



A STATISTICAL ANALYSIS OF MULTIPLE TEMPERATURE PROXIES: ARE RECONSTRUCTIONS OF SURFACE TEMPERATURES OVER THE LAST 1000 YEARS RELIABLE?

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Abstract

Predicting historic temperatures based on tree rings, ice cores, and other natural "proxies" is a difficult endeavor. The relationship between proxies and temperature is weak and the number of proxies is far larger than the number of target data points. Furthermore, the data contain complex spatial and temporal dependence structures which are not easily captured with simple models. In this talk, I will show that the proxy signal is too weak to reconstruct important features in the instrumental temperature record significantly better than sophisticated random series generated independently of temperature. Furthermore, various model specifications that perform similarly at predicting temperature produce extremely different temperature histories. Finally, the proxies seem unable to forecast the high levels of and sharp run-up in temperature in the 1990s either in-sample or from contiguous hold-out blocks, thus casting doubt on their ability predict such phenomena if in fact they occurred several hundred years ago. Finally, I will discuss our own reconstruction of Northern Hemisphere average annual land temperature over the last millennium, assess its reliability, and compare it to those from the climate science literature. I will show that our model provides a similar reconstruction but has much wider standard errors, reflecting the weak signal and large uncertainty encountered in this setting.