Incorporation of Pacific SSTs in a Time Series Model toward a Longer-Term Forecast for the Great Salt Lake Elevation

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ABSTRACT

A recent study identified a pronounced lagged relationship between the Great Salt Lake's (GSL) elevation and the central tropical Pacific sea surface temperatures (SST) at the 10–15-year time scale. Using this relationship, a principal component analysis of historical time series of SST and local precipitation (P) was used in the construction of a lagged regression model to predict first the GSL elevation tendency and, from there, the GSL elevation. The combined principal component–lagged regression model was able to replicate and forecast turnarounds in the GSL elevation—that is, where prolonged increasing trends were followed by persistent decreases and vice versa. The coupling of the two time series is somewhat different from previous nonparametric, nonlinear time series methods developed for shorter-term (1–2 year) forecasts of the GSL volume. Moreover, by not accounting for interannual variability in the model, a forecast for up to 8 years was feasible and was shown to intersect the 2009 and 2010 observations of the GSL elevation.