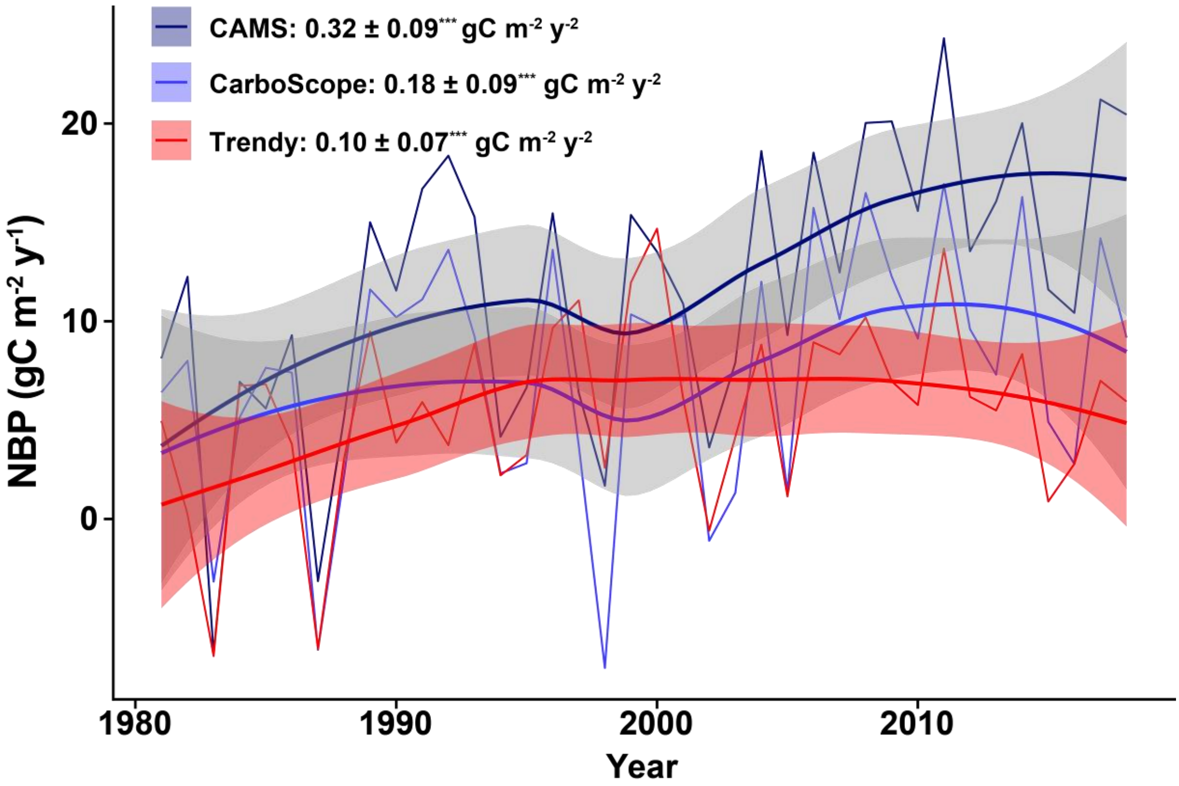
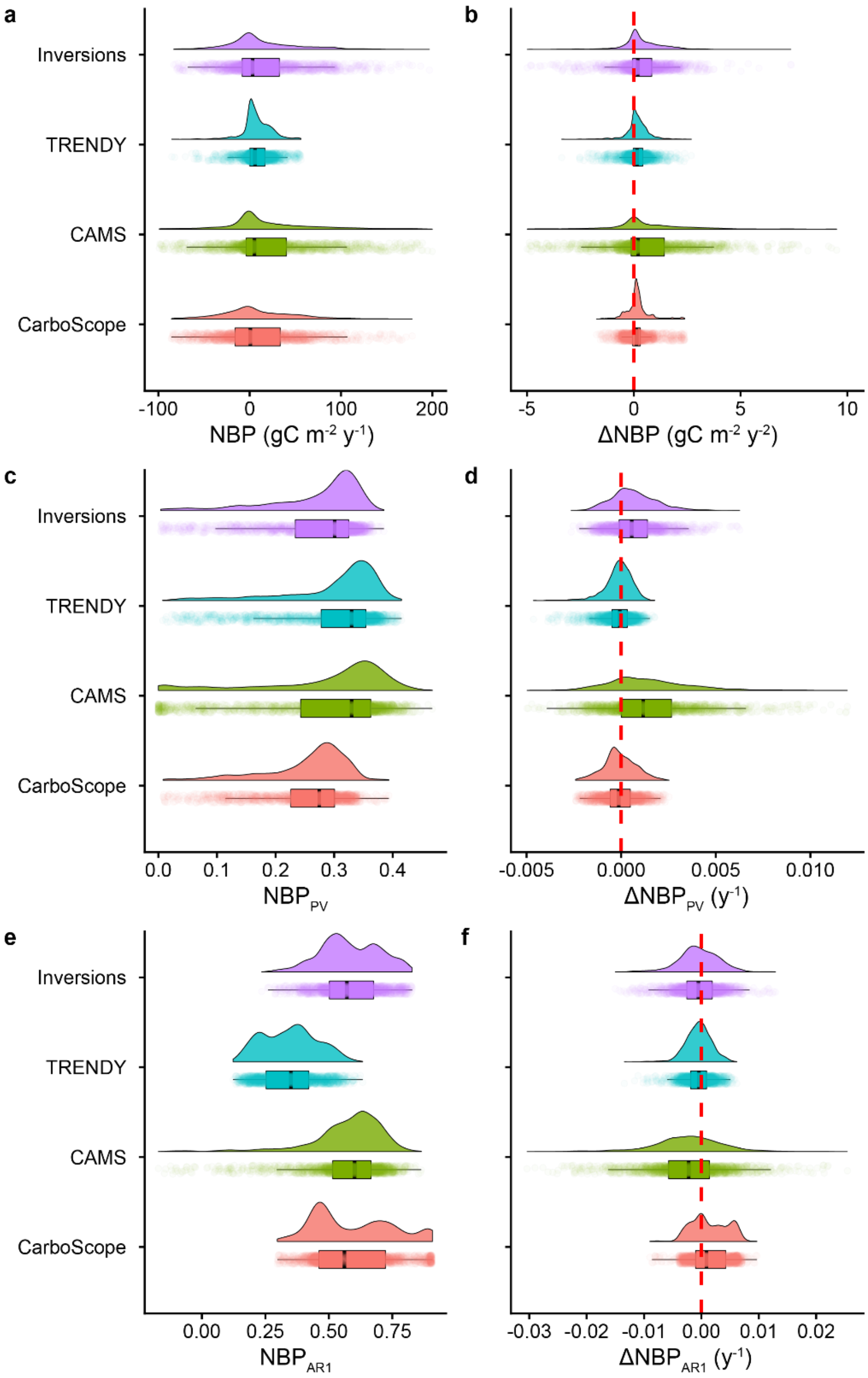
# 1. Supplementary figures and tables

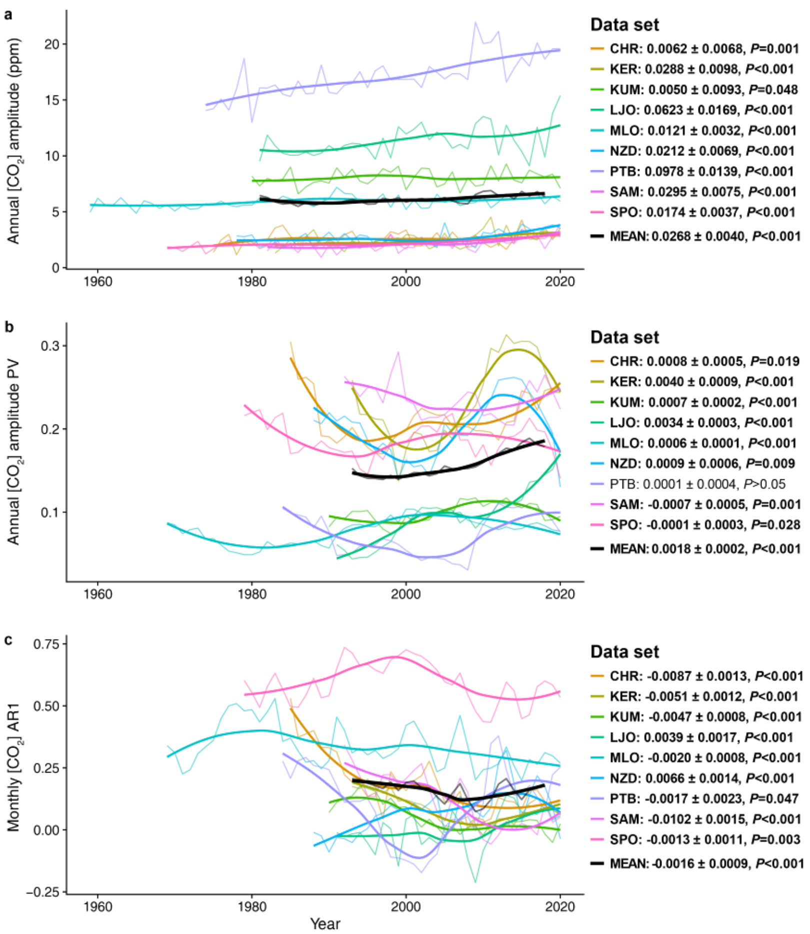
**Supplementary Figure 1: Temporal evolution of annual NBP derived from CAMS and CarboScope atmospheric inversion models and the Trendy ensemble of DGVMs.** The coefficients at the top of the panel indicate robust Theil-Sen's slopes (± standard error of the slope) with their corresponding p-values, estimated using the non-parametric Wilcoxon Mann-Whitney rank sum test. Values represent spatially-weighted global means. ***, $P$<0.001.



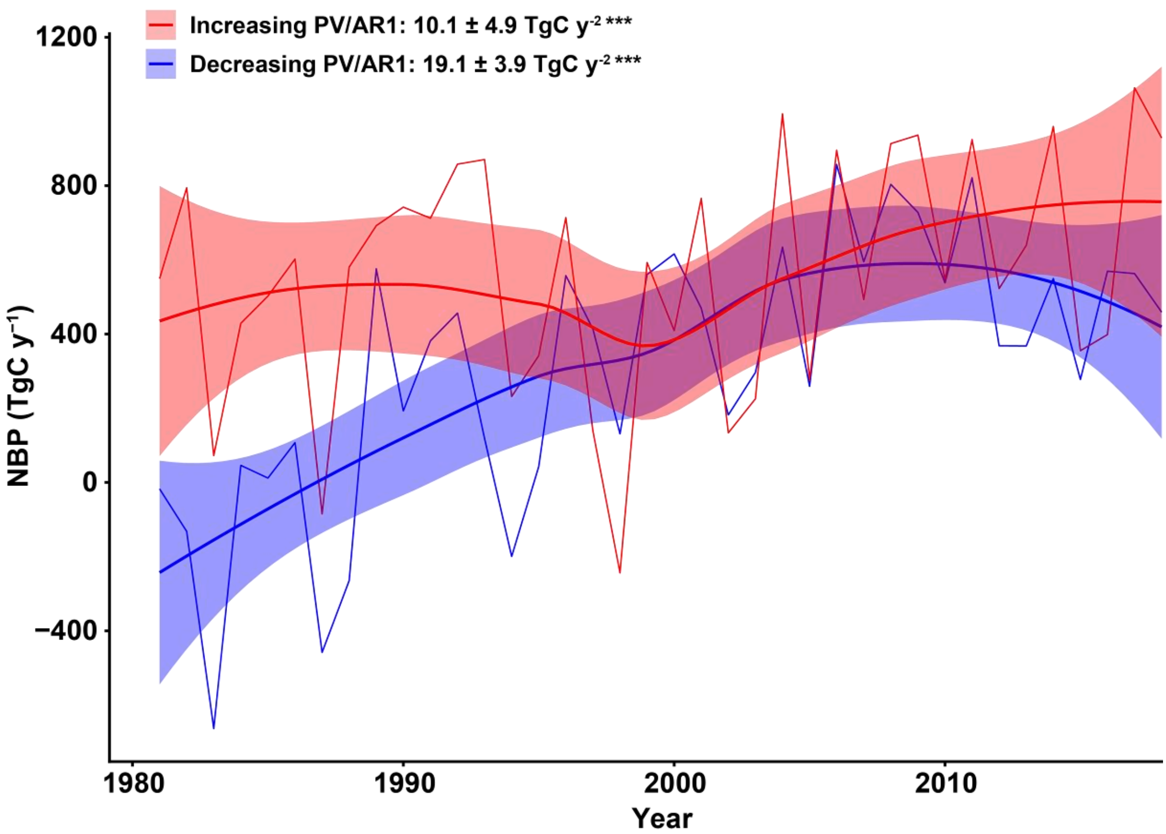
**Supplementary Figure 2: Raincloud plots showing the global distributions of NBP, $NBP_{PV}$, $NBP_{AR1}$ and their trends.** Inversions show the results from the combination of CAMS and CarboScope atmospheric inversion models. Boxes indicate the interquartile ranges of the distributions, solid lines indicate the medians and the whiskers extend to 1.5 times the interquartile range.



