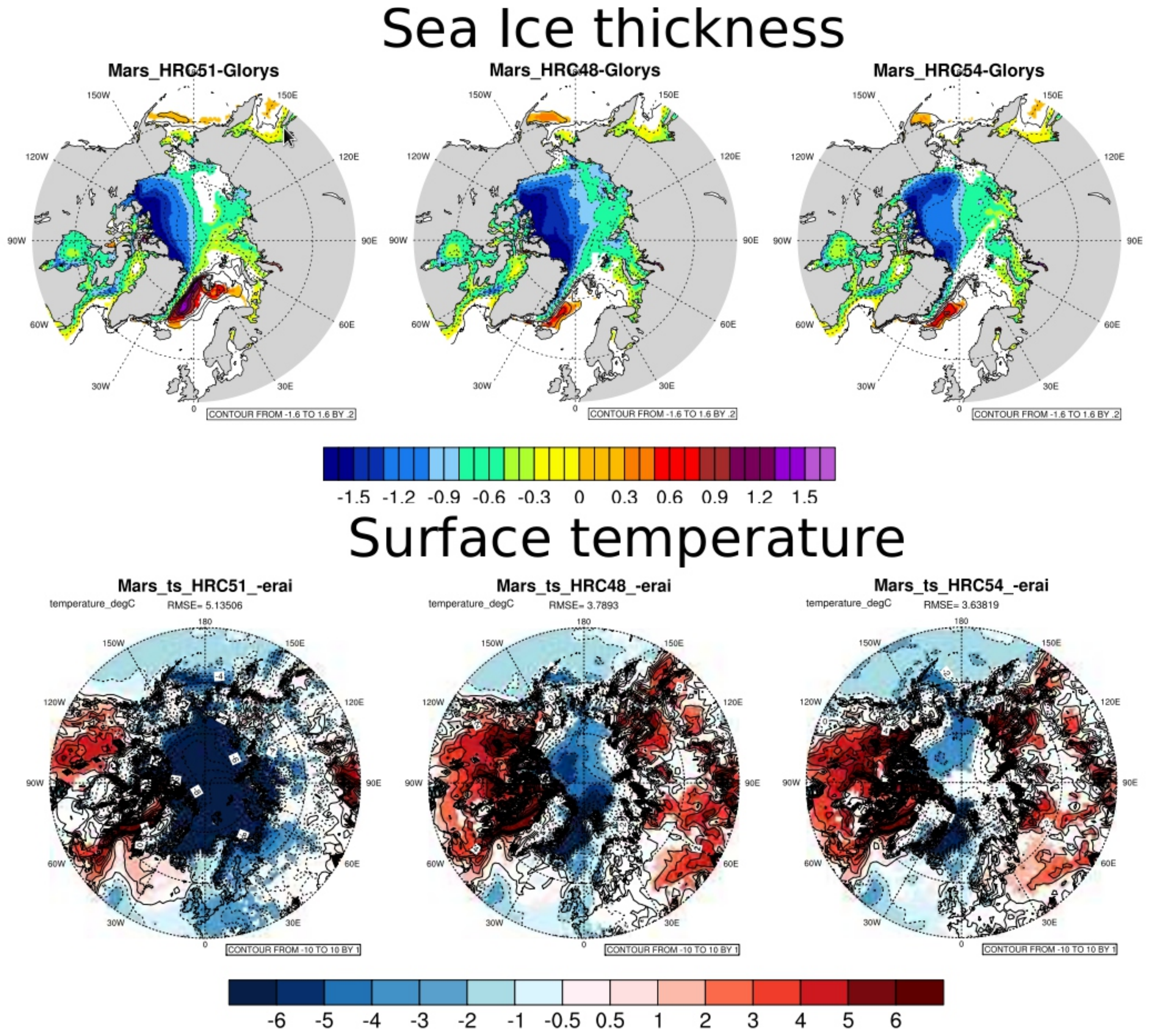

Figure 1: Sea ice thickness (m) and surface temperature (deg C) in a sensitivity study for the coefficient of intensity for the orographic gravity wave drag (GWDSE) in ARPEGE. HRC51, HRC48 and HRC54 have respectively GWDSE=0.01, 0.001 and 0.0001. For each simulation, the analysis is based on a run of 10 years. This analysis leads to the choice of GWDSE=0.001 for decadal runs, due to small surface temperature error and realistic sea ice thickness geographical distribution.

