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Supplement of

Investigating the impact of coupling HARMONIE-WINS50 (cy43) meteorology to LOTOS-EUROS (v2.2.002) on a simulation of NO$_2$ concentrations over the Netherlands

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Figure S1. Panel illustrating the comparison of the diurnal cycle of specific humidity, as measured at the Cabauw tower, with model levels obtained from both the ECMWF (a) and HARMONIE (b) models. The differences are quantified using the Root Mean Square Error (RMSE)
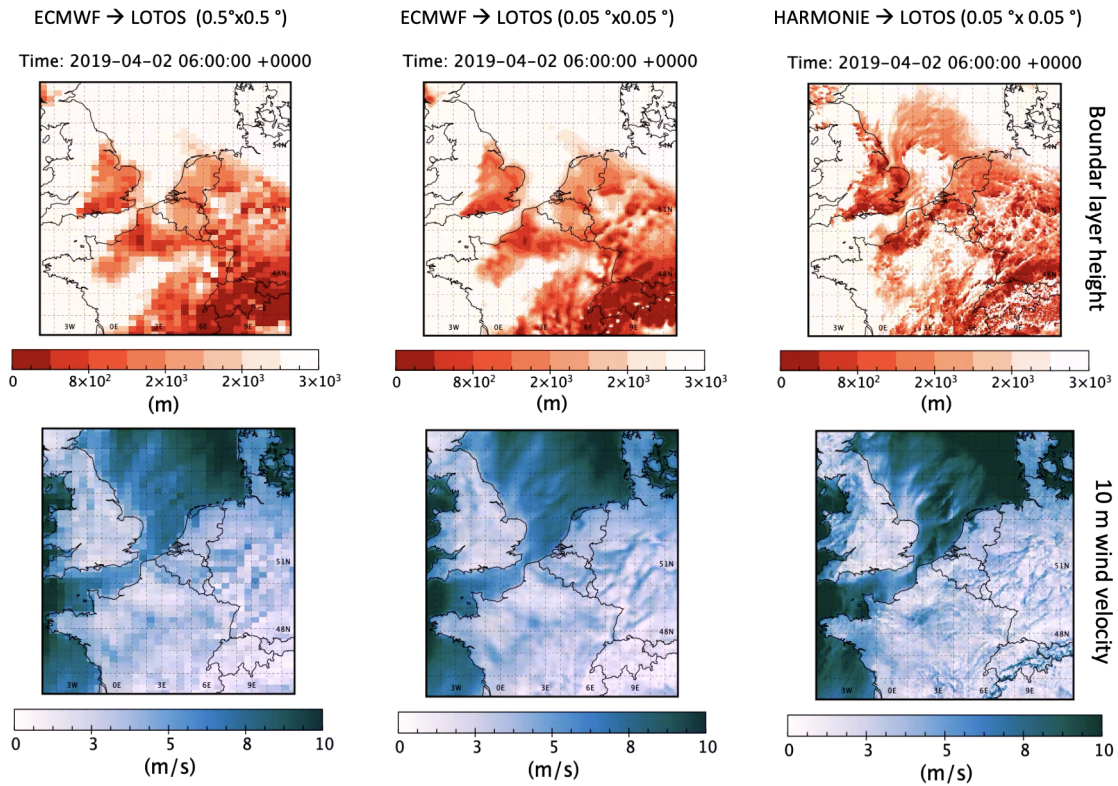
Figure S2. A comparison of the boundary layer and 10-meter wind velocity of ECMWF and HARMONIE interpolated to LOTOS-EUROS at different resolutions [0.5°, 0.05°] for April 2, 2019, at 6 UTC. The differences between ECMWF and HARMONIE indicate additional spatial structures using HARMONIE at the highest resolution, particularly in the North Sea region and mostly for boundary layer height
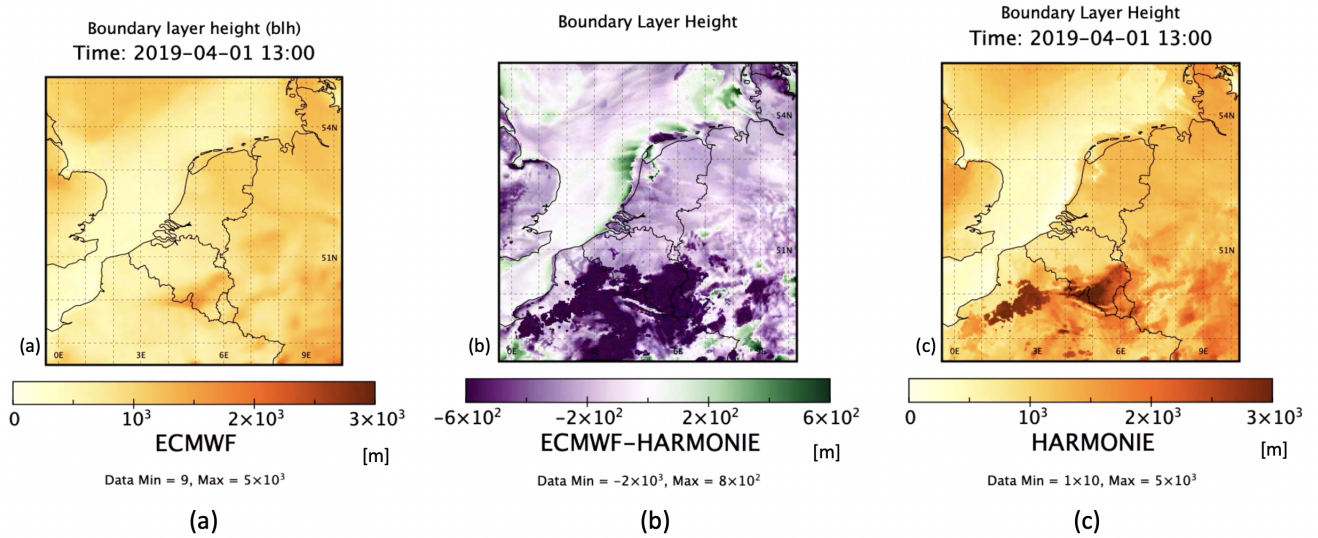
Figure S3. Boundary layer heights from ECMWF (a) and HARMONIE (c) as well as their difference (b) at the highest