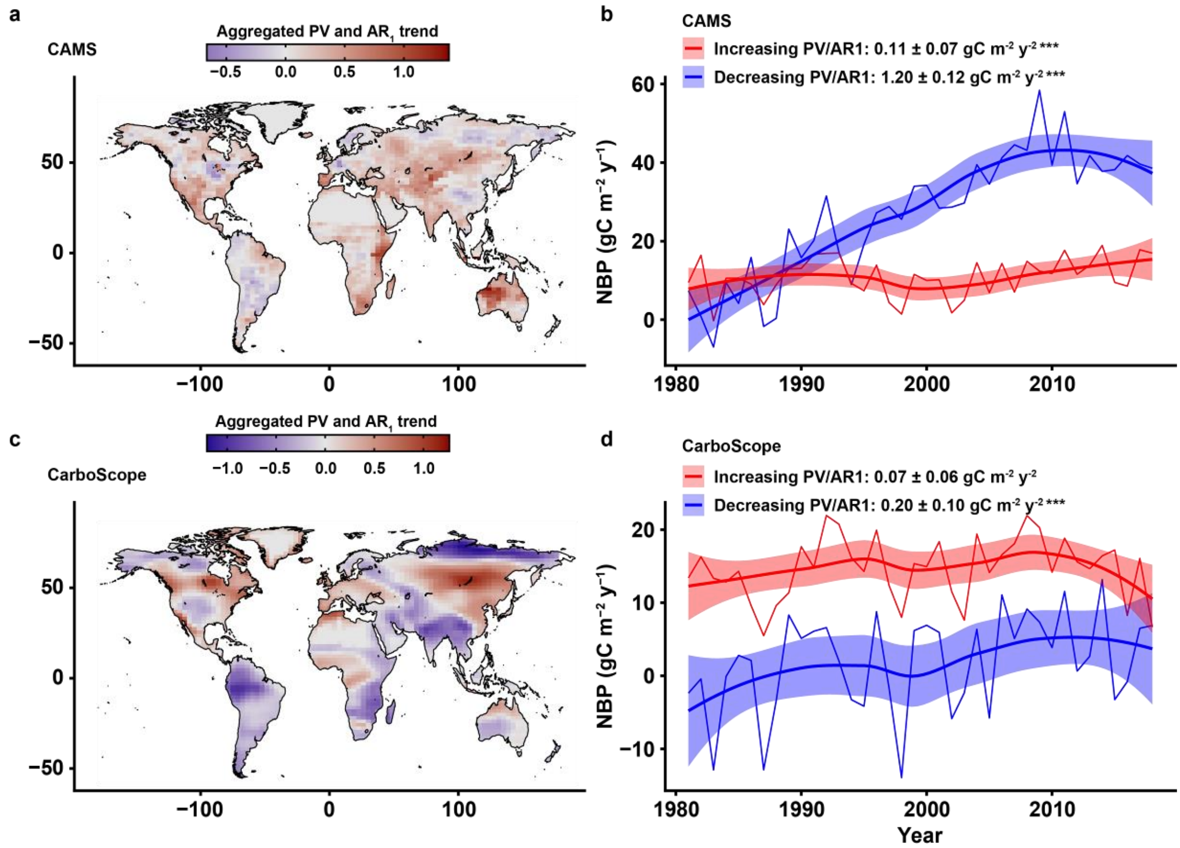
**Supplementary Figure 3: Temporal trends in the annual amplitude of atmospheric $CO_2$ concentrations, its interannual variability (PV), and its monthly $CO_2$ temporal autocorrelation.** Coloured lines represent the interannual variability of the annual amplitude in atmospheric $CO_2$ concentrations (a) and the 11-year moving average of its variability (b) and monthly $CO_2$ temporal autocorrelation (at lag 1, c) for nine monitoring stations distributed across the Pacific Ocean that covered the study period (1981–2018). Black lines indicate the mean amplitude (a), its temporal variability (b), and its temporal autocorrelation (c) across sites for the study period. Thick lines represent the smoothed trend for each site. Coefficients at the right indicate robust Theil-Sen's slopes (± standard error of the slope) and their corresponding *p*-values, estimated using the non-parametric Wilcoxon Mann-Whitney rank sum test. Mean trends were calculated over the study period only (1981–2018). CHR, Christmas Island (2.0°N, 157.3°W); KER, the Kermadec Islands (29.2°S, 177.9°W); KUM, Cape Kumukahi (19.5°N, 154.8°W); LJO, La Jolla Pier (32.9°N, 117.3°W); MLO, Mauna Loa Observatory (19.5°N, 155.6°W); NZD, Baring Head (41.4°S, 174.9°E); PTB, Point Barrow (71.3°N, 156.6°W); SAM, American Samoa (14.2°S, 170.6°W); SPO, South Pole (90.0°S).



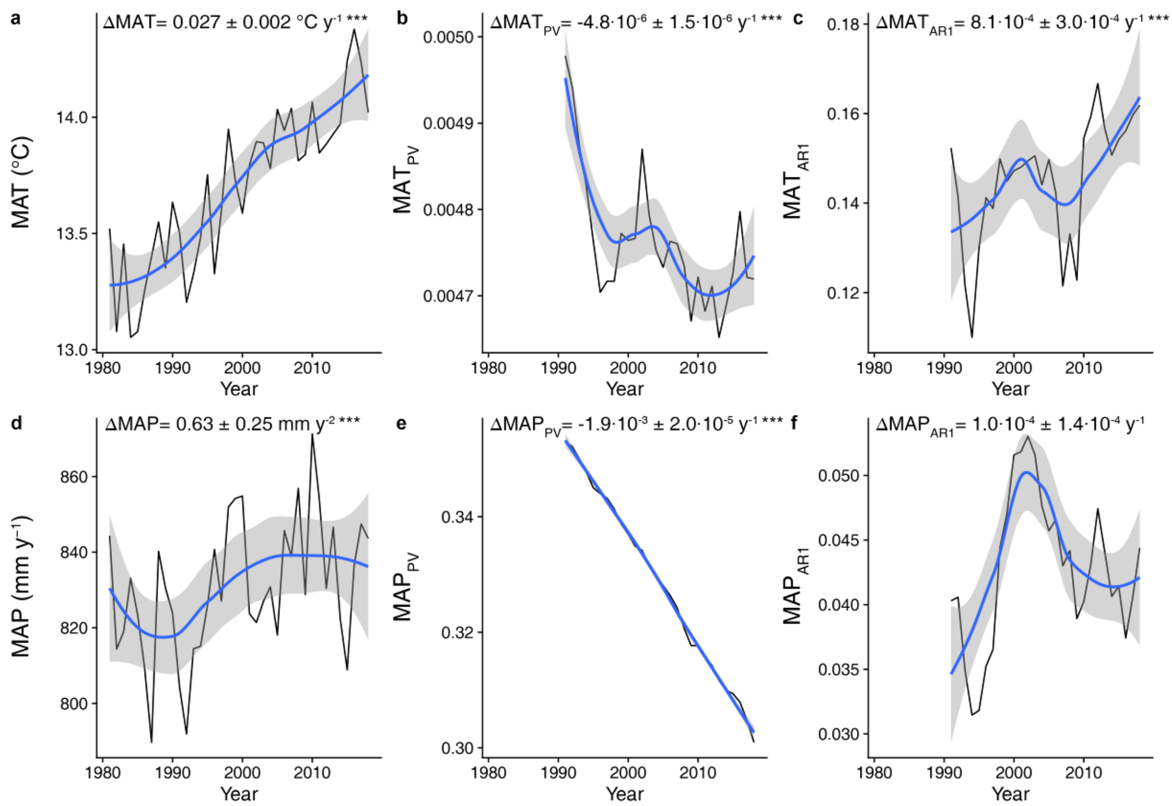
**Supplementary Figure 4: Global contribution of regions with concomitantly increasing $NBP_{PV\text{-}AR1}$ and concomitantly decreasing $NBP_{PV\text{-}AR1}$ over time as shown by the combination of CAMS and CarboScope.** Aggregated annual sum of NBP from regions with concomitantly increasing (red) and decreasing (blue) $NBP_{PV}$ and $NBP_{AR1}$. Smooth trends were estimated with a local regression (shaded indicate the standard error of the trend), and the coefficients at the top of the panel indicate robust Theil-Sen's slopes (± standard error of the slope) and their associated significance (***, *P*<0.001), estimated using the non-parametric Wilcoxon Mann-Whitney rank sum test.



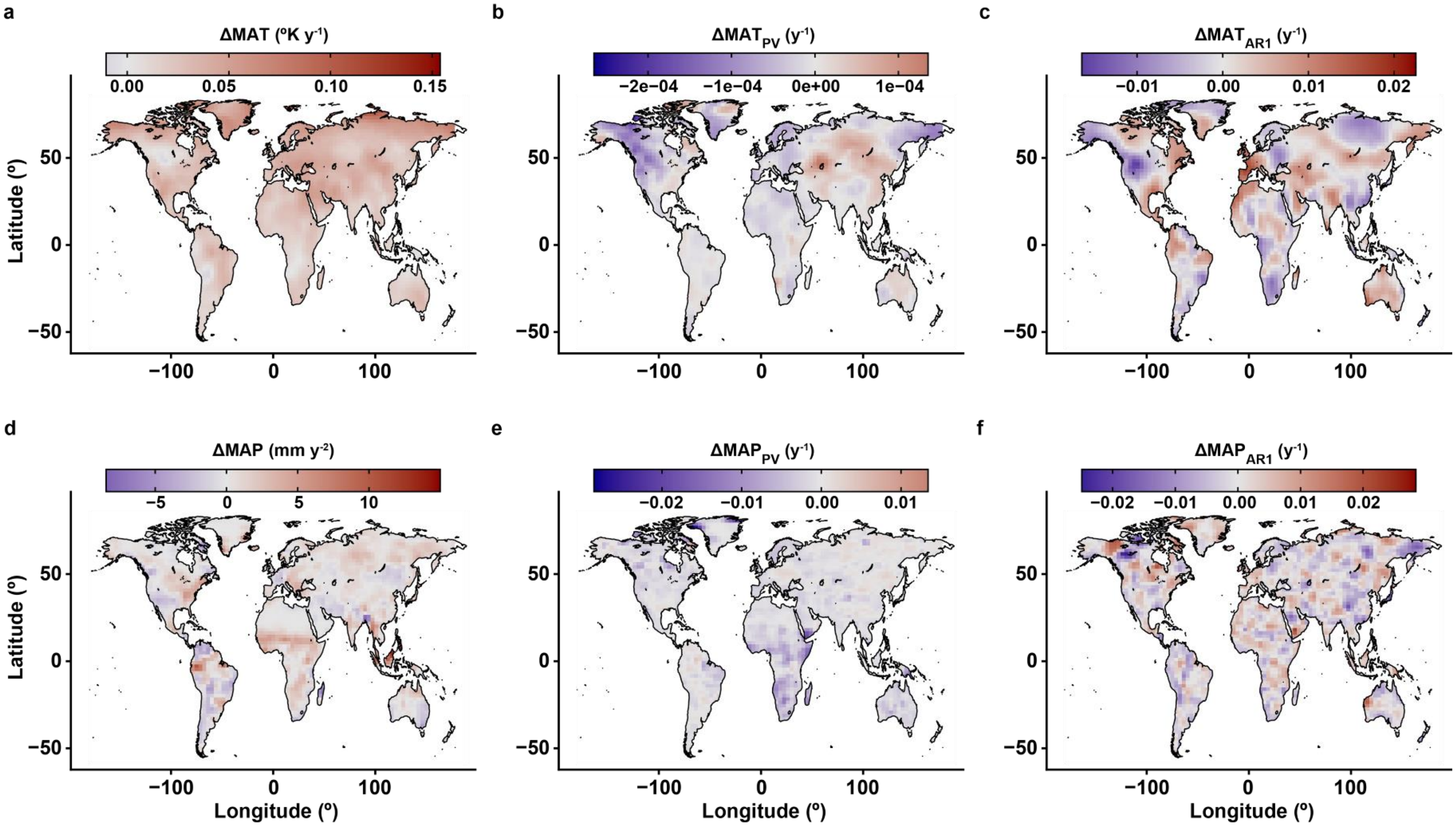
**Supplementary Figure 5: Regions with concomitantly increasing $NBP_{PV\text{-}AR1}$ and concomitantly decreasing $NBP_{PV\text{-}AR1}$ and their trends in mean annual NBP from CAMS and CarboScope atmospheric inversions.** Panels a (CAMS) and c (CarboScope) show the spatial distribution of the aggregated $NBP_{PV}$ and $NBP_{AR1}$ trend, showing increases in red (positive $\Delta NBP_{PV\text{-}AR1}$) and decreases in blue (negative $\Delta NBP_{PV\text{-}AR1}$). Spatial correlation between both atmospheric inversions was rho=0.10, $P$<0.001 (Spearman's correlation). Panels b (CAMS) and d (CarboScope) show the temporal evolution of mean annual NBP from regions increasing (red) and decreasing (blue) $\Delta NBP_{PV\text{-}AR1}$. Both atmospheric inversions show stronger increases in NBP over regions with decreasing $\Delta NBP_{PV\text{-}AR1}$. Only regions where trends in both indices (PV and AR1) were coincident on increasing or decreasing were used. Smooth trends were estimated with a local regression (shaded indicate the standard error of the trend), and the coefficients at the top of the panel indicate robust Theil-Sen's slopes (± standard error of the slope) and their associated significance (***, $P$<0.001), estimated using the non-parametric Wilcoxon Mann-Whitney rank sum test.