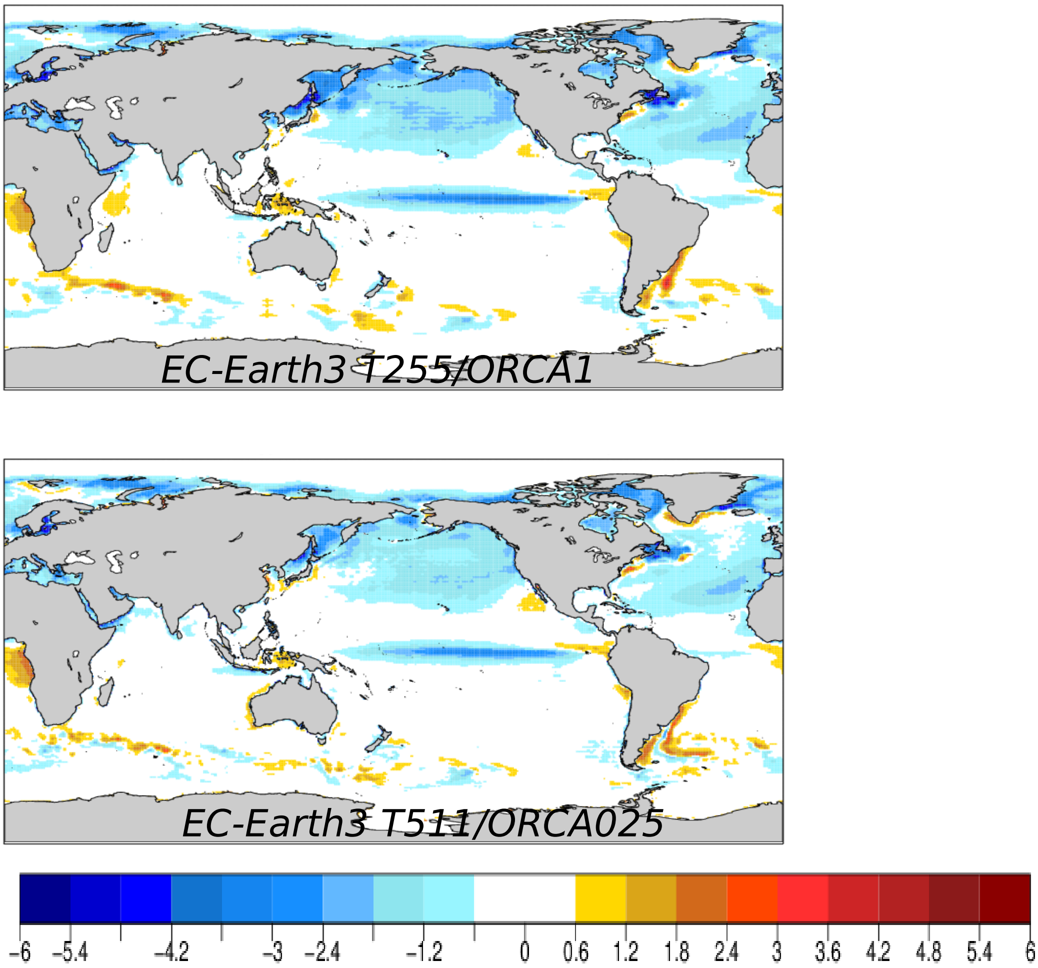

Figure 2: Mean SST (K) systematic error versus ERA Interim reanalysis for JJA, one-month lead predictions of EC-Earth3 T255/ORCA1 and T511/ORCA025. May start dates over 1993-2009 using ERA-Interim and GLORYS initial conditions. The higher resolution case give improved mean conditions, in particular over the North Atlantic and North Pacific.