resolution of 0.025° × 0.025° indicating enhanced HARMONIE structural features for April 1, 2019 at 13 UTC
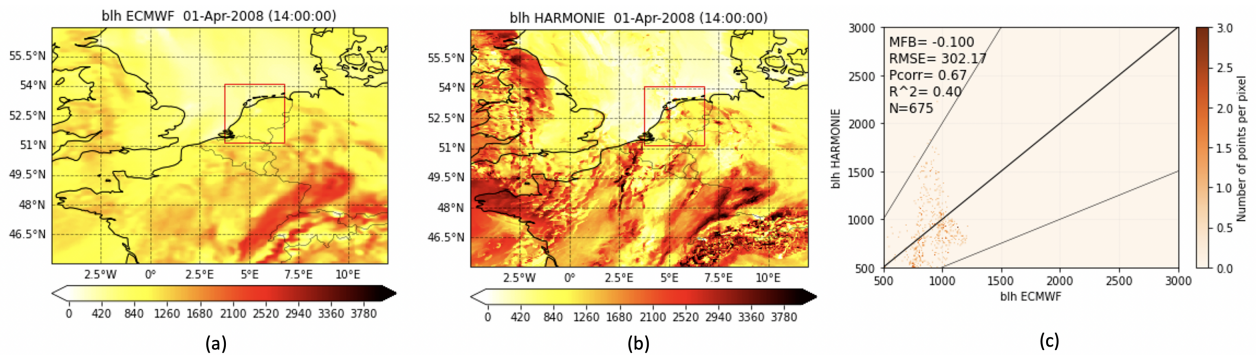

Figure S4. Boundary layer height of ECMWF (a) and HARMONIE (b) and their relationship quantified statistically (c) for the red square over the Netherlands. MFB = Mean Fractional Bias, RMSE = Root Mean Square Error, Pcorr = Pearson correlation coefficient as well R^2 the regression coefficient and N the number of pixels
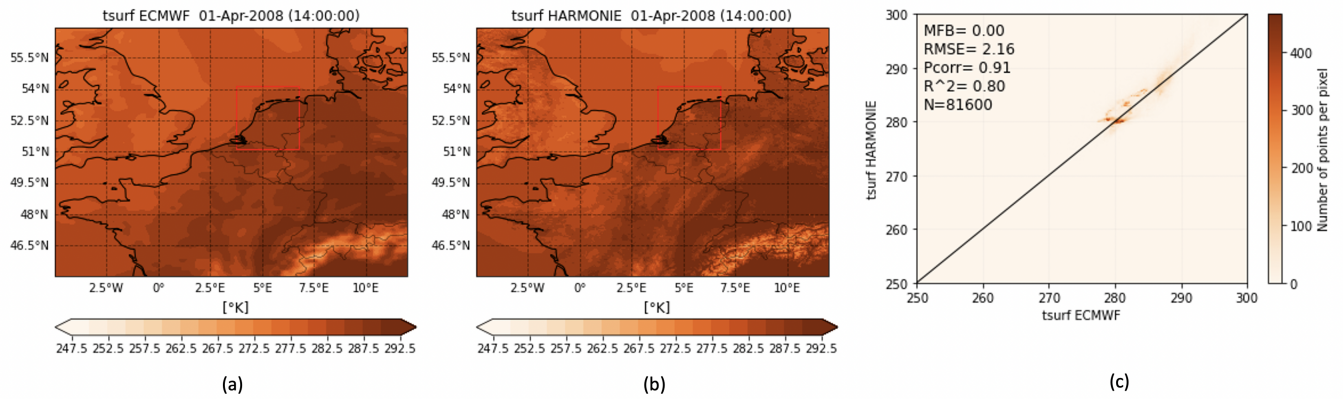
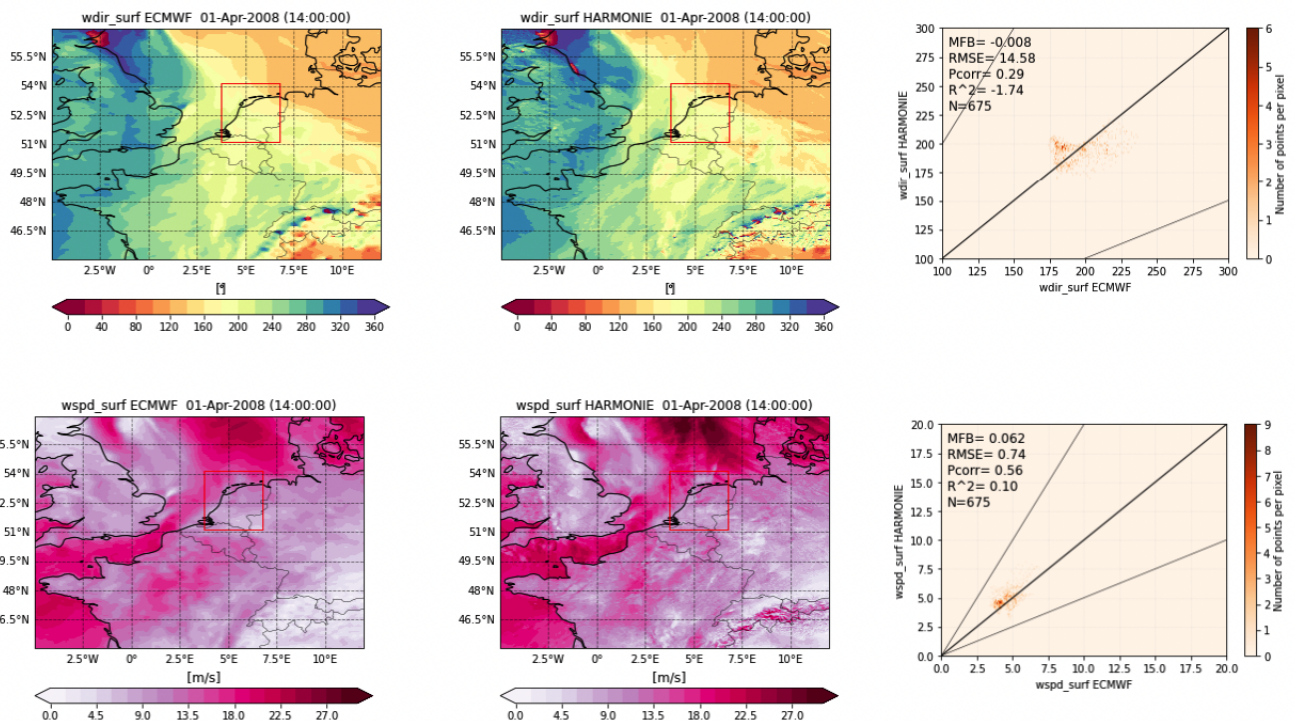**Figure S5.** As Figure 4 for surface temperature

