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Annual time scale teleconnections between European and North American cool-season climate over the past millennium

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Studies using instrumental, historical / documentary based, and natural proxy data consistently indicate a subtle but significant role of tropical Pacific sea surface temperatures (SSTs)in modulating cool season North Atlantic circulation and European temperatures over past centuries. Most recently, Brönnimann et al. (2007, Clim Dyn.) used the gridded European temperature set of Luterbacher et al. (2004, Science) and documentary El Niño information to extend this connection back 500 years. Graham et al. (2007, Clim. Change) present evidence for this relationship through the past millennium and hypothsize that western cool season North American aridity and European warmth during Medieval times ($\sim$800 to 1300 AD) both resulted from persistent mid-latitude circulation changes forced in part by cool tropical SSTs.

The findings above imply that there should be contemporaneous cool season linkages between western North American precipitation and European surface air temperatures. We examine this idea through the past 500 years using the annually-resolved Palmer Drought Severity Index (PDSI) reconstruction of Cook et al. (2004, Science) and the seasonally-resolved European temperature reconstruction of Luterbacher et al. (2004,cf. Xoplaki et al. (2005; Geophys. Res. Lett.).

Our initial results show a clear association between extremes (20^{th} and 80^{th} percentiles) of wet or dry conditions in the far western US and a north-south dipole in European temperature anomalies consistent with known El Nino-related effects in both regions. That the relationship appears to be asymmetric is also consistent with some earlier findings (Fraedrich and Müeller, 1992, Int. J. Clim.; Merkel and Latif, 2002,

Geophys. Res. Lett.; Pozo-Vázquez et al., 2005, Int. J. Clim.). Our new findings also point to widespread and relatively strong associations between reconstructed regional European winter temperature and speleothem isotope data from which Medieval climate changes have been inferred. Together the results of our work and previous studies support a systematic impact of tropical Pacific SST on European climate both in the present and through past centuries. We will discuss the results described above and those being developed for other seasons and for individual epochs and give physical explanations for those teleconnections.