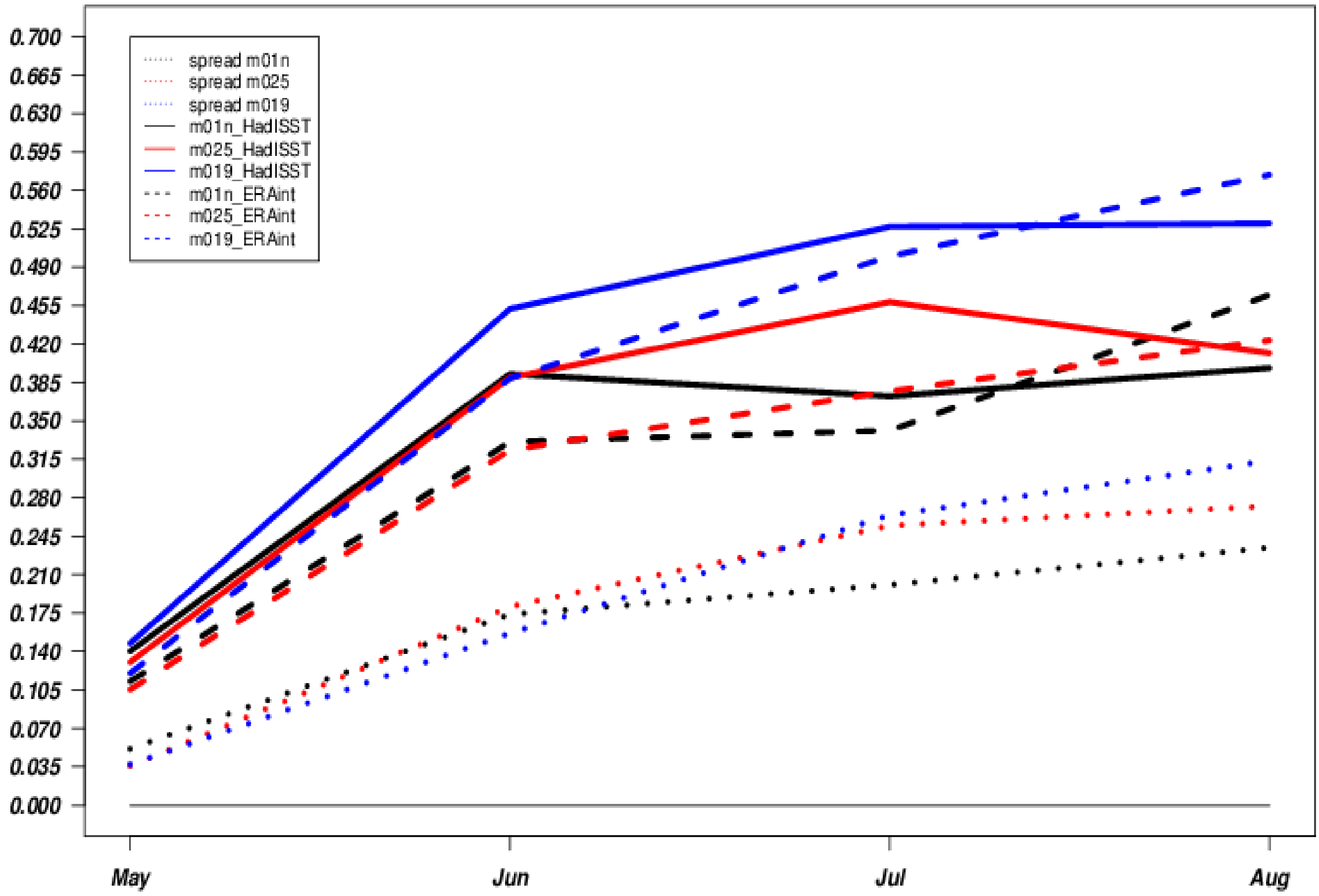

Figure 3: RMSE and spread of Niño3.4 SST (versus HadISST-solid and ERAInt-dashed) from four-month EC-Earth3 simulations: T255/ORCA1 (blue) , T255/ORCA025 (red) and T511/ORCA025 (black). May start dates over 1993-2009 using ERA-Interim and GLORYS initial conditions and ten- member ensembles. (Figure provided by C. Prodhomme, IC3). Higher resolved simulations show generally lower error and spread.

