Conference Poster, Published Version

Todt, M.; Bunzel, F.; Dobrynn, M.; Fröhlich, K.; Müller, Wolfgang; Baehr, Johanna

ENSO hindcast skill in the DWD - MPI-M - UHH seasonal prediction system

Zur Verfügung gestellt in Kooperation mit/Provided in Cooperation with:
Deutsche Meteorologische Gesellschaft, KlimaCampus Hamburg

ENSO hindcast skill in the DWD/MPI-M/UHH seasonal prediction system

M. Todt(1), F. Bunzel(2), M. Dobrynin(1), K. Fröhlich(3), W. Müller(2), and J. Baehr(1)

(1) Institute of Oceanography, Center for Earth System Research and Sustainability (CEN), Universität Hamburg, Hamburg, Germany, (2) Max Planck Institute for Meteorology, Hamburg, Germany, (3) Deutscher Wetterdienst (DWD), Offenbach, Germany; corresponding author: markus.todt@studium.uni-hamburg.de

1. Introduction & Model Setup

We analyse hindcast skill for ENSO in the joint seasonal prediction system of Deutscher Wetterdienst (DWD), Max-Planck-Institut für Meteorologie (MPI-M), and Universität Hamburg (UHH). The prediction system is based on the coupled earth system model MPI-ESM-LR, with the oceanic, atmospheric, and sea-ice components initialised from re-analyses. We analyse a hindcast ensemble between May 1981 to April 2015 with start dates every May and November, with 10 ensemble members running for 6 months each

2. Assessment of hindcast skill

In our analysis, we compare anomalies with respect to climatology for the bias-corrected hindcast ensemble-mean against the assimilation experiment (essentially resembling ERAinterim).

We quantify hindcast skill in terms of anomaly correlations (ACC) for the following variables: NINO3.4, Warm Water Volume (WWV, volume above 20C between 120E-80W and 5S-5N), SSH and spatially integrated zonal wind (NINO3.4 and WWV shown in Fig. 1).

