is one that is appropriately addressed by the OVL. Let's consider a simple example. A climate model is used to predict the temperature at a particular location during a particular historical

period. Rather than running the model once, an ensemble of simulations is produced to account for uncertainty in, say, an initial condition. This provides a distribution of temperatures. The variability in this distribution reflects uncertainty in the initial condition. Next, a proxy record is used to reconstruct the same temperature. Rather than producing a point estimate, the sampling distribution of this estimate is produced. This distribution reflects, among other things, measurement error in the proxy. Suppose further that the model is 'correct' up to uncertainty in the initial condition and the proxy estimate is unbiased. There is simply no reason to expect that - apart from the means agreeing - the two distributions should be alike. They reflect quite different sources of variability. Suppose, for example, that the measurement error in the proxy has very small variance so that the sampling distribution of the proxy estimate is tightly concentrated around the true temperature. But suppose that the uncertainty (or sensitivity to) the initial condition is large, so that the ensemble distribution, although centered at the same temperature, has large variance. In this case, the OVL will be close to 0 (because the probability density of the proxy will be close to 0 for most of the support of the ensemble distribution).

To be sure, there may be cases where the goal of the study is to produce the actual distribution of a quantity - for example, the distribution of flowering times of particular plant or the size distribution of a particular fish. My concern about this paper is that the authors have focused almost exclusively on the method with minimal consideration of the questions to which the method may provide an answer.

Interactive comment on Clim. Past Discuss., 10, 4535, 2014.