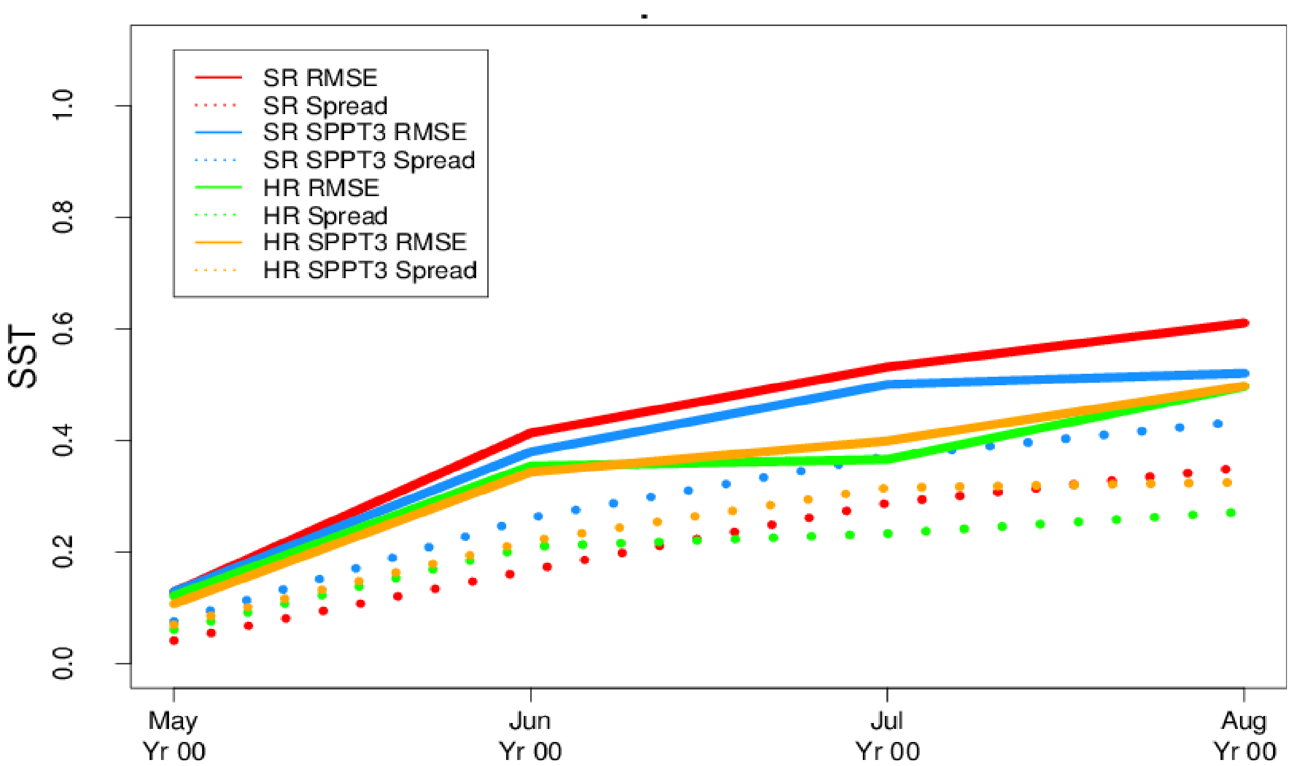

Figure 4: RMSE and spread of Niño3.4 SST (versus ERSST) from EC-Earth3 simulations: standard resolution (SR, T255/ORCA1), high resolution (HR, T511/ORCA025) without and with stochastic physics (SPPT3). May start dates over 1993-2009 using ERA-Interim and GLORYS and ten-member ensembles. Figure by L. Batté (Météo-France). The stochastic physics approach gives improved prediction skill for the low resoultion set-up, but not for the high resolution case.

