*Supplement of*

**A view of the European carbon flux landscape through the lens of the ICOS atmospheric observation network**

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| STILT station | Sampling height | r (all hours) | r (12, 15 CET) | Bias (all hours) | Bias (12, 15 CET) | RMSE (all hours) | RMSE (12, 15 CET) |
|---|---|---|---|---|---|---|---|
| BIR075 | 75 | 0.88 | 0.92 | -2.66 | -1.84 | 4.32 | 3.69 |
| CMN760 | 8 | 0.88 | 0.90 | -0.72 | -0.20 | 3.53 | 3.54 |
| GAT344 | 341 | 0.88 | 0.89 | -1.52 | -1.36 | 4.56 | 4.43 |
| HEL110 | 110 | 0.91 | 0.92 | -4.39 | -4.25 | 7.01 | 6.77 |
| HPB131 | 131 | 0.77 | 0.79 | -2.03 | -1.39 | 6.24 | 6.01 |
| HTM150 | 150 | 0.90 | 0.93 | -2.10 | -1.07 | 4.36 | 3.49 |
| IPR100 | 100 | 0.70 | 0.85 | -10.45 | -3.89 | 15.46 | 8.97 |
| JFJ | 5 | 0.81 | 0.81 | -1.21 | -1.23 | 4.10 | 4.24 |
| JUE120 | 120 | 0.57 | 0.72 | 0.82 | 3.64 | 12.77 | 11.62 |
| KIT200 | 200 | 0.68 | 0.82 | -7.05 | -4.28 | 13.22 | 9.97 |
| KRE125 | 125 | 0.79 | 0.86 | -3.25 | -1.48 | 6.60 | 4.94 |
| LIN099 | 98 | 0.71 | 0.86 | -3.22 | -1.50 | 8.82 | 5.33 |
| LMP | 8 | 0.92 | 0.92 | -0.76 | -0.63 | 2.25 | 2.21 |
| NOR100 | 100 | 0.84 | 0.92 | -3.15 | -1.27 | 5.65 | 3.73 |
| OPE120 | 120 | 0.82 | 0.87 | -1.93 | -0.90 | 4.97 | 3.89 |
| OXK163 | 163 | 0.77 | 0.75 | -1.10 | -1.03 | 5.49 | 6.12 |
| PAL | 12 | 0.89 | 0.95 | -0.69 | -0.71 | 3.53 | 2.82 |
| PRS | 10 | 0.84 | 0.87 | -0.60 | -0.18 | 3.41 | 2.79 |
| PUI084 | 84 | 0.89 | 0.95 | -2.27 | -0.91 | 4.64 | 3.26 |
| PUY | 10 | 0.83 | 0.86 | -0.88 | 0.25 | 3.44 | 3.06 |
| SAC100 | 100 | 0.64 | 0.83 | -1.60 | 0.20 | 9.90 | 6.26 |
| SMR125 | 125 | 0.92 | 0.95 | -2.21 | -1.15 | 4.13 | 3.14 |
| STE252 | 252 | 0.84 | 0.88 | -2.85 | -2.12 | 6.34 | 5.53 |
| SVB150 | 150 | 0.92 | 0.95 | -2.07 | -1.37 | 3.77 | 3.11 |
| TOH147 | 147 | 0.83 | 0.83 | 0.17 | 0.01 | 4.72 | 4.82 |
| TRN180 | 180 | 0.79 | 0.86 | -1.98 | -0.88 | 5.01 | 3.83 |
| UTO | 57 | 0.91 | 0.90 | -1.65 | -1.75 | 3.71 | 3.85 |
| WAO | 10 | 0.70 | 0.60 | -3.03 | -3.31 | 8.30 | 10.66 |
| ZSF | 3 | 0.87 | 0.88 | -0.90 | -0.69 | 3.65 | 3.55 |

**Table S1. Agreement between modelled and measured $CO_2$ concentrations at stations in the current (November 2022, limited to stations within the model domain) ICOS network year 2020. Results given all hours with model results (0:00. 3:00. 6:00. 9:00. 12:00. 15:00. 18:00 and 21:00 CET) and only afternoon hours (12:00 and 15:00 CET) are presented. A negative bias means model underestimation.**

| STILT id | Name | Sampling height | Country | Latitude | Longitude |
|---|---|---|---|---|---|
| ARN100* | El Arenosillo | | Spain | 37.1 | -6.73 |
| BIK300* | Bialystok | | Poland | 53.23 | 23.03 |
| BIR075 | Birkenes | 75 | Norway | 58.38 | 8.25 |