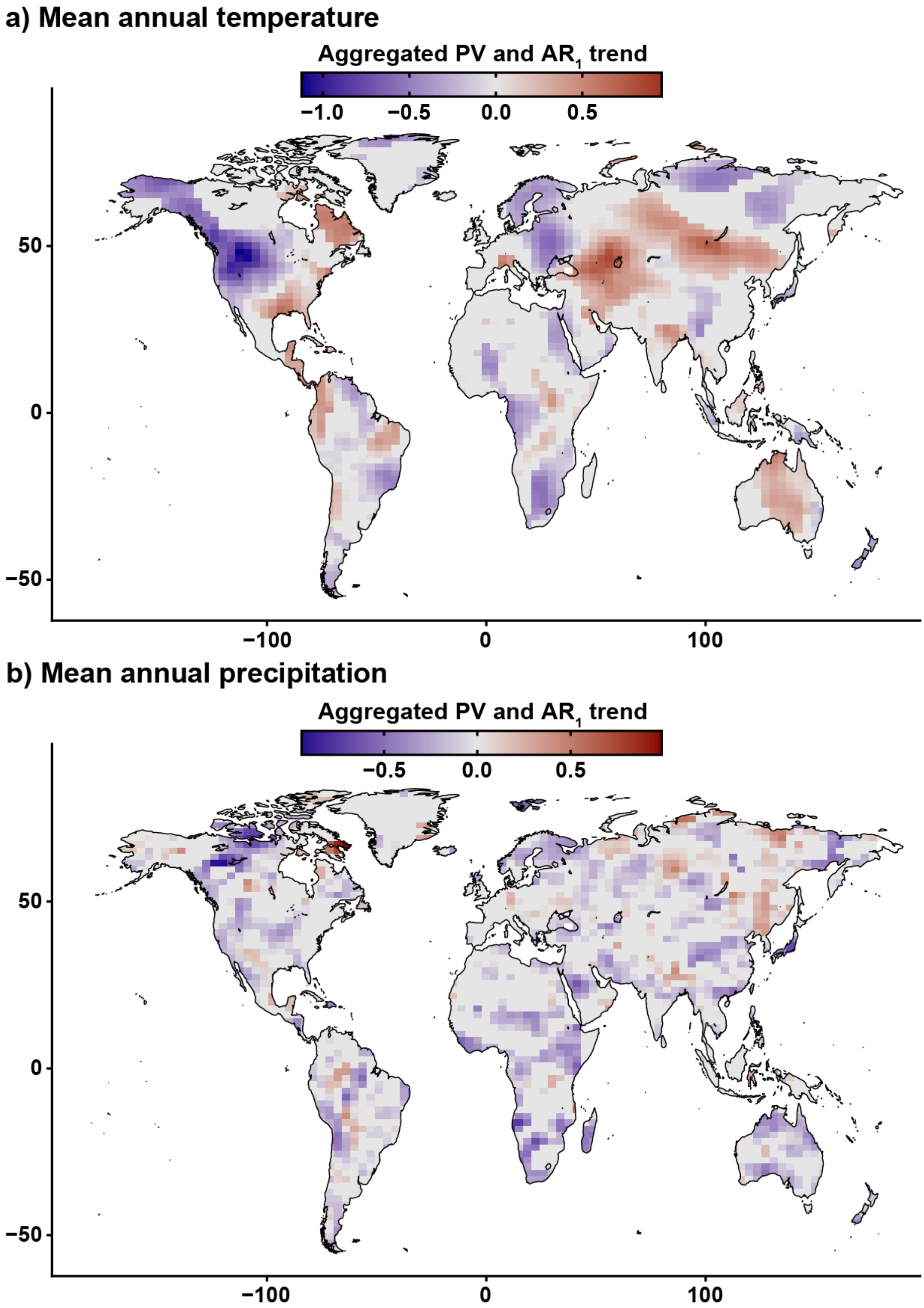
**Supplementary Figure 6: Temporal trends in mean annual temperature (MAT), mean annual precipitation (MAP), and their temporal interannual variability (PV) and temporal autocorrelation (AR1).** Blue lines represent smooth trends (grey, 95% confidence intervals). Coefficients at the top of the panels indicate robust Theil-Sen's slopes (± standard error of the slope) and their corresponding p-values estimated using the non-parametric Wilcoxon Mann-Whitney rank sum test. Trends in temporal variability and autocorrelation were calculated using an 11-year moving window from 1981 to 2018. Values represent spatially-weighted global means. ***, $P$<0.001.



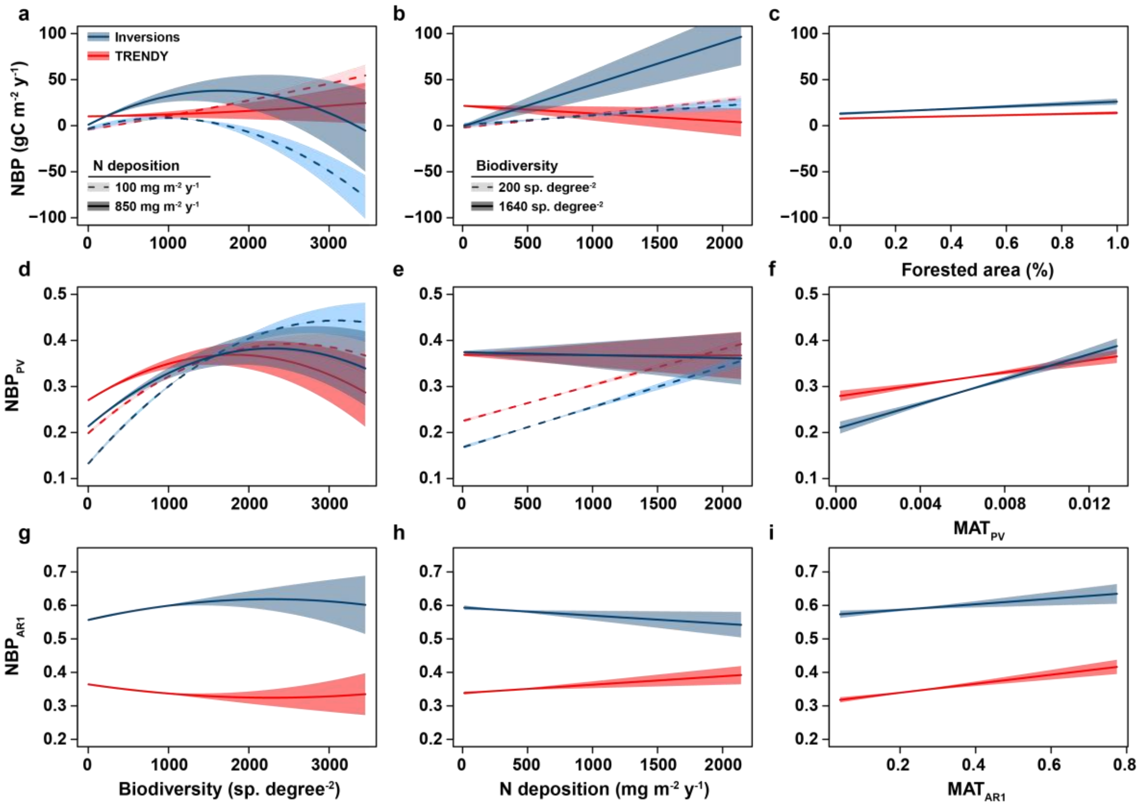
**Supplementary Figure 7: Global maps showing trends in mean annual temperature (MAT), mean annual precipitation (MAP), and their temporal interannual variability (PV) and temporal autocorrelation (AR1).** Panels a, b and c show trends in mean, PV and AR1 of mean annual temperature; panels d, e and f show trends in mean, PV and AR1 for mean annual precipitation. See Methods for further details.



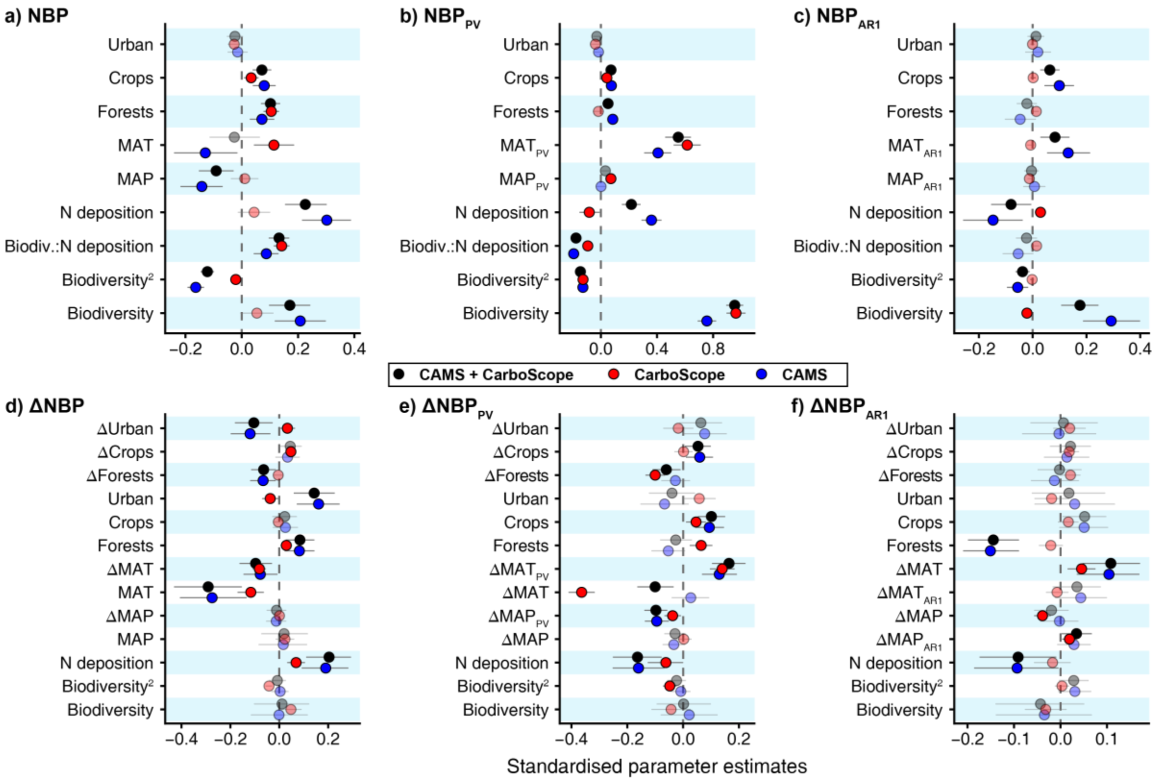
**Supplementary Figure 8: Maps showing the spatial patterns of the aggregated PV-AR1 trends in temperature and precipitation.** Regions with contrasting trends in PV and AR1 appear in grey. See **Methods** for details regarding the calculation of the aggregated PV and AR1 trends in annual temperature and precipitation.



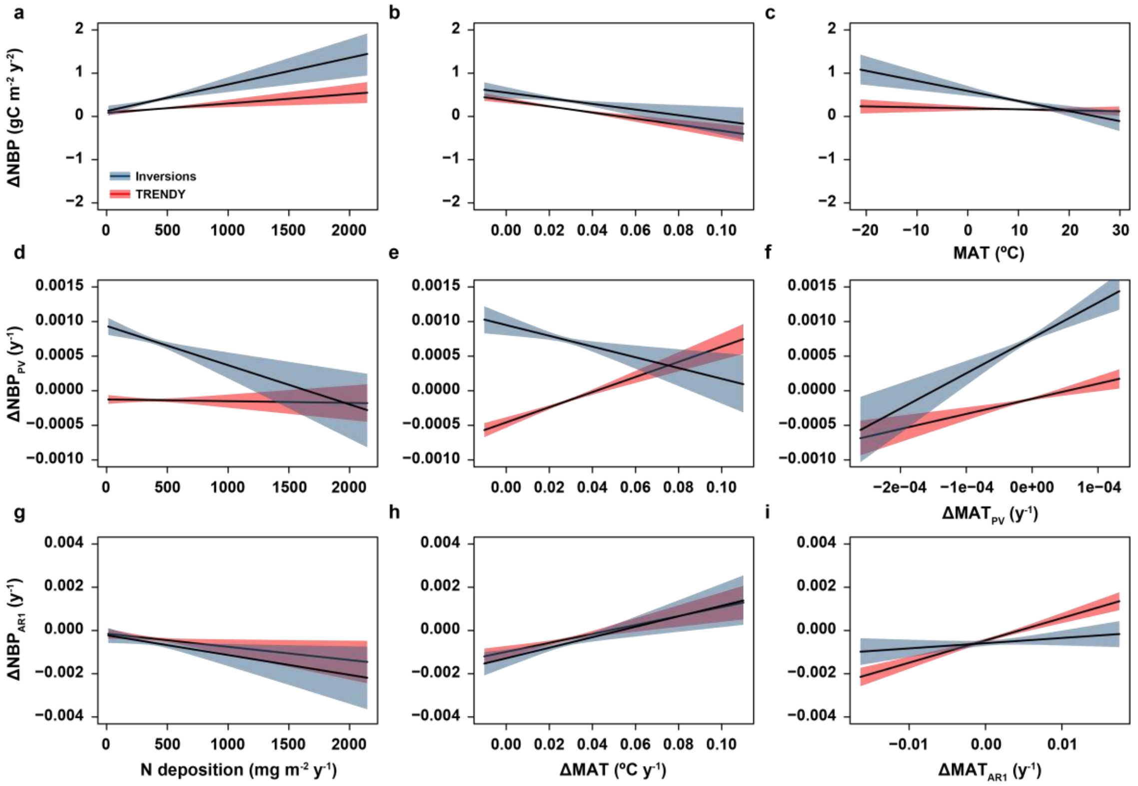
**Supplementary Figure 9: Response curves for net biome production (NBP), its variability ($NBP_{PV}$), and its temporal autocorrelation ($NBP_{AR1}$) showing patterns in atmospheric inversions and TRENDY.** Panels a, b, and c show the relationships of NBP with biodiversity, mean atmospheric nitrogen (N) deposition, and the percentage of forested area. Contrasting patterns between NBP derived from atmospheric inversions and from the Trendy ensemble occur mainly for biodiversity and N deposition. Panels d, e, and f show the relationships of $NBP_{PV}$ with biodiversity, N deposition, and the temporal variability of mean annual temperature ($MAT_{PV}$), respectively. The interactive effects of biodiversity and N deposition (see **Figure 3**) are also shown in panels a, b, d, and e. Panels g, h, and i show the relationships of $NBP_{AR1}$ with biodiversity, N deposition, and the temporal autocorrelation in monthly temperatures ($MAT_{AR1}$), respectively. Shaded areas represent the 95% credible interval of the slope. Plant biodiversity is shown in units of species per geographic degrees. Effect sizes are shown in **Figure 3** and in **Supplementary Materials – Model summaries (1-3)**.