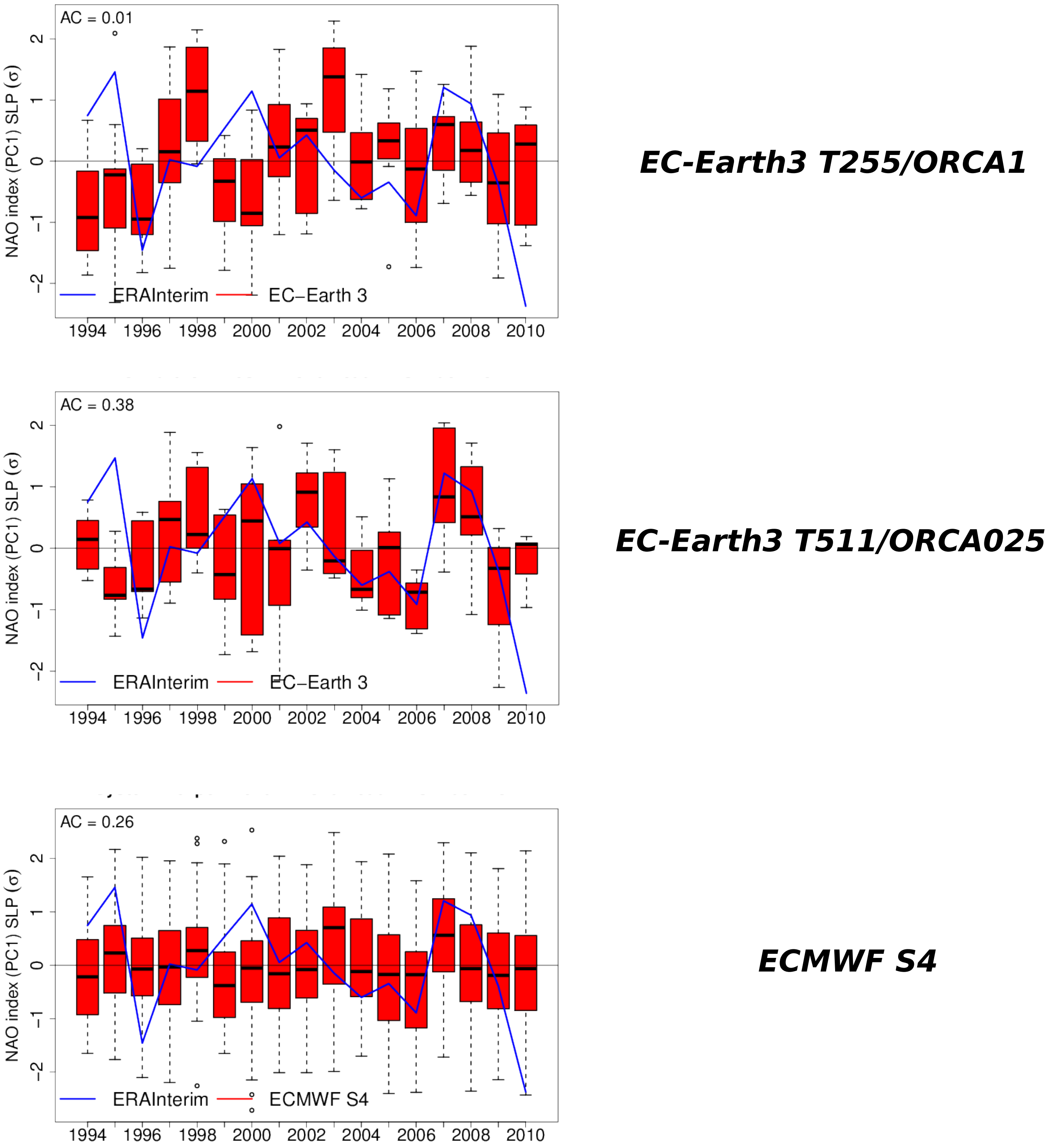

Figure 5: Predictions of DJF NAO with EC-Earth3 low and high resolution and ECMWF S4 started in November over 1993-2009 with ERA-Interim and GLORYS initial conditions and five-member ensembles. Correlation of the ensemble mean on top left. Figure by L. Batté (Météo-France). EC-Earth3 in the high resolution configuration gives the clearly best anomaly correlation (AC) values.

