**Grant Number**: N/A

The datasets contained herein have been funded by the JABBS Trust, Norbury Park Estate, The John Horseman Trust, Ecological Continuity Trust, the Natural Environment Research Council (NERC; (grants NE/S015833/1, NE/P003486/1, NE/N020502/1; NE/T000449/1; NE/T012323/1), and the University of Birmingham.

**Sponsor:**

**Project title**: BIFoR FACE environmental monitoring data

The following files have been archived:

|  |  |
| --- | --- |
| File name | File description  |
| Wod\_Brook\_stream | **Data type:** stream dataset from the Wood Brook stream at BIFoR FACE **Data owner**: S. Krause1,2 **Data originator**: P.J. Blaen1,3, N. Brekenfeld1,2 1. Birmingham Institute of Forest Research, University of Birmingham, Birmingham B15 2TT, UK2. School of Geography, Earth and Environmental Science, University of Birmingham, Birmingham B15 2TT, UKNow at Yorkshire Water, Chadwick Street, Leeds, LS10 1LJ, UK3. Yorkshire Water, Chadwick Street, Leeds, LS10 1LJ, UK **Format**: .csv **Monitoring period**: 2018-02-08 to 2020-09-24 **Sampling resolution**: 1 hour **Parameters & units**:datetime: date & timeWatertemperature\_degC: water temperature (°C) [Manta 2 multiprobe (Eureka, TX, USA); Range: -5° to 50°C, Accuracy: ±0.1°C, Resolution: ±0.01°C]Discharge\_Ls1: Water discharge (L/s) [from stage]DO\_mgL: dissolved oxygen (Optical DO, mg/L) [Manta 2 multiprobe (Eureka, TX, USA); Range: 0-25 mg/L, Accuracy: 1% of reading or 0.02mg/L, whichever is greater, Resolution: 0.01 mg/L]stage\_cm: stage (cm) [PR-36X pressure transducer by KELLER (Winterthur, Switzerland); Range: 0-1 bar relative, Linearity error: 0.002 %FS, Accuracy: -0.009-0.006 %FS] |
| weather | **Data type:** weather dataset from BIFoR FACE **Data owner**: A.R. MacKenzie1,2 **Data originator**: N.J. Harper1,2, G. Curioni1,2 1. Birmingham Institute of Forest Research, University of Birmingham, Birmingham B15 2TT, UK2. School of Geography, Earth and Environmental Science, University of Birmingham, Birmingham B15 2TT, UK **Format**: .zip file containing .csv files **Monitoring period**: 2016 to 2020 **Sampling resolution**: 1 day **Parameters & units**:yearmonthdatedoy: day of the year pcpn: precipitation (mm), the mean of the rainfall measured by 4 rain gauges on the BIFoR FACE met towers (bottom) [TR-525M by Texas Electronics (Dallas, Texas); Resolution: 0.1 mm, Accuracy: 50 mm per hour or +/-1%, Range: 700 mm per hour]air\_temp: air temperature (°C), the mean of the air temperature measured by 4 sensors on the BIFoR FACE met towers (bottom) [HMP155RH by Vaisala (Helsinki, Finland); Range: −80 ... +60 °C, Accuracy: at −80 ... +20 °C (−112 ... +68 °F)±(0.226 - 0.0028 × temperature) °C]RH: relative humidity (%), the mean of the relative humidity measured by 4 sensors on the BIFoR FACE met towers (bottom) [HMP155RH by Vaisala (Helsinki, Finland); Range: 0-100 %RH, Accuracy at −20 ... +40 °C: ±(1.0 + 0.008 × reading) %RH]amb\_P: ambient pressure (hPa), the mean of the ambient pressure measured by 4 sensors on the BIFoR FACE met towers (top) [PTB210 by Vaisala (Helsinki, Finland); Total accuracy: ± 0.50 hPa]WS: wind speed (m/s), the mean of the wind speed measured by 4 sensors on the BIFoR FACE met towers (top) [R3-100 by Gill Instruments (Lymington, UK); Range: 0-45 m/s, Resolution: 0.01 m/s]PAR\_LI190:  Photosynthetically Active Radiation (PAR) measured as Photosynthetic Photon Flux Density (PPFD, µmol m-2 s-1), the mean of PAR measured by 4 sensors on the BIFoR FACE met towers (top) [LI-190RQuantum Sensor by LI-COR Biosciences (Lincoln, USA); Sensitivity: Typically 5 μA to 10 μA per 1,000 μmol s-1 m-2]NetRAD\_2: net solar radiation (W/m²), the mean of net radiation measured by 4 sensors on the BIFoR FACE met towers (top) [Lite2 by Kipp & Zonen (Delft, The Netherlands); Spectral range: 0.2 to 100 µm = 200 to 100.000 nm, Sensitivity: 10 µV/W/m²] Suffix:\_met: parameter measured from the BIFoR FACE met towers\_top: parameter measured on the top of the BIFoR FACE met towers (~25m)\_bot: parameter measured on the bottom of the BIFoR FACE met towers (~2m)\_gnosall: parameter derived as the mean of a number of sensors from the weather underground network (https://www.wunderground.com/wundermap) located at approximately 3-4 km from the BIFoR FACE site. These values are available for comparison and were used to fill gaps in the BIFoR FACE dataset\_reservoir: data from rain gauge located north of the BIFoR FACE forest next to a reservoir. Only used to fill data gaps if both the FACE and Gnosall data were missing.\_min: minimum for the selected time period\_max: maximum for the selected time period |
| FACE\_FCP\_data | **Data type:** BIFoR FACE facility operational dataset (CO2, wind, air temperature, solar radiation) **Data owner**: A.R. MacKenzie1,2 **Data originator**: N.J. Harper1,2, G. Curioni1,2 1. Birmingham Institute of Forest Research, University of Birmingham, Birmingham B15 2TT, UK2. School of Geography, Earth and Environmental Science, University of Birmingham, Birmingham B15 2TT, UK **Format**: .zip file containing .csv files **Monitoring period**: 2017 to 2020 **Sampling resolution**: 1 day **Parameters & units**:yearmonthdatedoy: day of the year treatment: FACE CO2 treatment, eCO2 (elevated to + 150 ppm above ambient), aCO2 (ambient CO2), undisturbed (no structure)array: BIFoR FACE experimental patchesSUNALT: solar altitude (deg) - Degrees Calculated based on LongitudeAZI: sun azimuth (deg) - Calculated from LatitudeWS: wind speed (m/s) - sensor at ~20 m, within the canopy (only in fumigated arrays) [WMT701 by Vaisala (Helsinki, Finland); Range: 0-40 m/s, Resolution: 0.01 m/s; Accuracy: ±0.1 m/s or 2% of reading, whichever is greater]WD: wind direction (deg) - sensor at ~20 m, within the canopy (only in fumigated arrays)[WMT701 by Vaisala (Helsinki, Finland); Range: 0-359°, Resolution: 0.01°; Accuracy: ±2°]air\_temp: air temperature (°C) - sensor at ~20 m, within the canopy (in fumigated and control arrays) [107 thermistors by Campbell Scientific (Logan, USA); Range: -35° to +50°C, Tolerance: ±0.2°C (over 0° to 50°C range)] RSOL: total solar radiation (W/m2) - sensor at ~25 m, above the canopy (in fumigated and control arrays) [LP02 by Campbell Scientific (Logan, USA); Spectral Range: 285-3000 nm, Maximum Irradiance: 2000 W/m2, Sensitivity: 15 µV/W/m2 (nominal)]PVC: CO2 demanded valve position Kurz Valve (unitless) - opening of the CO2 valve (engineering parameter)PVR: CO2 actual gas flow Kurz (unitless) (engineering parameter)CCONT: ambient [CO2] (ppm) (twinned control array) - actual [CO2] in the paired control array CBASE: ambient [CO2] (ppm) (lowest of the three control arrays) - [CO2] in the control plots used as reference to define [CO2] targetCSET: [CO2] setpoint (ppm) - target [CO2] for fumigated arrays, i.e. reference (CBASE) + 150 ppmCGRAB: [CO2] 5s average of 1s sampling (ppm), reading at time stamp at 21 metersC1MIN: 1 min average of CGRAB (i.e. [CO2])C5MIN: 5 min average of CGRAB (i.e. [CO2]) Suffix:\_min: minimum for the selected time period\_max: maximum for the selected time period |
