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Filling Gaps in Environmental Data Using Statistical Downscaling

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Abstract

Marine environmental time series may often have gaps for different reasons e.g. bad weather conditions. These gaps are in general a handicap for a consistent description of structure and functioning of marine ecosystems. The mesozooplankton time-series of the Archipelago Sea of Finland has a gap from 1985-1991. Here we present the preliminary results of a downscaling experiment applying several predictors to fill the gap in this time-series.

Statistical Downscaling

The idea behind statistical downscaling is to identify high correlations between the regional or local observations of interest and potentially important climate variables. The basic concept is sketched in Figure 1.

Predictand:
• *Acartia* spp. (1967-1995, gap 1985-1991)

Predictors:
• observed sea level pressure (SLP) field (NCAR,1899-1996) (Trenberth & Paolino 1980)
• hindcast sea level pressure field (SMHI, 1969-1998)
• hindcast sea level salinity field (SMHI, 1969-1998) (Kauker & Meier, 2003)

The model is designed to detect relationships between anomalies. If a relationship is detected, the missing values can be regressed by the predictor.
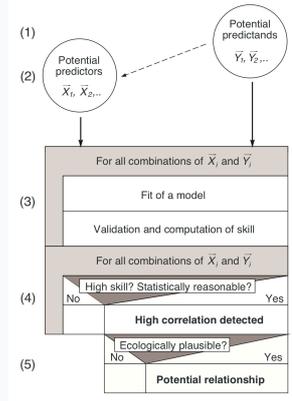
Figure 1: Method after Kröncke et al. (1998).

Results

Predictor:
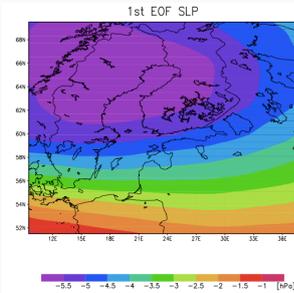
Figure 2: 1st EOF SLP hindcast (SMHI)
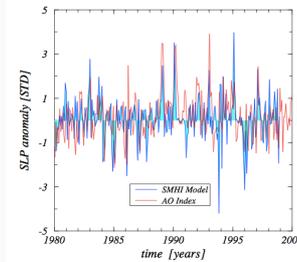
Figure 3: Time coefficients SLP (blue), Arctic Oscillation Index (red)

The model hindcast is in good agreement with the observed SLP field.

Interannual variability is controlled by climate variability.

Trends in *Arcatia* spp. seem to be controlled by salinity.

Downscaling Results:
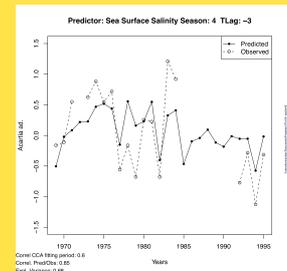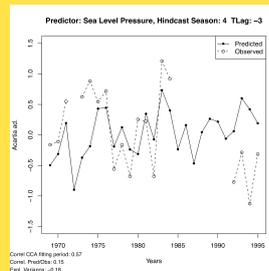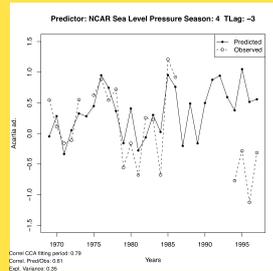
Conclusions

If a high skill between predictor and predictand can be identified, gaps in environmental time-series can be filled and the model can be used for future prediction. (e.g. Dippner & Kröncke 2003)

References
Dippner, J. W. and I. Kröncke (2003). Climate Research 25(2): 179-182.
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Kröncke, I., Dippner, J. W., Heyen, H., and Zeiss, B. 1998. Marine Ecology Progress Series, 167: 25–36.
Trenberth, K. E., and Paolino, D. A. Jr 1980. Monthly Weather Review, 112: 1999–2015.