**Table 1:** Table 5 in Manuscript – Prior and posterior fit to data statistics for the inversion period 2013-2014. $R^2$ and RMSE are calculated monthly and averaged over this period. Values in brackets are the posterior fit statistics for the corresponding net flux inversions. *Weybourne data (from February to December 2013) is used for validation of the results only and is not included in the inversions.

| **DALEC inversion** | | | | | | |
|---|---|---|---|---|---|---|
| Measurement site | Prior $R^2$ | Posterior $R^2$ | Prior RMSE | Posterior RMSE | Prior mean bias | Posterior mean bias |
| Mace Head | 0.20 | 0.59 (0.54) | 2.88 | 1.53 (1.62) | -1.19 | 0.55 (0.38) |
| Ridge Hill | 0.26 | 0.67 (0.61) | 3.82 | 2.09 (2.30) | -1.27 | -0.10 (-0.05) |
| Tacolneston | 0.22 | 0.61 (0.56) | 3.92 | 2.20 (2.44) | -1.63 | -0.25 (-0.28) |
| Heathfield | 0.21 | 0.71 (0.58) | 4.07 | 1.88 (2.31) | -1.99 | 0.11 (0.21) |
| Bilsdale | 0.20 | 0.60 (0.55) | 4.62 | 2.02 (2.23) | -3.68 | -0.52 (-0.58) |
| Angus | 0.35 | 0.67 (0.63) | 3.09 | 1.28 (1.41) | -2.35 | -0.01 (0.00) |
| **Weybourne* | *0.13* | *0.31 (0.28)* | *6.17* | *5.08 (5.32)* | *2.89* | *2.25 (2.37)* |
| **JULES inversion** | | | | | | |
| Measurement site | Prior $R^2$ | Posterior $R^2$ | Prior RMSE | Posterior RMSE | Prior mean bias | Posterior mean bias |
| Mace Head | 0.29 | 0.66 (0.56) | 2.84 | 1.26 (1.44) | -1.33 | 0.16 (-0.01) |
| Ridge Hill | 0.33 | 0.67 (0.59) | 3.86 | 2.14 (2.41) | -1.14 | -0.21 (-0.05) |
| Tacolneston | 0.24 | 0.53 (0.52) | 4.06 | 2.71 (2.70) | -1.84 | -0.89 (-0.74) |
| Heathfield | 0.28 | 0.66 (0.57) | 4.07 | 2.14 (2.38) | -2.43 | -0.25 (-0.23) |
| Bilsdale | 0.33 | 0.61 (0.62) | 4.53 | 2.10 (2.19) | -3.60 | -0.96 (-0.82) |
| Angus | 0.43 | 0.67 (0.62) | 2.85 | 1.39 (1.55) | -1.78 | 0.43 (0.48) |
| **Weybourne* | *0.16* | *0.29 (0.23)* | *5.85* | *5.10 (5.49)* | *2.63* | *2.07 (2.56)* |

**Table 2:** Table S1 in manuscript - Annual UK net biospheric flux for June 2014 as estimated with an inversion using footprints disaggregated for 12, 24, 48 and 72 hours back in time, as well as an inversion using integrated footprints combined with monthly fluxes. DALEC NEE was used as the prior flux in this test.

| | |
|---|---|
| Prior | $-355$ |
| Posterior | |
| Integrated footprints | $79 \pm^{103}_{106}$ |
| 12-hour back footprints | $-207 \pm^{85}_{85}$ |
| 24-hour back footprints | $-356 \pm^{87}_{88}$ |
| 48-hour back footprints | $-382 \pm^{92}_{86}$ |
| 72-hour back footprints | $-412 \pm^{110}_{101}$ |

**Table 3:** Boundary condition test (for purposes of author response, not included in manuscript).

| | June 2014 | December 2014 |
|---|---|---|
| BC +1ppm | $-353 \pm^{94}_{90}$ | $107 \pm^{79}_{76}$ |
| BC used in inversions | $-356 \pm^{87}_{88}$ | $96 \pm^{64}_{56}$ |
| BC -1ppm | $-365 \pm^{94}_{91}$ | $89 \pm^{73}_{67}$ |