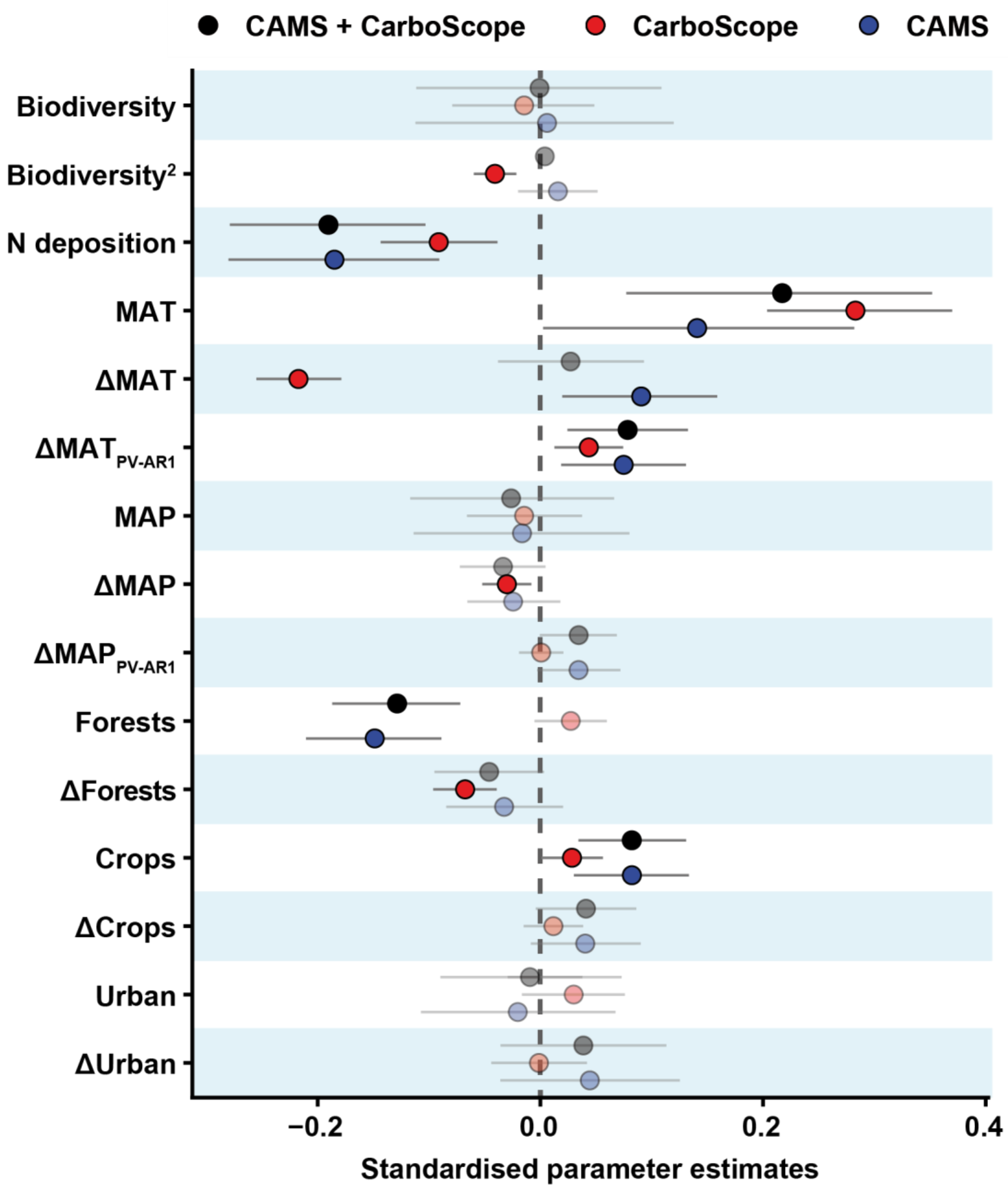
**Supplementary Figure 10: Spatial correlations of NBP, $NBP_{PV}$ and $NBP_{AR1}$ and their trends with their predictors.** Points and confidence bands indicate, respectively, the 50% percentile and the 95% credible interval of the regression model parameter estimates. Solid dots indicate that the 95% of the distributions of the parameter estimates do not cross zero. See **Methods** for details on statistical models.



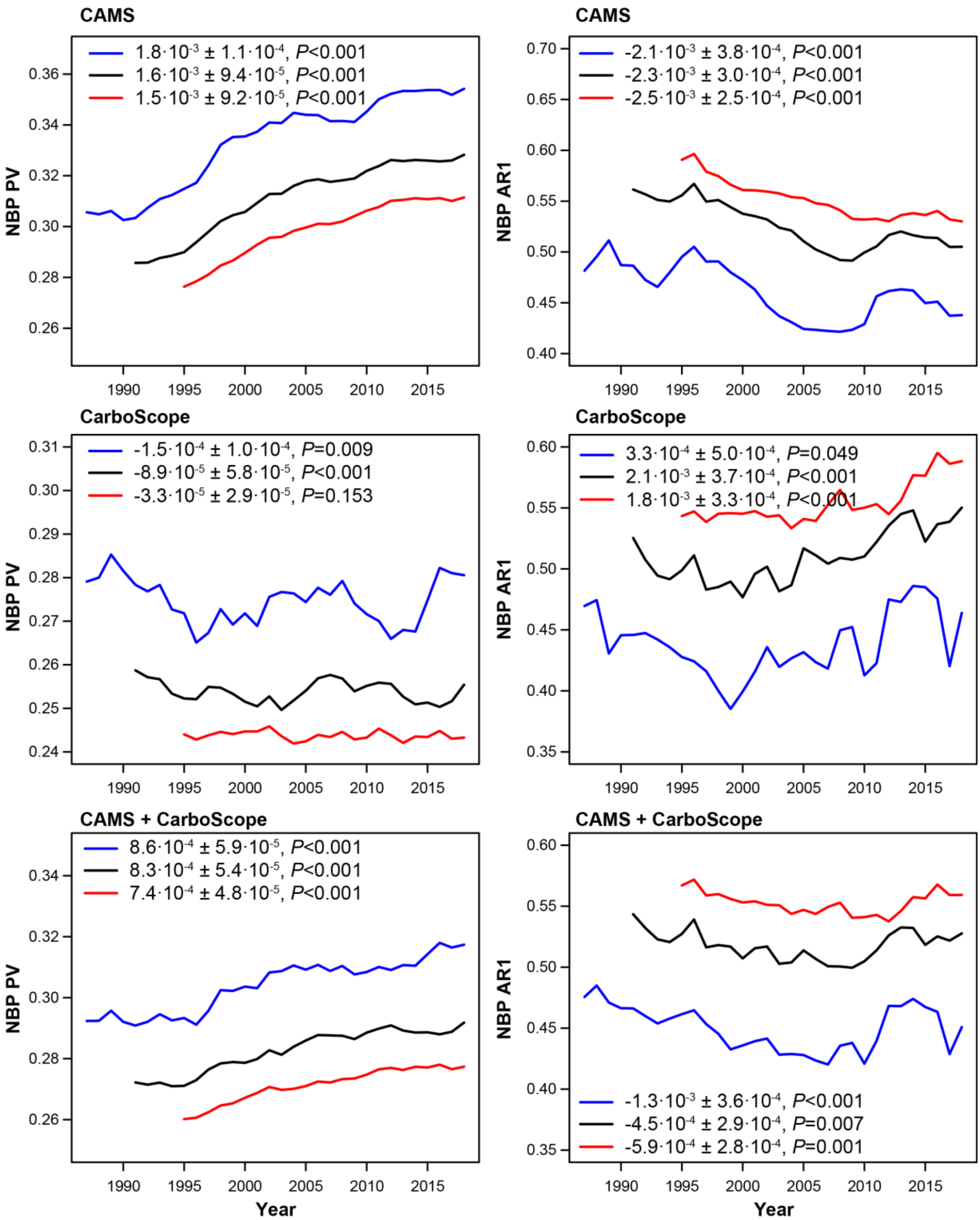
**Supplementary Figure 11: Response curves for trends in net biome production (ΔNBP), its variability ($\Delta NBP_{PV}$), and its monthly temporal autocorrelation ($\Delta NBP_{AR1}$).** Panels a, b, and c show the relationships of ΔNBP with N deposition, trends in mean annual temperature (ΔMAT), and trends in mean annual temperature (MAT), respectively. For $\Delta NBP_{PV}$ and $\Delta NBP_{AR1}$, the third column (panels f and i) indicates trends in MAT temporal variability and autocorrelation, respectively. Shaded areas represent the 95% credible interval of the slope. Effect sizes are shown in **Figure 3** and in **Supplementary Materials – Model summaries (4-6)**.



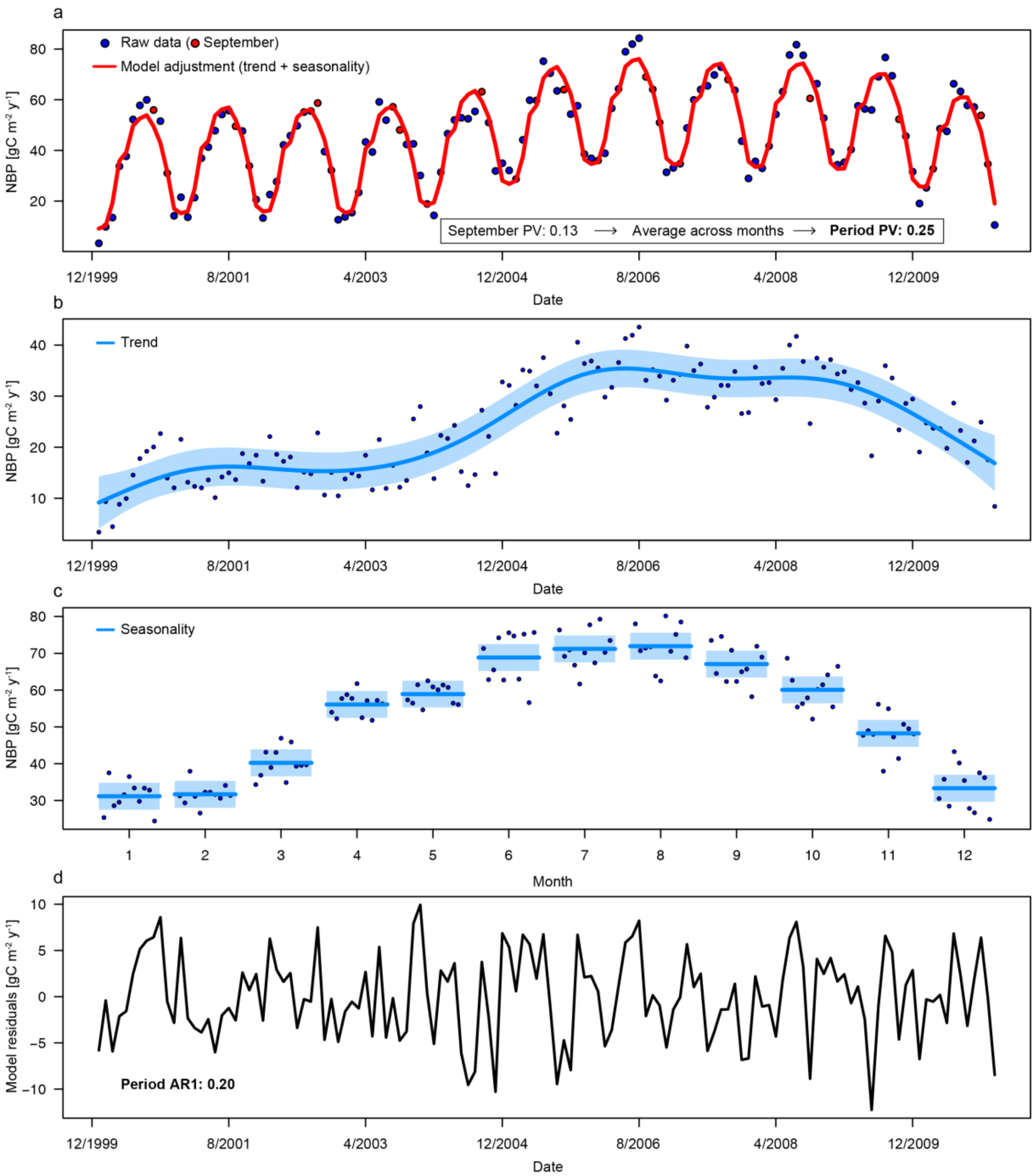
**Supplementary Figure 12: Spatial controls of aggregated trends in $NBP_{PV\text{-}AR1}$.** Points and confidence bands indicate, respectively, the 50% percentile and the 95% credible interval of the regression model parameter estimates. Solid dots indicate that the 95% of the distributions of the parameter estimates do not cross zero. See **Methods** for details on statistical models.