| | | | | | |
|---|---|---|---|---|---|
| CMN760 | Monte Cimone | 8 | Italy | 44.19 | 10.7 |
| EST110* | SMEAR Estonia | | Estonia | 58.27 | 27.27 |
| FKL015* | Finokalia | | Greece | 35.34 | 25.67 |
| GAT344 | Gartow | 341 | Germany | 53.07 | 11.44 |
| HAC* | Helmos | | Greece | 37.98 | 22.2 |
| HEL110 | Helgoland | 110 | Germany | 54.18 | 7.9 |
| HPB131 | Hohenpeissenberg | 131 | Germany | 47.8 | 11.01 |
| HTM150 | Hyltemossa | 150 | Sweden | 56.1 | 13.42 |
| HUN115* | Hegyhátsál | | Hungary | 46.95 | 16.65 |
| IPR100 | Ispra | 100 | Italy | 45.81 | 8.63 |
| JFJ | Jungfraujoch | 5 | Switzerland | 46.55 | 7.98 |
| JUE120 | Jülich | 120 | Germany | 50.91 | 6.41 |
| KAS* | Kasprowy Wierch | | Poland | 49.25 | 19.98 |
| KIT200 | Karlsruhe | 200 | Germany | 49.09 | 8.43 |
| KRE250 | Křešín u Pacova | 250 | Czechia | 49.57 | 15.08 |
| LAH032* | Lahemaa | | Estonia | 59.5 | 25.9 |
| LIN099 | Lindenberg | 98 | Germany | 52.21 | 14.12 |
| LMP | Lampedusa | 8 | Italy | 35.52 | 12.63 |
| LMU080* | La Muela | | Spain | 41.6 | -1.1 |
| LUT | Lutjewad | 60 | Netherlands | 53.4 | 6.35 |
| MAH* | Malin Head | | Ireland | 55.37 | -7.34 |
| MAJ100* | Majadas de Tiétar | | Spain | 39.95 | -5.79 |
| MHD* | Mace Head | | Ireland | 53.33 | -9.9 |
| NOR100 | Norunda | 100 | Sweden | 60.09 | 17.48 |
| OPE120 | Observatoire pérenne de l'environnement | 120 | France | 48.55 | 5.5 |
| OXK163 | Ochsenkopf | 163 | Germany | 50.05 | 11.82 |
| PAL | Pallas-Sammaltunturi | 12 | Finland | 67.97 | 24.12 |
| PCW150* | Poland Central West | | Poland | 52.29 | 18.62 |
| PRS | Plateau Rosa | 10 | Italy | 45.94 | 7.71 |
| PSE150* | Poland South East | | Poland | 50.71 | 20.77 |
| PUI084 | Puijo | 84 | Finland | 62.91 | 27.66 |
| PUY | Puy de Dôme | 10 | France | 45.77 | 2.97 |
| RGL090* | Ridge Hill | 90 | UK | 52.0 | -2.54 |
| SAC100 | Saclay | 100 | France | 48.72 | 2.14 |
| SMR125 | Hyytiälä | 125 | Finland | 61.85 | 24.29 |
| SNZ* | Sniezka mountain | | Poland | 50.74 | 15.74 |
| SSL* | Schauinsland | 12 | Germany | 47.91 | 7.91 |
| STE252 | Steinkimmen | 252 | Germany | 53.04 | 8.46 |
| SVB150 | Svartberget | 150 | Sweden | 64.26 | 19.77 |
| TOH147 | Torfhaus | 147 | Germany | 51.8 | 10.53 |
| TRN180 | Trainou | 180 | France | 47.96 | 2.11 |
| UTO | Utö - Baltic sea | 57 | Finland | 59.78 | 21.38 |
| VSD006* | Vilsandi | | Estonia | 58.38 | 21.82 |
| VTO014* | Valenia | | Ireland | 51.94 | -10.25 |
| WAO | Weybourne | 10 | UK | 52.95 | 1.12 |
| WES | Westerland | 14 | Germany | 54.92 | 8.3 |

| | | | | | |
|---|---|---|---|---|---|
| ZSF | Zugspitze | 3 | Germany | 47.42 | 10.98 |

**Table S2. Information about stations in the current (November 2022, limited to stations within the model domain) and extended (*) ICOS network. Sampling height is only provided for stations in the current network.**

See separate Excel-file for Table S3. Table S3 is a supplement to Table 1 with information on respiration and total $CO_2$ signals at the stations.