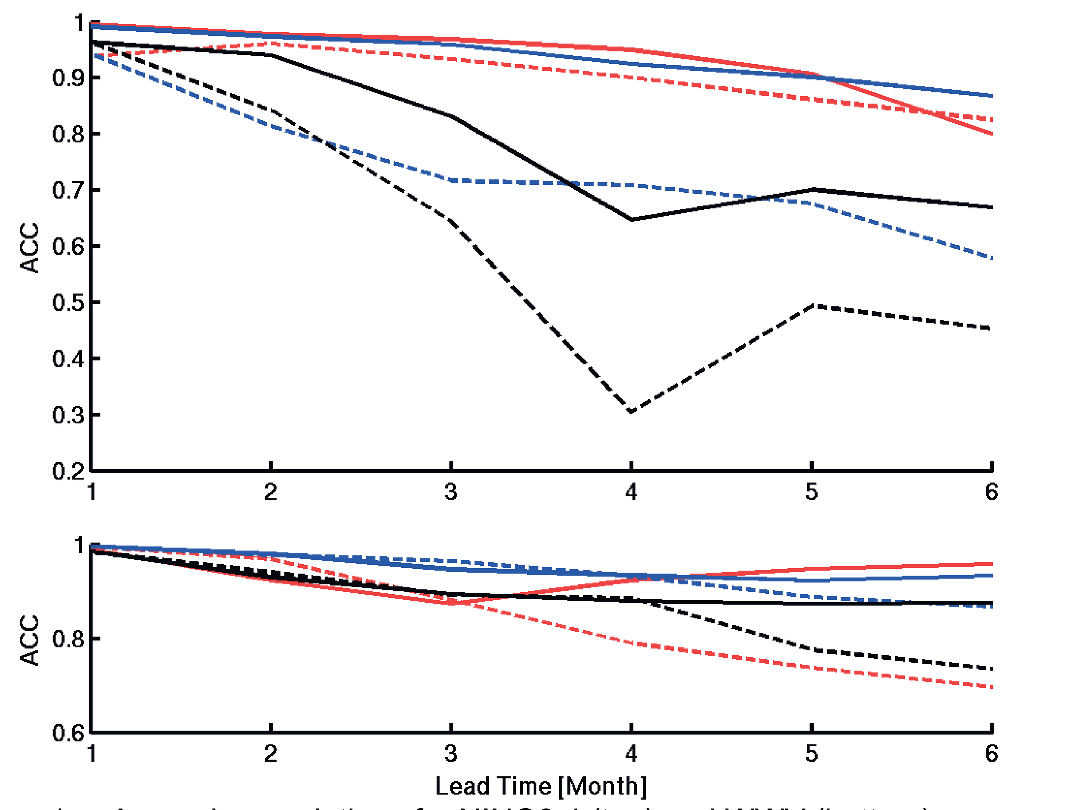

Figure 1 - Anomaly correlations for NINO3.4 (top) and WWV (bottom) considering 3 states: El Nino (red), neutral (black), and La Nina (blue). Solid lines indicate November start dates, dashed lines indicate May start dates.

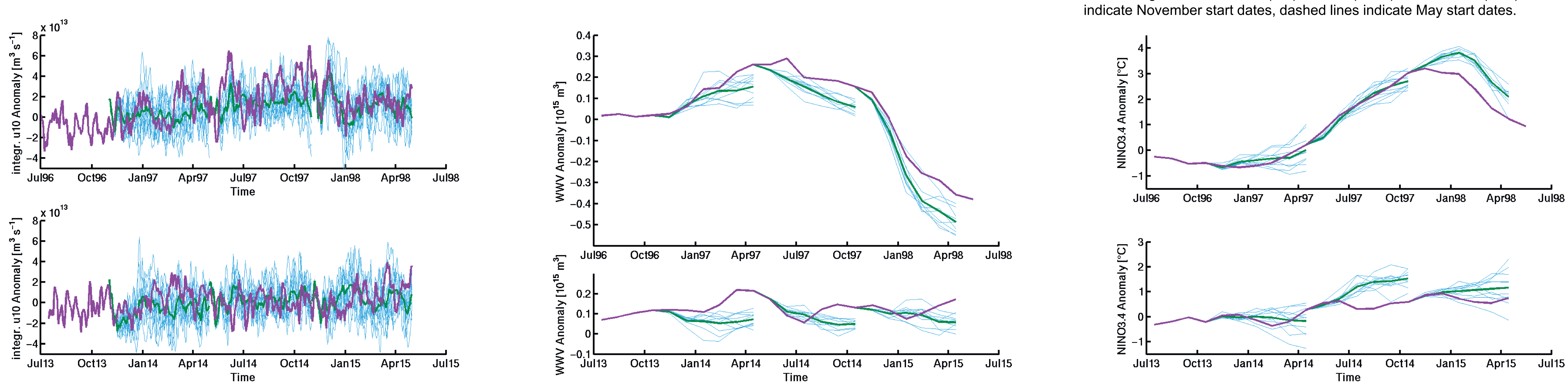

Figure 2 - Hindcast spread for the 1997 El Nino (top) and the 2014 borderline El Nino (bottom) regarding 3 variables: spatially integrated zonal wind (left), WWV (centre), and NINO3.4 (right). The violet line indicates the assimilation run, the green line indicates the hindcast ensemble mean, and the light blue lines indicate the hindcast ensemble members.