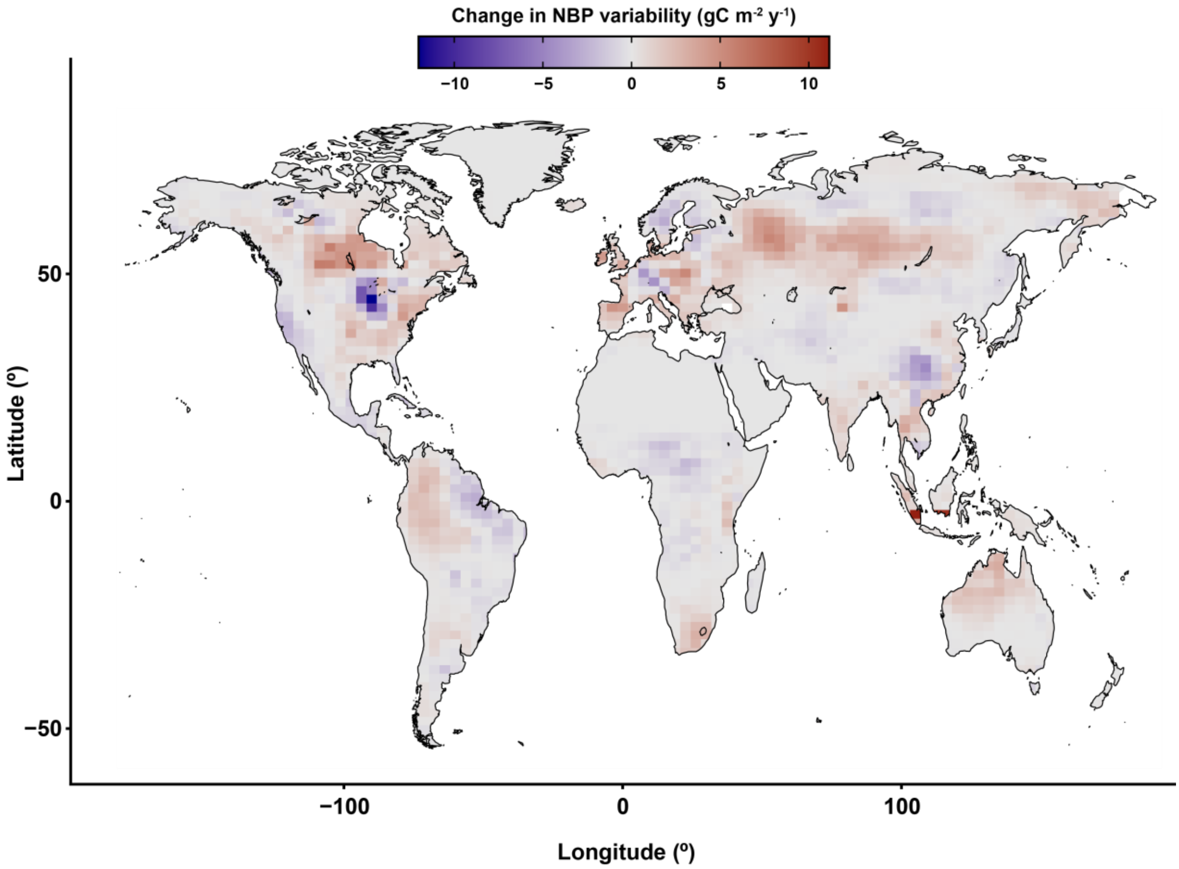
**Supplementary Figure 13: Sensitivity analyses showing minimal differences when selecting different window lengths (7, 11 and 15 years) to estimate trends in $NBP_{PV}$ and $NBP_{AR1}$.** Blue, black and red lines show, respectively, results for 7, 11 and 15-year window lengths. Coefficients show the linear Theil-Sen's slopes of the results (± standard error of the slope) and their corresponding p-values estimated using the non-parametric Wilcoxon Mann-Whitney rank sum test. Values represent spatially-weighted global means.



**Supplementary Figure 14: Example of calculation of PV and AR1 metrics (simulated NBP time series).** Panel a shows the raw data of NBP (blue dots) and the model adjustment (red line) when controlling for the trend (smoothed term) and the seasonality of the time series using a generalised additive model (GAM). Temporal variability is calculated from raw data, by means of the proportional variability index (PV), as the average across the twelve months of the PV of each month across years (as an example, September data points are shown in red). Panel b and c show, respectively, the partial residuals of the fitted trend and seasonality estimated by the GAM model. Panel d shows the residuals of the model from which we finally calculated the temporal autocorrelation at lag 1 for the period.



**Supplementary Figure 15: Map showing the approximate magnitude of the change in NBP due to changing temporal interannual variability over the study period.** See Supplementary text, section 1 for further details on the calculation of the magnitude of change.



**Supplementary Table 1: Sensitivity analyses showing strong spatial correlations amongst the results obtained using different window lengths (7, 11 and 15 years) to estimate trends in $NBP_{PV}$ and $NBP_{AR1}$.** Values indicate Spearman's correlations (rho). The upper part of the diagonals shows correlations amongst AR1 results from different widow lengths, the lower part of the diagonals shows results for PV. d) Show the spatial correlation for the aggregated trends in PV and AR1 (see **Figure 2**).

| | **7 years** | **11 years** | **15 years** |
|---|---|---|---|
| **a) *CAMS + CarboScope*** | | | |
| 7 years | 1 | 0.81 | 0.68 |
| 11 years | 0.90 | 1 | 0.90 |
| 15 years | 0.83 | 0.94 | 1 |
| **b) *CAMS*** | | | |
| 7 years | 1 | 0.77 | 0.62 |
| 11 years | 0.91 | 1 | 0.89 |
| 15 years | 0.76 | 0.93 | 1 |
| **c) *CarboScope*** | | | |
| 7 years | 1 | 0.76 | 0.59 |
| 11 years | 0.83 | 1 | 0.86 |
| 15 years | 0.69 | 0.90 | 1 |
| **d) *CAMS + CarboScope (PV + AR1 trends)*** | | | |
| 7 years | 1 | 0.88 | 0.78 |
| 11 years | - | 1 | 0.94 |
| 15 years | - | - | 1 |

## 2. Supplementary notes

**How much does the temporal behaviour of regional NBP change given the reported increase in PV?**

We can illustrate the magnitude of change in NBP given an increase in variability with an example, but because PV is calculated by the proportional comparison of all pair-wise values in a time series, and the example is based on average values, the results may not be exact. For example, the Iberian Peninsula shows a value for $NBP_{PV}$ of around 0.25 and a trend in $NBP_{PV}$ of around 0.003 $y^{-1}$ (**Figure 1**). Considering that average NBP for that region during the study period is around 20 gC $m^{-2}$ $y^{-1}$, the increase in variability over 28 years (1981 to 2018 with an 11-year moving window) would be around 0.084, which represents an increase of 8.4% in variability. That increase means that if NBP would have remained constant, and initial $NBP_{PV}$ would have been 0.208 (increasing to 0.292 by the end of the study period at a rate of 0.003 per year), the average range of variability would have gone from 20 x 0.208 = 4.16 gC $m^{-2}$ $y^{-1}$ to 20 x 0.292 = 5.84 gC $m^{-1}$ $y^{-1}$. Given the large heterogeneity of trends in $NBP_{PV}$ at the global scale, the reported average global increase in PV as a result of the combination of CAMS and CarboScope is small ($8.3 \cdot 10^{-4}$, Figure 1f) which represents an increase of PV of 0.023 over the study period (2.3% increase in variability). So, if NBP would have remained constant at 10 gC $m^{-2}$ $y^{-1}$ at the global scale, the reported increase in $NBP_{PV}$ over an average $NBP_{PV}$ of around 0.28, would have entailed an increase in variability from 10 x 0.238 = 2.38 gC $m^{-2}$ $y^{-1}$ to 10 x 0.262 = 2.62 gC $m^{-2}$ $y^{-1}$ over the entire world. **Supplementary Figure 15** shows the regional magnitude of change in NBP with changing temporal variability following the methodology explained above.

For temporal autocorrelation, however, there is literally no possible way to assess how an increase in autocorrelation would affect values of NBP in the previous manner. That metric describes how strongly correlated are consecutive numbers. Therefore, our results combining trends in $NBP_{PV}$ and $NBP_{AR1}$ have the same drawback due to the impossibility to assess the impact of AR1 on values of NBP.

# 3. Model summaries

**Variable names**

**Biodiversity:** plant species richness (biodiver), I(biodiver^2) indicates the $x^2$ part of a polynomial fit (i.e., biodiversity + $\text{biodiversity}^2$).

**Atmospheric N deposition**: mean annual atmospheric N deposition (mean.ndep.tot).

**Climate**: mean annual temperature (tmps.mean), mean sum of annual precipitation (pres.mean), temporal variability in temperature (tmps.pv), temporal variability in precipitation (pres.pv), temporal autocorrelation in temperature (tmps.ar1), temporal autocorrelation in precipitation (pres.ar1), aggregated index combining trends in PV and AR1 (temperature: tmps.pv.ar1.trend; precipitation: pres.pv.ar1.trend).

**Climate change**: trend in mean annual temperature (tmps.mean.trend), trend in mean sum of annual precipitation (pres.mean.trend), trend in the temporal variability in temperature (tmps.pv.trend), trend in the temporal variability in precipitation (pres.pv.trend), trend in the temporal autocorrelation of temperature (tmps.ar1.trend), trend in the temporal autocorrelation of precipitation (pres.ar1.trend).

**Land use**: mean percentage of forested land (mean.forested), mean percentage of agricultural land (mean.croped), mean percentage of urbanised land (mean.urbaned).

**Land use change**: trend in mean percentage of forested land (trnd.forested), trend in mean percentage of agricultural land (trnd.croped), trend in mean percentage of urbanised land (trnd.urbaned).

**Additional estimated parameters:** nu2, tau2 and rho are estimated by the spatial regression model.

Bold coefficients indicate that 95% of the posterior distribution did not overlap 0. All variables were standardised before fitting the model (mean=0, sd=1).

## 1. Spatial variability in mean NBP

### 1.1. *Atmospheric inversions (CAMS + CarboScope)*

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | **0.0524** | **0.0288** | **0.0763** | 3851.9 | 1.9 |
| **biodiver** | **0.1708** | **0.097** | **0.2435** | 2612.2 | 0.6 |
| **mean.ndep.tot** | **0.2257** | **0.1538** | **0.3016** | 1858.8 | 0.4 |
| **I(biodiver^2)** | **-0.1222** | **-0.1461** | **-0.0984** | 3607.7 | -1.2 |
| **tmps.mean** | -0.0263 | -0.1144 | 0.0643 | 481 | -0.1 |
| **pres.mean** | **-0.0909** | **-0.1524** | **-0.0288** | 3079.9 | -1.2 |
| **mean.forested** | **0.1019** | **0.0682** | **0.1366** | 3776.4 | -1 |
| **mean.croped** | **0.0716** | **0.0389** | **0.1047** | 5161.3 | 0.6 |
| **mean.urbaned** | -0.0243 | -0.0529 | 0.0045 | 4875.2 | -0.2 |
| **biodiver:mean.ndep.tot** | **0.1324** | **0.0958** | **0.1687** | 3407.5 | -0.8 |
| **nu2** | **0.0023** | **0.0012** | **0.0046** | 5322 | 0.2 |
| **tau2** | **5.4106** | **5.0299** | **5.7928** | 63883 | -1 |
| **rho** | **0.9642** | **0.9114** | **0.9910** | 35213.9 | -1 |

DIC = -5081.876 p.d = 2038.19 LMPL = 1522.32

### 1.2. *TRENDY*

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | **0.0983** | **0.0686** | **0.1277** | 4470.3 | 0 |
| **biodiver** | **0.3968** | **0.3013** | **0.4915** | 2000.2 | 0.8 |
| **mean.ndep.tot** | **0.1167** | **0.0215** | **0.2102** | 1761.5 | -0.6 |
| **I(biodiver^2)** | 0.0193 | -0.0111 | 0.0496 | 4230.2 | -0.6 |
| **tmps.mean** | **0.1600** | **0.0409** | **0.2787** | 464.1 | 0.9 |
| **pres.mean** | 0.0551 | -0.024 | 0.1323 | 3505.8 | -1.1 |
| **mean.forested** | **0.1238** | **0.0790** | **0.1681** | 4292.4 | -0.3 |
| **mean.croped** | **-0.2862** | **-0.3290** | **-0.2443** | 5336.2 | 1.1 |
| **mean.urbaned** | -0.0120 | -0.0489 | 0.0252 | 5519.4 | -0.5 |
| **biodiver:mean.ndep.tot** | **-0.2231** | **-0.2678** | **-0.1781** | 4112.1 | 0.8 |
| **nu2** | **0.0045** | **0.0018** | **0.0126** | 2698.1 | -1 |
| **tau2** | **8.7307** | **8.0748** | **9.3708** | 24383.1 | 1.1 |
| **rho** | **0.9614** | **0.9031** | **0.9905** | 11797.1 | 1.3 |

DIC = -3732.725 p.d = 1885.291 LMPL = 736.85

### 1.3. *CAMS*

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | **0.1175** | **0.0888** | **0.1471** | 3372.3 | 2.7 |
| **biodiver** | **0.2078** | **0.1173** | **0.2987** | 2291 | 1.7 |
| **mean.ndep.tot** | **0.3021** | **0.2140** | **0.3880** | 1714.9 | 0.8 |
| **I(biodiver^2)** | **-0.1635** | **-0.1927** | **-0.1341** | 3298.5 | -0.8 |
| **tmps.mean** | **-0.1294** | **-0.2406** | **-0.0153** | 435 | 1.1 |
| **pres.mean** | **-0.1418** | **-0.2179** | **-0.0678** | 2852.8 | -0.5 |
| **mean.forested** | **0.0717** | **0.0287** | **0.1155** | 3144.2 | -0.6 |
| **mean.croped** | **0.0798** | **0.0395** | **0.1204** | 4509 | -0.6 |
| **mean.urbaned** | -0.0147 | -0.0503 | 0.0210 | 4343.7 | -0.4 |
| **biodiver:mean.ndep.tot** | **0.0872** | **0.0425** | **0.1308** | 3074.3 | -2.1 |
| **nu2** | 0.0033 | 0.0014 | 0.0080 | 3523.7 | -0.8 |
| **tau2** | 7.9095 | 6.9563 | 8.6804 | 28803.1 | 1.6 |
| **rho** | 0.9088 | 0.7984 | 0.9752 | 22688.7 | 0.7 |