Figure S6. As Figure 4 for wind direction (top panels) and wind speed (bottom panels)
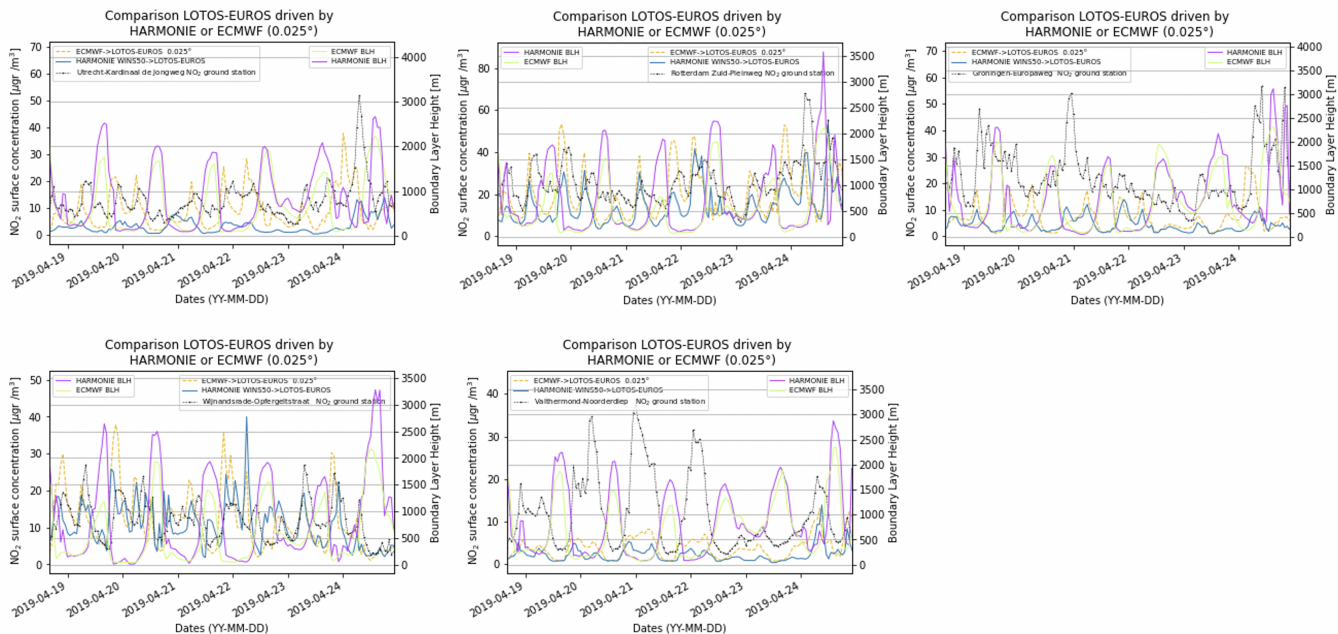
Figure S7. NO$_2$ concentrations of the two LOTOS-EUROS model configurations compared to the ground observations and to the boundary layer height for the time period April 19-25, 2019
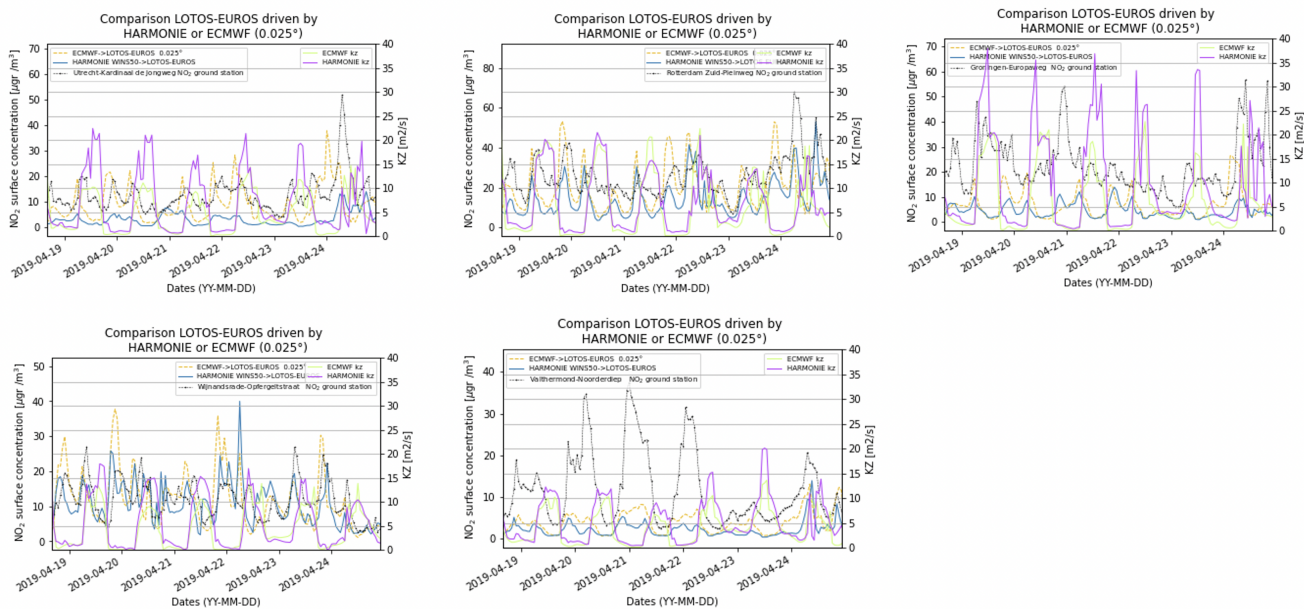

Figure S8. NO$_2$ concentrations of the two LOTOS-EUROS model configurations compared to the ground observations and to the Kz diffusion coefficient for the time period April 19-25, 2019