| soil\_monitoring | **Data type:** soil monitoring parameters from BIFoR FACE (e.g. soil moisture and temperature) **Data owner**: A.R. MacKenzie1,2 **Data originator**: S.E. Quick1,2, G. Curioni1,2 1. Birmingham Institute of Forest Research, University of Birmingham, Birmingham B15 2TT, UK2. School of Geography, Earth and Environmental Science, University of Birmingham, Birmingham B15 2TT, UK **Format**: .zip file containing .csv files **Monitoring period**: 2015 to 2020 **Sampling resolution**: 1 day **Parameters & units**:yearmonthdatedoy: day of the year treatment: FACE CO2 treatment, eCO2 (elevated to + 150 ppm above ambient), aCO2 (ambient CO2), undisturbed (no structure)array: BIFoR FACE experimental patchesBattV: logger battery voltage (V)vwc: volumetric water content (%v) [CS655 by Campbell Scientific (Logan, USA); Range: 0-100 %v, Accuracy: ±3% (typical with factory VWC model) where solution EC < 10 dS/m, Precision: < 0.05%]Ka: relative dielectric apparent permittivity (unitless) [CS655 by Campbell Scientific (Logan, USA); Range: 1-81, Accuracy: ±(3% of reading + 0.8) from 1 to 40 for solution EC ≤ 8 dS/m, ±2 (from 40 to 81 for solution EC ≤ 2.8 dS/m), Precision: < 0.02]EC: bulk electrical conductivity (dS/m) [CS655 by Campbell Scientific (Logan, USA); Range: 0-8 dS/m, Accuracy: ±(5% of reading + 0.05 dS/m), Precision: 0.5% of BEC]surf\_temp: surface soil temperature (°C) [CS655 by Campbell Scientific (Logan, USA); Range: -50° to +70°C, Resolution: 0.001°C, Accuracy: ±0.1°C (for typical soil temperatures [0 to 40°C] when probe body is buried in soil, ±0.5°C (for full temperature range), Precision: ±0.02°C]temp: soil temperature (°C) [107 thermistors by Campbell Scientific (Logan, USA); Range: -35° to +50°C, Tolerance: ±0.2°C (over 0° to 50°C range)] Suffix:\_group1, \_group2: groups of 3 sensors installed 1m apart\_10cm, \_20cm, \_40cm, \_60cm, \_100cm: temperature sensor depth (cm) |
| PF\_dts\_soilmoisture\_18-04-12\_20-07-07\_1m | **Data type:** high resolution soil moisture by active distributed temperature sensing (XT-DTS™ unit and a heat pulse system by Silixa Ltd., London, UK) measured in a plantation field adjacent to the BIFoR FACE facility **Data owner**: S. Krause1,2 **Data originator**: G. Curioni1,2, F. Ciocca3 1. Birmingham Institute of Forest Research, University of Birmingham, Birmingham B15 2TT, UK2. School of Geography, Earth and Environmental Science, University of Birmingham, Birmingham B15 2TT, UK3. Silixa  Ltd., London, WD6 3SN, United Kingdom **Format**: .fst binary format (it can be opened with the statistical software R using the fst library, and with the Julia programming language) **Monitoring period**: 2018 to 2020 **Sampling resolution**: 6 hours, over space: 1m **Parameters & units**:timedepth: depth of the fibre optic cable (m)dist: distance along the fibre optic cable (m)vwc: volumetric water content (%v)vwc\_sm: smoothed volumetric water content (%v) (smoothing over both distance, using a loess algorithm, and time, using a rolling mean with k=7)vwc\_der: first derivative of vwc\_sm (%v)rect\_x\_start: time parameter for plotting a heatmap (start of rectangles in the x-axis)rect\_x\_end: time parameter for plotting a heatmap (end of rectangles on the x-axis)rect\_y\_start: distance parameter for plotting a heatmap (start of rectangles on the y-axis)rect\_y\_end: distance parameter for plotting a heatmap (end of rectangles on the y-axis) |

**Publications**: BIFoR FACE: Water-soil-vegetation-atmosphere research in a temperate deciduous forest catchment, including under elevated CO2 [submitted to Hydrological processes]