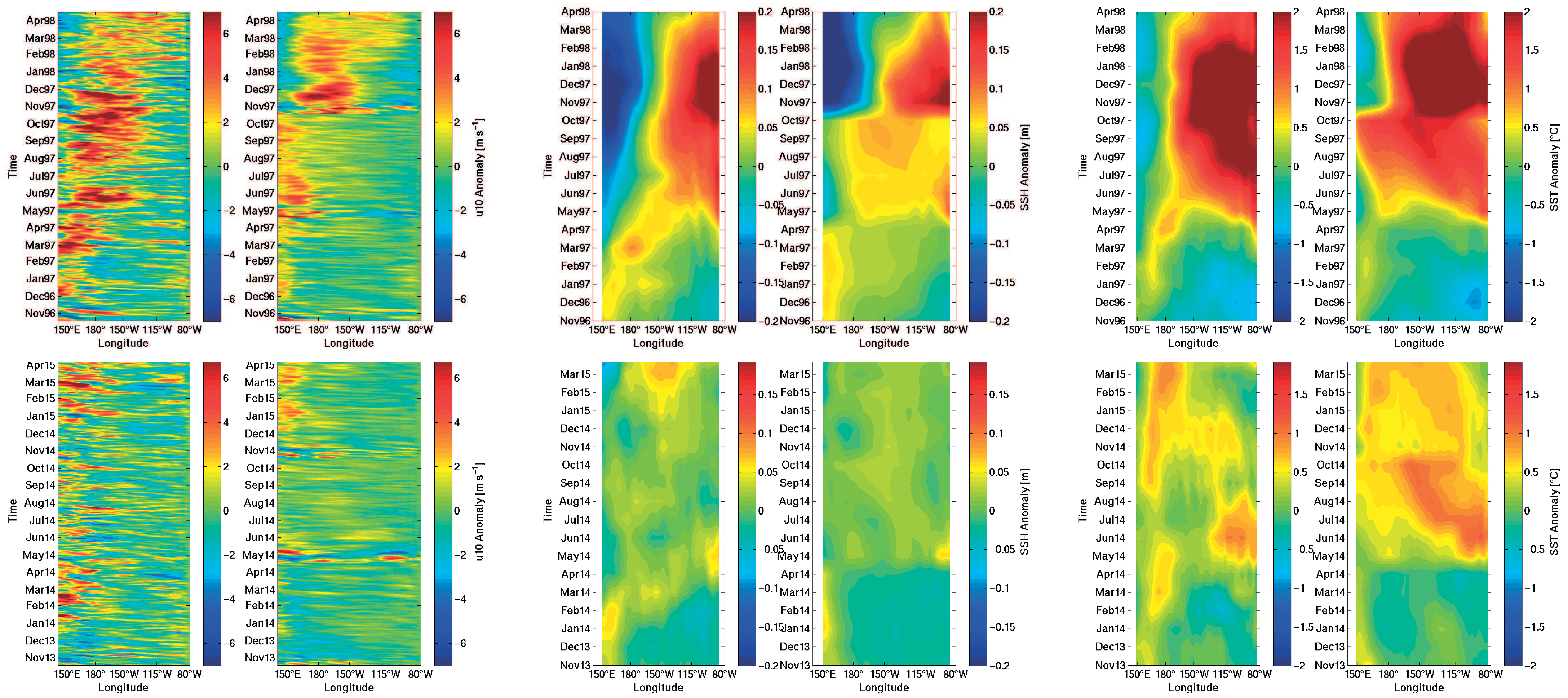

Figure 3 - Hovmöller plots for the evolution of the 1997 El Nino (top) and the 2014 borderline El Nino (bottom) regarding 3 variables: zonal wind (left), SSH (central), and SST (right)

3. Preliminary Conclusions

We find hindcast skill for both Nino 3.4 and WWV (Fig 1.), though the hindcast varies with start date (November start dates show generally higher hindcast skill than May start dates) and with the considered ENSO state (El Nino states show generally higher hindcast skill than La Nina or neutral conditions).
The hindcast ensemble resembles the magnitude and distribution of the wind variability shown in the assimilation experiment. Yet, the hindcast skill for zonal wind anomalies is limited to 2 to 3 months.

The comparison of the predictive skill for the strong 1997 and weak 2014 El Nino event shows (Fig. 2 and Fig. 3):
the 1997 El Nino with distinct movement of warm water masses and strong wind anomalies, resulted in strong SST anomalies, which the prediction system can reproduce
the 2014 El Nino with a weak upper ocean signal and short-term westerly wind anomalies, resulted in weak SST anomalies, which the prediction system mistakes for the start of a strong El Nino.