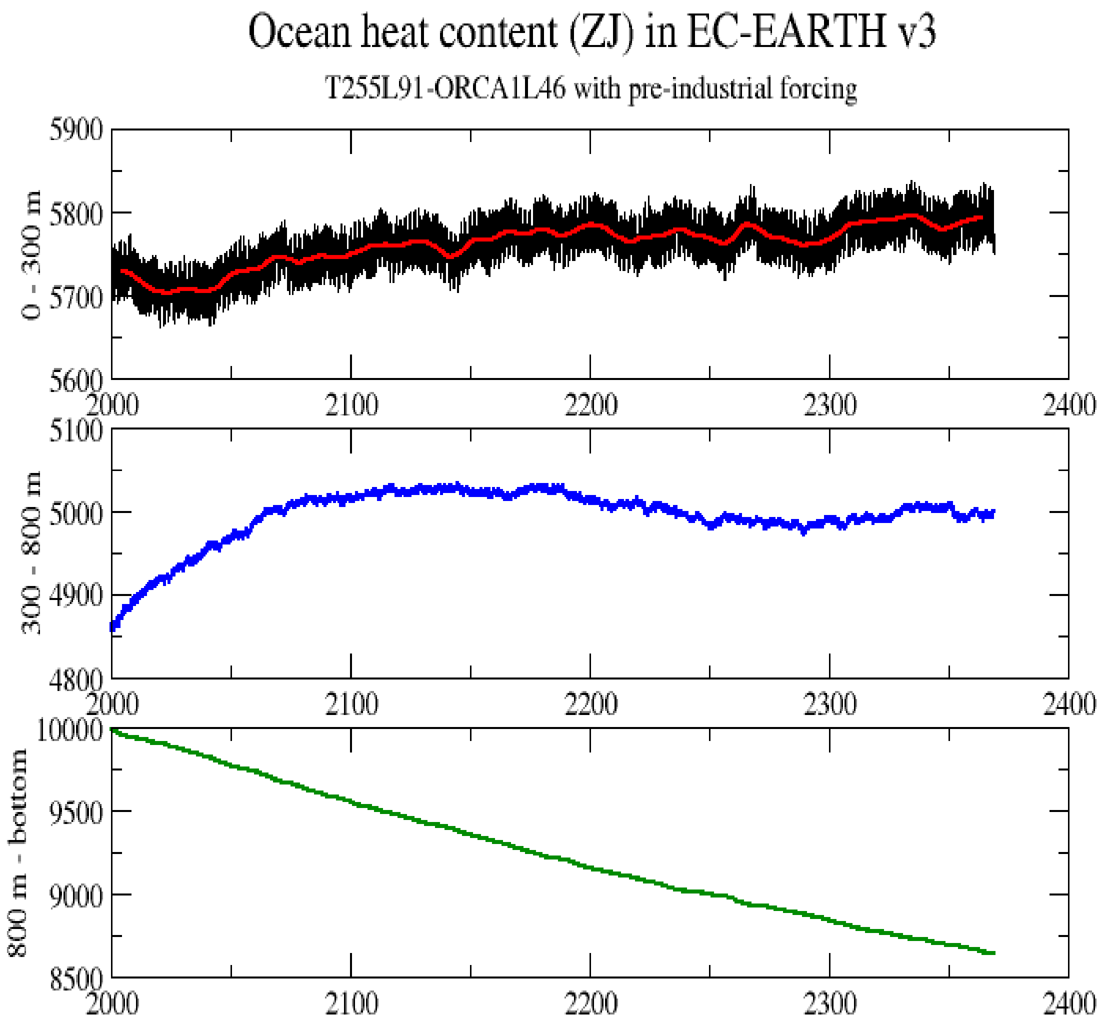

Figure 6: Timeseries of ocean heat content (in ZJ) in a long EC-EARTH simulation with constant pre-industrial forcing, model years are arbitrary. The top panel shows the heat content in the topmost 300 m of the ocean, the middle panel the heat content of the layer between 300 and 800 m, and at the bottom the heat content below 800 m depth. An 10-yr running mean has been applied to the heat content in the top layer (red line). The heat content of the top 800 m varies a lot during the first 80 years of the simulation, after that it stabilizes. The heat content of the deep ocean doesn't stabilize in the entire 380-year long simulation although the rate of change decreases slightly with the simulation length. Ocean states picked from this spin-up/control simulation after model year 2100 were later used for the initialization of the ocean in transient climate simulations.