DIC = -4355.835 p.d = 1964.491 LMPL = 1111.89

### 1.4. *CarboScope*

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | **-0.0533** | **-0.0719** | **-0.0350** | 3999.6 | 0.1 |
| **biodiver** | 0.0537 | -0.0048 | 0.1127 | 2469.3 | -1.2 |
| **mean.ndep.tot** | 0.0439 | -0.0138 | 0.1009 | 1752.6 | -0.3 |
| **I(biodiver^2)** | **-0.0213** | **-0.0402** | **-0.0024** | 3416.4 | 0 |
| **tmps.mean** | **0.1142** | **0.0432** | **0.1860** | 466.3 | -1.9 |
| **pres.mean** | 0.0107 | -0.0388 | 0.0591 | 3182 | 0.9 |
| **mean.forested** | **0.1048** | **0.0773** | **0.1327** | 3681.8 | 0.8 |
| **mean.croped** | **0.0334** | **0.0078** | **0.0597** | 4810.7 | 1.1 |
| **mean.urbaned** | **-0.0267** | **-0.0498** | **-0.0039** | 4595.8 | 0.5 |
| **biodiver:mean.ndep.tot** | **0.1417** | **0.1132** | **0.1695** | 3146.8 | -0.1 |
| **nu2** | 0.0015 | 0.0009 | 0.0026 | 8304.2 | 1.1 |
| **tau2** | 3.5164 | 3.3101 | 3.7390 | 70000 | -1.7 |
| **rho** | 0.9871 | 0.9660 | 0.9970 | 68207.9 | -2.3 |

DIC = -6014.875 p.d = 2091.966 LMPL = 2042.7

## 2. Spatial variability in NBP$_{PV}$

### 2.1. *Atmospheric inversions (CAMS + CarboScope)*

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | **0.2392** | **0.2166** | **0.2616** | 5138 | -0.3 |
| **biodiver** | **0.9535** | **0.8929** | **1.0144** | 4127.4 | -1.3 |
| **mean.ndep.tot** | **0.2172** | **0.1500** | **0.2828** | 2403.9 | 1.3 |
| **I(biodiver^2)** | **-0.1459** | **-0.1684** | **-0.1233** | 4616.6 | 0.7 |
| **tmps.pv** | **0.5513** | **0.4586** | **0.6416** | 602.6 | -0.7 |
| **pres.pv** | **0.0319** | **0.0010** | **0.0633** | 4429.1 | -1.2 |
| **mean.forested** | **0.0510** | **0.0171** | **0.0848** | 4499 | 1.4 |
| **mean.croped** | **0.0719** | **0.0405** | **0.1033** | 7022.6 | 0.1 |
| **mean.urbaned** | **-0.0292** | **-0.0564** | **-0.0019** | 6408.1 | 0 |
| **biodiver:mean.ndep.tot** | **-0.1772** | **-0.2111** | **-0.1435** | 4075.4 | -0.7 |
| **nu2** | **0.0029** | **0.0014** | **0.0064** | 4124.9 | 0.2 |
| **tau2** | **4.7717** | **4.3670** | **5.1426** | 35670.3 | -0.2 |
| **rho** | **0.9485** | **0.8762** | **0.9870** | 30714.9 | -0.6 |

DIC = -4635.541 p.d = 1991.098 LMPL = 1290.43

### 2.2. *TRENDY*

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | **0.2090** | **0.1893** | **0.2290** | 4641.8 | 1.5 |
| **biodiver** | **0.6324** | **0.5784** | **0.6866** | 3462.1 | 1.3 |
| **mean.ndep.tot** | **0.1970** | **0.1392** | **0.2564** | 2365.3 | 0.3 |
| **I(biodiver^2)** | **-0.1331** | **-0.1535** | **-0.1130** | 4481.8 | -1 |
| **tmps.pv** | **0.2602** | **0.1825** | **0.3374** | 561 | 0.3 |
| **pres.pv** | **0.2171** | **0.1889** | **0.2447** | 3906.8 | 0.6 |
| **mean.forested** | **0.1522** | **0.1222** | **0.1816** | 3999.7 | -0.5 |
| **mean.croped** | **0.1508** | **0.1232** | **0.1783** | 6345.2 | -0.9 |
| **mean.urbaned** | -0.0132 | -0.037 | 0.0114 | 5775 | 0.5 |
| **biodiver:mean.ndep.tot** | **-0.1442** | **-0.1742** | **-0.1150** | 3963 | -0.6 |
| **nu2** | **0.0021** | **0.0011** | **0.0040** | 6053 | -0.3 |
| **tau2** | **3.7970** | **3.5037** | **4.0750** | 55672.7 | -0.4 |
| **rho** | **0.9566** | **0.8943** | **0.9890** | 34951 | -1.2 |

DIC = -5299.126 p.d = 2047.861 LMPL = 1673.68

## 2.3. *CAMS*

| | **Median** | **2.50%** | **97.50%** | **n.effective** | **Geweke.diag** |
|---|---|---|---|---|---|
| **(Intercept)** | **0.2299** | **0.2056** | **0.2543** | 4502 | -2 |
| **biodiver** | **0.7554** | **0.6900** | **0.8216** | 3865.6 | 0.5 |
| **mean.ndep.tot** | **0.3605** | **0.2896** | **0.4319** | 2217.5 | -1.5 |
| **I(biodiver^2)** | **-0.1281** | **-0.1521** | **-0.1035** | 4410.8 | 0.8 |
| **tmps.pv** | **0.4070** | **0.3089** | **0.5015** | 537.1 | 1.9 |
| **pres.pv** | 0.0012 | -0.0328 | 0.0353 | 4087.3 | 0.8 |
| **mean.forested** | **0.0845** | **0.0482** | **0.1201** | 4224.9 | -0.6 |
| **mean.croped** | **0.0747** | **0.0408** | **0.1083** | 6304 | 1.4 |
| **mean.urbaned** | -0.0168 | -0.0466 | 0.0131 | 6037.6 | 1.9 |
| **biodiver:mean.ndep.tot** | **-0.1937** | **-0.2303** | **-0.1567** | 3672.8 | 1.5 |
| **nu2** | 0.0031 | 0.0014 | 0.0070 | 4263.4 | -0.6 |
| **tau2** | 5.4439 | 4.8453 | 5.9396 | 25754.6 | -2.8 |
| **rho** | 0.9201 | 0.8194 | 0.9786 | 21242.2 | -3 |

DIC = -4477.512 p.d = 1987.668 LMPL = 1196.64

## 2.4. *CarboScope*

| | **Median** | **2.50%** | **97.50%** | **n.effective** | **Geweke.diag** |
|---|---|---|---|---|---|
| **(Intercept)** | **0.1763** | **0.1520** | **0.2014** | 4026.2 | 0.4 |
| **biodiver** | **0.9621** | **0.8956** | **1.0308** | 3266.8 | 1.4 |
| **mean.ndep.tot** | **-0.0828** | **-0.1527** | **-0.0089** | 2033.8 | -1.8 |
| **I(biodiver^2)** | **-0.1272** | **-0.1520** | **-0.1027** | 3983.2 | -1.8 |
| **tmps.pv** | **0.6152** | **0.5184** | **0.7115** | 493.8 | -1.8 |
| **pres.pv** | **0.0712** | **0.0374** | **0.1056** | 3738.4 | 1.7 |
| **mean.forested** | -0.0179 | -0.0546 | 0.0190 | 3634.1 | 0.1 |
| **mean.croped** | **0.0425** | **0.0083** | **0.0763** | 5690.4 | 1.3 |
| **mean.urbaned** | **-0.0391** | **-0.0694** | **-0.0092** | 5095.2 | 1.7 |
| **biodiver:mean.ndep.tot** | **-0.0934** | **-0.1298** | **-0.0569** | 3218.4 | 1.8 |
| **nu2** | 0.0028 | 0.0013 | 0.0059 | 4535 | 0.3 |
| **tau2** | 5.7641 | 5.3175 | 6.1845 | 57264.5 | 0 |
| **rho** | 0.9560 | 0.8938 | 0.9891 | 47159.3 | 1.3 |

DIC = -4718.69 p.d = 2011.388 LMPL = 1295.89

## 3. Spatial variability in NBP$_{AR1}$

### 3.1. *Atmospheric inversions (CAMS + CarboScope)*

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | **0.0499** | **0.0240** | **0.0753** | 4334.5 | -1.1 |
| **biodiver** | **0.1758** | **0.1061** | **0.2445** | 3131 | 1 |
| **mean.ndep.tot** | **-0.0805** | **-0.1545** | **-0.0051** | 2551.5 | -2.5 |
| **I(biodiver^2)** | **-0.0378** | **-0.0638** | **-0.0115** | 4484.6 | -1.5 |
| **tmps.ar1** | **0.0830** | **0.0288** | **0.1367** | 1875.5 | 1.1 |
| **pres.ar1** | -0.0044 | -0.0317 | 0.0231 | 6768.8 | -1.2 |
| **mean.forested** | -0.0215 | -0.0596 | 0.0155 | 3670 | 1.5 |
| **mean.croped** | **0.0637** | **0.0280** | **0.1000** | 6385.1 | 0 |
| **mean.urbaned** | 0.0121 | -0.0193 | 0.0432 | 6006.9 | -0.3 |
| **biodiver:mean.ndep.tot** | -0.0229 | -0.0624 | 0.0160 | 3931.2 | 3 |
| **nu2** | **0.0037** | **0.0016** | **0.0092** | 3385.7 | 0.3 |
| **tau2** | **6.4355** | **5.9658** | **6.8948** | 41076.7 | 1.1 |
| **rho** | **0.9632** | **0.9089** | **0.9910** | 64138.6 | -0.2 |

DIC = -4123.148  p.d = 1939.636  LMPL = 974.04

### 3.2. *TRENDY*

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | -0.0193 | -0.0395 | 0.0008 | 5100.6 | 0.4 |
| **biodiver** | **-0.1311** | **-0.1853** | **-0.0769** | 3620.2 | 1 |
| **mean.ndep.tot** | **0.0810** | **0.0234** | **0.1377** | 2858.3 | -0.7 |
| **I(biodiver^2)** | **0.0259** | **0.0060** | **0.0459** | 5600.9 | -0.4 |
| **tmps.ar1** | **0.1433** | **0.1016** | **0.1853** | 2131.7 | -0.1 |
| **pres.ar1** | **0.0899** | **0.0690** | **0.1109** | 8145.7 | 0.7 |
| **mean.forested** | **-0.1492** | **-0.1791** | **-0.1198** | 4217.7 | 1.3 |
| **mean.croped** | 0.0144 | -0.0130 | 0.0423 | 7772 | -1.6 |
| **mean.urbaned** | **0.0354** | **0.0112** | **0.0595** | 6928 | 0.3 |
| **biodiver:mean.ndep.tot** | -0.0129 | -0.0423 | 0.0172 | 4539.6 | 0 |
| **nu2** | **0.0026** | **0.0013** | **0.0052** | 5069.3 | -0.6 |
| **tau2** | **3.8896** | **3.6475** | **4.1442** | 56501.3 | 0.6 |
| **rho** | **0.9816** | **0.9521** | **0.9956** | 65592 | -1.4 |

DIC = -4875.772  p.d = 2014.984  LMPL = 1443.5

### 3.3. *CAMS*

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | **0.0844** | **0.0462** | **0.1236** | 2880.9 | -0.4 |
| **biodiver** | **0.2919** | **0.1871** | **0.3994** | 2315 | -1.1 |
| **mean.ndep.tot** | **-0.1473** | **-0.2588** | **-0.0373** | 1872.3 | 0.5 |
| **I(biodiver^2)** | **-0.0559** | **-0.0954** | **-0.0168** | 3090.6 | 0.3 |
| **tmps.ar1** | **0.1320** | **0.0536** | **0.2137** | 1367.9 | -0.3 |
| **pres.ar1** | 0.0065 | -0.0352 | 0.0477 | 4507.2 | 0.3 |
| **mean.forested** | -0.0466 | -0.1037 | 0.0120 | 2365.4 | 1.7 |
| **mean.croped** | **0.0990** | **0.0438** | **0.1536** | 4197.3 | 0.3 |
| **mean.urbaned** | 0.0192 | -0.0279 | 0.0683 | 4161.1 | 0.6 |
| **biodiver:mean.ndep.tot** | -0.0539 | -0.1119 | 0.0028 | 3170.8 | 0.1 |
| **nu2** | 0.0056 | 0.0020 | 0.0181 | 2147.1 | 0.5 |
| **tau2** | 11.703 | 9.0062 | 14.309 | 15815.7 | 0.9 |
| **rho** | 0.7356 | 0.5563 | 0.9017 | 15312.7 | 0.9 |

DIC = -3325.409 p.d = 1813.241 LMPL = 433.5

### 3.4. *CarboScope*

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | -0.0055 | -0.0123 | 0.0012 | 6870.7 | 1.9 |
| **biodiver** | **-0.0213** | **-0.0395** | **-0.0031** | 5413.6 | 1.4 |
| **mean.ndep.tot** | **0.0290** | **0.0096** | **0.0487** | 4105.6 | 1.2 |
| **I(biodiver^2)** | -0.0021 | -0.0089 | 0.0046 | 7637.1 | -1.4 |
| **tmps.ar1** | -0.0076 | -0.0217 | 0.0061 | 2633.2 | -1.1 |
| **pres.ar1** | **-0.0123** | **-0.0193** | **-0.0054** | 11649.3 | 0 |
| **mean.forested** | **0.0134** | **0.0035** | **0.0232** | 5859.7 | -1.9 |
| **mean.croped** | 0.0017 | -0.0076 | 0.0110 | 11310.5 | -0.8 |
| **mean.urbaned** | -0.0006 | -0.0088 | 0.0075 | 10564.5 | 0.2 |
| **biodiver:mean.ndep.tot** | **0.0145** | **0.0043** | **0.0245** | 6630.4 | -0.7 |
| **nu2** | 0.0004 | 0.0003 | 0.0006 | 27719.2 | -1 |
| **tau2** | 0.4438 | 0.4182 | 0.4713 | 68976.4 | 1.2 |
| **rho** | 0.9989 | 0.9971 | 0.9998 | 69210 | 1.1 |

DIC = -8832.31 p.d = 2122.28 LMPL = 3598.25

## 4. Spatial variability in trends of mean NBP

### 4.1. *Atmospheric inversions (CAMS + CarboScope)*

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | 0.0078 | -0.0270 | 0.0415 | 2779.4 | -0.3 |
| **biodiver** | 0.0113 | -0.1036 | 0.1224 | 1779 | -1.2 |
| **I(biodiver^2)** | -0.0078 | -0.0414 | 0.0269 | 2881.2 | 0.3 |
| **mean.ndep.tot** | **0.2035** | **0.1098** | **0.2932** | 1357 | -0.4 |
| **tmps.mean** | **-0.2907** | **-0.4304** | **-0.1531** | 362.5 | -1.7 |
| **pres.mean** | 0.0196 | -0.0735 | 0.1170 | 2281.3 | 0.8 |
| **tmps.mean.trend** | **-0.0968** | **-0.1626** | **-0.0297** | 1888 | -0.4 |
| **pres.mean.trend** | -0.0114 | -0.0519 | 0.0287 | 3230.2 | 0.2 |
| **mean.forested** | **0.0843** | **0.0265** | **0.1433** | 2819.1 | -0.7 |
| **mean.croped** | 0.0222 | -0.0287 | 0.0721 | 3739.5 | 0.2 |
| **mean.urbaned** | **0.1426** | **0.0591** | **0.2264** | 2979 | 0.4 |
| **trnd.forested** | **-0.0641** | **-0.1149** | **-0.014** | 2827.9 | 0.9 |
| **trnd.croped** | 0.0447 | -0.0019 | 0.0920 | 2794.5 | -0.5 |
| **trnd.urbaned** | **-0.1041** | **-0.1815** | **-0.027** | 3019.7 | -0.1 |
| **nu2** | **0.0040** | **0.0016** | **0.0103** | 3141.1 | 0.6 |
| **tau2** | **11.795** | **10.192** | **13.082** | 31132.6 | 1.3 |
| **rho** | **0.8896** | **0.7656** | **0.9693** | 26303.5 | 2 |

DIC = -3990.262 p.d = 1933.688 LMPL = 879.6

### 4.2. *TRENDY*

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | -0.0013 | -0.0372 | 0.0334 | 2925.6 | 0.9 |
| **biodiver** | 0.1143 | -0.0047 | 0.2304 | 1755.4 | 0.5 |
| **I(biodiver^2)** | 0.0013 | -0.0334 | 0.0371 | 2902.8 | -0.9 |
| **mean.ndep.tot** | **0.1469** | **0.0544** | **0.2419** | 1655.4 | -0.6 |
| **tmps.mean** | -0.0575 | -0.1879 | 0.0799 | 467.6 | -0.3 |
| **pres.mean** | **-0.1119** | **-0.2058** | **-0.0167** | 2419.3 | -0.1 |
| **tmps.mean.trend** | **-0.2134** | **-0.2814** | **-0.1473** | 2234.3 | -1.1 |
| **pres.mean.trend** | **0.3061** | **0.2661** | **0.3457** | 3874.3 | 0.4 |
| **mean.forested** | **0.0774** | **0.0171** | **0.1374** | 2705.3 | 0.9 |
| **mean.croped** | **-0.0884** | **-0.1384** | **-0.0382** | 4399.3 | 0 |
| **mean.urbaned** | 0.0254 | -0.0615 | 0.1115 | 3613.8 | 0 |
| **trnd.forested** | -0.0473 | -0.0982 | 0.0037 | 3313.3 | 1.5 |
| **trnd.croped** | **-0.1335** | **-0.1808** | **-0.0853** | 3056.3 | 0.8 |
| **trnd.urbaned** | **-0.0863** | **-0.1657** | **-0.0068** | 3811.3 | 0.3 |
| **nu2** | **0.0048** | **0.0018** | **0.0135** | 2543.9 | -0.1 |
| **tau2** | **11.009** | **8.7874** | **12.939** | 11120.3 | -0.5 |
| **rho** | **0.7949** | **0.625** | **0.9308** | 10326.3 | -0.9 |

DIC = -3616.401 p.d = 1882.808 LMPL = 658.06

### 4.3. *CAMS*

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | -0.0036 | -0.0379 | 0.0325 | 2739.9 | -0.3 |
| **biodiver** | -0.0011 | -0.1164 | 0.1166 | 1884.9 | -0.2 |
| **I(biodiver^2)** | 0.0036 | -0.0324 | 0.0378 | 2797.1 | 0.3 |
| **mean.ndep.tot** | **0.1898** | **0.0917** | **0.2824** | 1337.4 | 1.8 |
| **tmps.mean** | **-0.2747** | **-0.406** | **-0.1335** | 451.3 | 0.4 |
| **pres.mean** | 0.0164 | -0.0846 | 0.1139 | 1986.3 | -0.5 |
| **tmps.mean.trend** | **-0.0777** | **-0.1464** | **-0.0070** | 1750 | 1.6 |
| **pres.mean.trend** | -0.0126 | -0.0539 | 0.0286 | 3101.6 | 0.6 |
| **mean.forested** | **0.0821** | **0.0220** | **0.1438** | 2512.5 | 0.7 |
| **mean.croped** | 0.0249 | -0.0267 | 0.0764 | 3526.1 | -1.1 |
| **mean.urbaned** | **0.1607** | **0.0718** | **0.2465** | 2844.5 | 0.2 |
| **trnd.forested** | **-0.0661** | **-0.1192** | **-0.0148** | 3171.9 | -0.5 |
| **trnd.croped** | 0.0337 | -0.0160 | 0.0838 | 2635.5 | 0.2 |
| **trnd.urbaned** | **-0.1195** | **-0.1985** | **-0.0364** | 2837.6 | -0.8 |
| **nu2** | 0.0041 | 0.0017 | 0.0108 | 2868.9 | 1 |
| **tau2** | 12.272 | 10.223 | 13.956 | 23157.1 | -0.5 |
| **rho** | 0.8469 | 0.6993 | 0.9538 | 25272.5 | -0.5 |

DIC = -3908.619 p.d = 1927.172 LMPL = 867.15

### 4.4. *CarboScope*

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | **0.0421** | **0.0285** | **0.0557** | 5015.3 | 0.8 |
| **biodiver** | **0.0475** | **0.0031** | **0.0913** | 3377.6 | 0.1 |
| **I(biodiver^2)** | **-0.0421** | **-0.0557** | **-0.0286** | 4800.1 | -0.8 |
| **mean.ndep.tot** | **0.0687** | **0.0322** | **0.1052** | 2111.1 | -1.7 |
| **tmps.mean** | **-0.1164** | **-0.1704** | **-0.0632** | 633.1 | 0.8 |
| **pres.mean** | 0.0230 | -0.0148 | 0.0609 | 3605 | 0.2 |
| **tmps.mean.trend** | **-0.0815** | **-0.1084** | **-0.0552** | 3042.2 | 0 |
| **pres.mean.trend** | 0.0006 | -0.0151 | 0.0164 | 5546 | 1.2 |
| **mean.forested** | **0.0287** | **0.0054** | **0.0517** | 4644.6 | -1 |
| **mean.croped** | -0.0040 | -0.0236 | 0.0157 | 6429.8 | 1.6 |
| **mean.urbaned** | **-0.037** | **-0.0701** | **-0.0034** | 5105.2 | -1 |
| **trnd.forested** | -0.0044 | -0.0244 | 0.0157 | 5541.3 | 0.4 |
| **trnd.croped** | **0.0474** | **0.0289** | **0.0661** | 4651.5 | 0.3 |
| **trnd.urbaned** | **0.0331** | **0.0021** | **0.0642** | 5167.9 | 0.1 |
| **nu2** | 0.0011 | 0.0007 | 0.0017 | 11516.9 | 0.8 |
| **tau2** | 2.0656 | 1.9462 | 2.1941 | 67101.3 | -1.2 |
| **rho** | 0.9938 | 0.9833 | 0.9985 | 70000 | -1.6 |

DIC = -6706.438 p.d = 2108.892 LMPL = 2458.83

## 5. Spatial variability in trends of $NBP_{PV}$

### 5.1. *Atmospheric inversions (CAMS + CarboScope)*

| | **Median** | **2.50%** | **97.50%** | **n.effective** | **Geweke.diag** |
|---|---|---|---|---|---|
| **(Intercept)** | 0.0235 | -0.0101 | 0.0573 | 3223 | -0.3 |
| **biodiver** | 0.0017 | -0.0946 | 0.0997 | 2342.4 | 0.1 |
| **I(biodiver^2)** | -0.0235 | -0.0571 | 0.0100 | 3206.6 | 0.2 |
| **mean.ndep.tot** | **-0.1634** | **-0.2516** | **-0.0769** | 1712.3 | 0.3 |
| **tmps.mean.trend** | **-0.1002** | **-0.1638** | **-0.0341** | 1665.9 | 0.6 |
| **pres.mean.trend** | -0.0290 | -0.0672 | 0.0085 | 3916.1 | -0.6 |
| **tmps.pv.trend** | **0.1644** | **0.1036** | **0.2236** | 1785.7 | 1.1 |
| **pres.pv.trend** | **-0.0974** | **-0.1388** | **-0.0566** | 3773.7 | -0.1 |
| **mean.forested** | **-0.0264** | **-0.0824** | **0.0316** | 2328.8 | 1.2 |
| **mean.croped** | **0.1013** | **0.0529** | **0.1507** | 4144.7 | -0.4 |
| **mean.urbaned** | -0.0398 | -0.1222 | 0.0426 | 3403 | 1.9 |
| **trnd.forested** | **-0.0602** | **-0.1094** | **-0.0093** | 3595.3 | 1 |
| **trnd.croped** | **0.0534** | **0.0067** | **0.0992** | 2949 | 0.8 |
| **trnd.urbaned** | 0.0637 | -0.0132 | 0.1395 | 3461.7 | -1.2 |
| **nu2** | **0.0044** | **0.0017** | **0.0116** | 2939.1 | 0.8 |
| **tau2** | **11.102** | **9.4125** | **12.455** | 35986.7 | 0.9 |
| **rho** | **0.8686** | **0.7316** | **0.9614** | 34169.8 | 1 |

DIC = -3804.119 p.d = 1910.947 LMPL = 784.98

### 5.2. *TRENDY*

| | **Median** | **2.50%** | **97.50%** | **n.effective** | **Geweke.diag** |
|---|---|---|---|---|---|
| **(Intercept)** | 0.0231 | -0.0067 | 0.0521 | 3693.2 | 0.7 |
| **biodiver** | -0.0084 | -0.0926 | 0.0753 | 2781.5 | 1.7 |
| **I(biodiver^2)** | -0.0231 | -0.0519 | 0.0064 | 3663.5 | -0.8 |
| **mean.ndep.tot** | -0.0121 | -0.0861 | 0.0631 | 2432.8 | -1.2 |
| **tmps.mean.trend** | **0.2373** | **0.1813** | **0.2946** | 2074.6 | -0.6 |
| **pres.mean.trend** | **-0.1402** | **-0.174** | **-0.1064** | 4973.1 | -0.1 |
| **tmps.pv.trend** | **0.1183** | **0.0641** | **0.1711** | 2355.2 | 0.4 |
| **pres.pv.trend** | **0.3919** | **0.3558** | **0.4278** | 4755.3 | 0.3 |
| **mean.forested** | 0.0185 | -0.0317 | 0.0687 | 3400 | -0.3 |
| **mean.croped** | 0.0388 | -0.0042 | 0.0823 | 5495 | 0.6 |
| **mean.urbaned** | -0.0656 | -0.139 | 0.0063 | 4268.7 | -1.4 |
| **trnd.forested** | -0.0432 | -0.0872 | 0.0018 | 4495.5 | 1.1 |
| **trnd.croped** | **0.0657** | **0.0252** | **0.1059** | 3858.1 | 0.2 |
| **trnd.urbaned** | 0.0627 | -0.0046 | 0.1301 | 4531.2 | 1.1 |
| **nu2** | **0.0045** | **0.0018** | **0.0127** | 2625 | -0.7 |
| **tau2** | **7.9472** | **6.351** | **9.3386** | 22991.3 | 0 |
| **rho** | **0.7953** | **0.6263** | **0.9308** | 22049.9 | 0.3 |