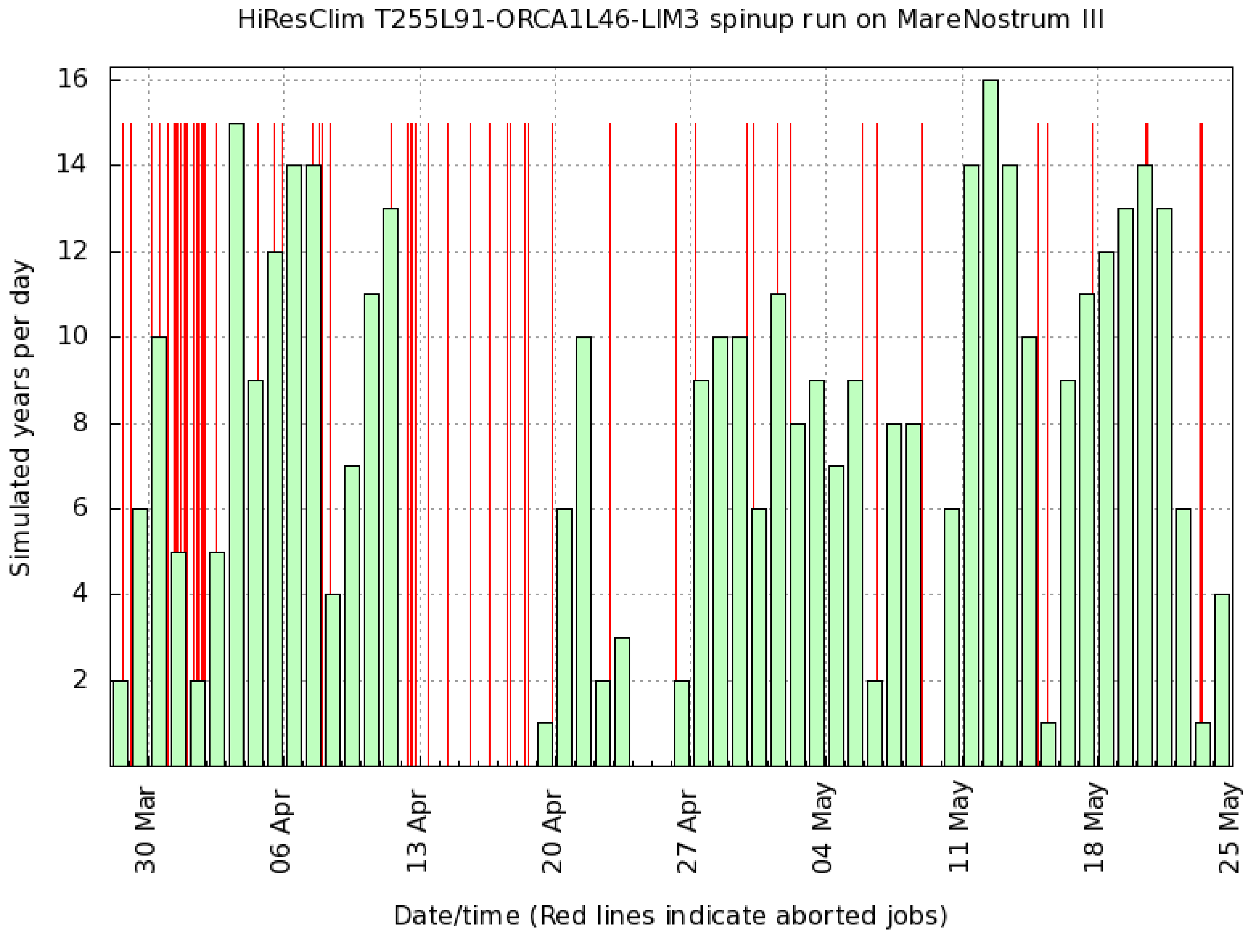

Figure 7: Time series of achieved performance for a spin-up run of EC-Earth T255-ORCA025-LIM3 with SYPD (simulated years per day) in green and job abort events indicated by red lines. The maximum of achieved SYPD is found at 16. It becomes clear that the maximum value is reached rarely and the actual SYPD (ASYPD), as the average over the green bars, is distinctly smaller.