DIC = -3732.416 p.d = 1880.682 LMPL = 742.6

### 5.3. *CAMS*

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | 0.0082 | -0.0267 | 0.0432 | 3302.4 | -0.4 |
| **biodiver** | 0.0217 | -0.0806 | 0.1239 | 2235 | -0.4 |
| **I(biodiver^2)** | -0.0082 | -0.0431 | 0.0265 | 3307.1 | 0.4 |
| **mean.ndep.tot** | **-0.1599** | **-0.2522** | **-0.0670** | 1636.4 | 0 |
| **tmps.mean.trend** | 0.0274 | -0.0409 | 0.0934 | 1700.9 | -1.6 |
| **pres.mean.trend** | -0.0333 | -0.0735 | 0.0075 | 3607.9 | -1.3 |
| **tmps.pv.trend** | **0.1295** | **0.0676** | **0.1926** | 1802.9 | 0.4 |
| **pres.pv.trend** | **-0.0945** | **-0.1369** | **-0.0510** | 3558.6 | -0.3 |
| **mean.forested** | -0.0531 | -0.1133 | 0.0068 | 2333 | -0.7 |
| **mean.croped** | **0.0938** | **0.0427** | **0.1465** | 4124.6 | -1.3 |
| **mean.urbaned** | -0.0665 | -0.1528 | 0.0200 | 3365.4 | -0.2 |
| **trnd.forested** | -0.0276 | -0.0782 | 0.0250 | 3561.9 | -0.3 |
| **trnd.croped** | **0.0595** | **0.0103** | **0.1073** | 2657 | 1.8 |
| **trnd.urbaned** | 0.0773 | -0.0030 | 0.1566 | 3558.6 | 1.4 |
| **nu2** | 0.0048 | 0.0018 | 0.0134 | 2416.3 | 0.4 |
| **tau2** | 11.855 | 9.7117 | 13.637 | 29616.6 | -1.6 |
| **rho** | 0.8282 | 0.6720 | 0.9454 | 28108.7 | -1.6 |

**DIC = -3623.725 p.d = 1881.522 LMPL = 633.15**

### 5.4. *CarboScope*

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | **0.0478** | **0.0237** | **0.0719** | 3247 | -1.5 |
| **biodiver** | -0.0430 | -0.1136 | 0.0266 | 2451.3 | -0.6 |
| **I(biodiver^2)** | **-0.0478** | **-0.0718** | **-0.0237** | 3211.3 | 1.5 |
| **mean.ndep.tot** | -0.0617 | -0.1267 | 0.0003 | 1475.3 | -0.9 |
| **tmps.mean.trend** | **-0.3634** | **-0.4103** | **-0.3166** | 1773.4 | -0.1 |
| **pres.mean.trend** | 0.0023 | -0.0255 | 0.0303 | 3592.2 | 0.3 |
| **tmps.pv.trend** | **0.1401** | **0.0959** | **0.1843** | 1690.7 | 0.9 |
| **pres.pv.trend** | **-0.0376** | **-0.0670** | **-0.0075** | 3636.2 | 1.1 |
| **mean.forested** | **0.0646** | **0.0238** | **0.1048** | 2660.3 | 0.4 |
| **mean.croped** | **0.0464** | **0.0104** | **0.0816** | 4379.3 | 1.8 |
| **mean.urbaned** | 0.0579 | -0.0011 | 0.1167 | 3584 | 1.3 |
| **trnd.forested** | **-0.1000** | **-0.1349** | **-0.0649** | 3831 | 0.1 |
| **trnd.croped** | 0.0016 | -0.0314 | 0.0341 | 2941.2 | 0.2 |
| **trnd.urbaned** | -0.0174 | -0.0710 | 0.0372 | 3681.2 | -0.8 |
| **nu2** | 0.0023 | 0.0012 | 0.0045 | 5539.6 | -1.5 |
| **tau2** | 6.3211 | 5.8927 | 6.7523 | 68535.6 | -1 |
| **rho** | 0.9677 | 0.9195 | 0.9922 | 64800 | 1.2 |

**DIC = -5124.036 p.d = 2049.197 LMPL = 1556.57**

## 6. Spatial variability in trends of $NBP_{AR1}$

### 6.1. *Atmospheric inversions (CAMS + CarboScope)*

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | -0.0285 | -0.0605 | 0.0035 | 3453.9 | 0.9 |
| **biodiver** | -0.0431 | -0.1400 | 0.0512 | 2275.8 | 1.7 |
| **I(biodiver^2)** | 0.0284 | -0.0034 | 0.0604 | 3417.2 | -0.9 |
| **mean.ndep.tot** | **-0.0912** | **-0.1741** | **-0.0092** | 1914.3 | 1.4 |
| **tmps.mean.trend** | **0.1082** | **0.0475** | **0.1711** | 1980.3 | -0.6 |
| **pres.mean.trend** | -0.0194 | -0.0568 | 0.0176 | 4247.3 | 0.4 |
| **tmps.ar1.trend** | 0.0353 | -0.0167 | 0.0867 | 2257.8 | -0.3 |
| **pres.ar1.trend** | **0.0343** | **0.0017** | **0.0673** | 5461.3 | -0.8 |
| **mean.forested** | **-0.1445** | **-0.1990** | **-0.0893** | 2593.4 | -0.9 |
| **mean.croped** | **0.0518** | **0.0043** | **0.0984** | 4920.1 | -2.6 |
| **mean.urbaned** | 0.0181 | -0.0617 | 0.0961 | 4030.4 | 0.7 |
| **trnd.forested** | -0.0022 | -0.0494 | 0.0453 | 4065 | -1.2 |
| **trnd.croped** | 0.0214 | -0.0230 | 0.0654 | 3397.7 | 0.7 |
| **trnd.urbaned** | 0.0064 | -0.0648 | 0.0801 | 4020.7 | -0.2 |
| **nu2** | **0.0047** | **0.0018** | **0.0134** | 2580.7 | -1 |
| **tau2** | **10.858** | **9.6371** | **11.864** | 48380.5 | -0.2 |
| **rho** | **0.9173** | **0.8162** | **0.9778** | 58817.2 | 0.2 |

**DIC = -3666.425, p.d = 1870.205 LMPL = 701.98**

| 6.2. *TRENDY* | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | **0.0591** | **0.0240** | **0.0946** | 4016.3 | 0.9 |
| **biodiver** | **0.2276** | **0.1260** | **0.3303** | 2810.5 | -0.8 |
| **I(biodiver^2)** | **-0.0591** | **-0.0945** | **-0.0242** | 4062.1 | -0.9 |
| **mean.ndep.tot** | **-0.0969** | **-0.1864** | **-0.0084** | 2278.3 | 0.2 |
| **tmps.mean.trend** | **0.1473** | **0.0803** | **0.2140** | 2320.1 | 1 |
| **pres.mean.trend** | **-0.1171** | **-0.1586** | **-0.0764** | 4601.9 | 2.1 |
| **tmps.ar1.trend** | **0.2419** | **0.1854** | **0.2993** | 2742.8 | -0.1 |
| **pres.ar1.trend** | **0.2639** | **0.2272** | **0.2997** | 6121 | -0.5 |
| **mean.forested** | 0.0146 | -0.0462 | 0.0757 | 2701.5 | -0.1 |
| **mean.croped** | **0.1118** | **0.0592** | **0.1638** | 5469.4 | 0.7 |
| **mean.urbaned** | 0.0042 | -0.083 | 0.0884 | 4521.7 | -1.8 |
| **trnd.forested** | -0.0220 | -0.0755 | 0.0314 | 4351.7 | -0.9 |
| **trnd.croped** | -0.0376 | -0.0863 | 0.0109 | 3779.3 | -0.5 |
| **trnd.urbaned** | 0.0064 | -0.0726 | 0.0875 | 4440.2 | 1.3 |
| **nu2** | **0.0067** | **0.0022** | **0.0237** | 1869.9 | 0.3 |
| **tau2** | **11.513** | **9.1933** | **13.559** | 20720.6 | 0.5 |
| **rho** | **0.7919** | **0.6237** | **0.9291** | 20608.4 | 0.5 |

**DIC = -3000.355 p.d = 1733.364 LMPL = 260.9**

**6.3.** ***CAMS***

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | -0.0309 | -0.0661 | 0.0046 | 3205.2 | -0.7 |
| **biodiver** | -0.0347 | -0.1392 | 0.0675 | 2207 | -1.2 |
| **I(biodiver^2)** | 0.0309 | -0.0047 | 0.0660 | 3163.8 | 0.7 |
| **mean.ndep.tot** | **-0.0933** | **-0.1858** | **-0.0042** | 1737.4 | -1.2 |
| **tmps.mean.trend** | **0.1042** | **0.035** | **0.1696** | 1936.4 | 0.8 |
| **pres.mean.trend** | -0.0023 | -0.0442 | 0.0385 | 3544.3 | 0.4 |
| **tmps.ar1.trend** | 0.0436 | -0.0119 | 0.0998 | 2114.6 | -0.8 |
| **pres.ar1.trend** | 0.0290 | -0.0072 | 0.0649 | 5097.1 | -0.9 |
| **mean.forested** | **-0.1508** | **-0.2095** | **-0.0893** | 2499.3 | 1 |
| **mean.croped** | 0.0508 | -0.0025 | 0.1024 | 4236.4 | 1 |
| **mean.urbaned** | 0.0305 | -0.056 | 0.1169 | 3782.5 | 0.8 |
| **trnd.forested** | -0.0131 | -0.0636 | 0.0395 | 3886.6 | 1 |
| **trnd.croped** | 0.0137 | -0.0357 | 0.0620 | 3080.7 | 1 |
| **trnd.urbaned** | -0.0033 | -0.0827 | 0.0768 | 3789.1 | -0.7 |
| **nu2** | 0.0054 | 0.0019 | 0.0167 | 2316.3 | -1.9 |
| **tau2** | 12.085 | 10.093 | 13.725 | 34690.7 | 0.9 |
| **rho** | 0.8486 | 0.7034 | 0.9537 | 33756.8 | 0.5 |

**DIC = -3392.847 p.d = 1830.146 LMPL = 506.34**

**6.4.** ***CarboScope***

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | -0.0032 | -0.0185 | 0.0121 | 3955.7 | -0.2 |
| **biodiver** | -0.0319 | -0.0767 | 0.0132 | 2748.7 | 0.1 |
| **I(biodiver^2)** | 0.0032 | -0.0121 | 0.0184 | 3926.3 | 0.2 |
| **mean.ndep.tot** | -0.0171 | -0.0571 | 0.0219 | 1966.6 | 0 |
| **tmps.mean.trend** | **0.0453** | **0.0152** | **0.0753** | 2047.8 | -0.8 |
| **pres.mean.trend** | **-0.0388** | **-0.0567** | **-0.0210** | 4475.8 | 0.9 |
| **tmps.ar1.trend** | -0.0075 | -0.0313 | 0.0171 | 2459.4 | -0.1 |
| **pres.ar1.trend** | **0.0192** | **0.0035** | **0.0348** | 5465.9 | -0.9 |
| **mean.forested** | -0.0209 | -0.0465 | 0.0051 | 2861.9 | -0.2 |
| **mean.croped** | 0.0168 | -0.0057 | 0.0388 | 5265.1 | 1.3 |
| **mean.urbaned** | -0.0191 | -0.0559 | 0.0186 | 4299.2 | -1.2 |
| **trnd.forested** | 0.0213 | -0.0012 | 0.043 | 4649.5 | 0.9 |
| **trnd.croped** | 0.0188 | -0.0022 | 0.0398 | 3289.4 | 0.2 |
| **trnd.urbaned** | 0.0197 | -0.0157 | 0.0541 | 4087.8 | 0.6 |
| **nu2** | 0.0011 | 0.0007 | 0.0018 | 11387.3 | 1.9 |
| **tau2** | 2.6533 | 2.5009 | 2.8180 | 70022.4 | 1.1 |
| **rho** | 0.9923 | 0.9796 | 0.9982 | 70000 | 0.3 |

**DIC = -6626.257 p.d = 2113.523 LMPL = 2409.82**

## 7. Spatial variability in trends of the aggregated $NBP_{PV-AR1}$ index

### 7.1. *Atmospheric inversions combined (CAMS + CarboScope)*

| | **Median** | **2.50%** | **97.50%** | **n.effective** | **Geweke.diag** |
|---|---|---|---|---|---|
| **(Intercept)** | -0.004 | -0.038 | 0.030 | 3447.5 | 1.1 |
| **biodiver** | -0.001 | -0.112 | 0.109 | 1998.1 | 2 |
| **I(biodiver^2)** | 0.004 | -0.029 | 0.038 | 3419.7 | -1 |
| **mean.ndep.tot** | **-0.190** | **-0.279** | **-0.103** | 1933.9 | -0.7 |
| **tmps.mean** | **0.217** | **0.077** | **0.352** | 468.9 | 1.5 |
| **pres.mean** | -0.026 | -0.117 | 0.066 | 2335.6 | -0.9 |
| **tmps.mean.trend** | 0.027 | -0.038 | 0.093 | 2307.1 | 0.4 |
| **pres.mean.trend** | -0.034 | -0.072 | 0.005 | 3891.4 | 0.9 |
| **tmps.pv.ar1.trend** | **0.078** | **0.024** | **0.133** | 2321 | -1.1 |
| **pres.pv.ar1.trend** | 0.034 | -0.001 | 0.069 | 5130.4 | -0.1 |
| **mean.forested** | **-0.129** | **-0.187** | **-0.072** | 3129.6 | -0.9 |
| **mean.croped** | **0.082** | **0.034** | **0.131** | 4593.3 | -0.5 |
| **mean.urbaned** | -0.009 | -0.090 | 0.073 | 3779.7 | -2.1 |
| **trnd.forested** | -0.046 | -0.095 | 0.003 | 3992.4 | -1.6 |
| **trnd.croped** | 0.041 | -0.004 | 0.086 | 3641.6 | 1.8 |
| **trnd.urbaned** | 0.039 | -0.036 | 0.113 | 4034.9 | 1.9 |
| **nu2** | 0.005 | 0.002 | 0.012 | 2762.2 | -0.3 |
| **tau2** | 11.296 | 9.841 | 12.461 | 41447.4 | 0.7 |
| **rho** | 0.898 | 0.781 | 0.971 | 31696.2 | 0.8 |
| DIC = -3712.121 | p.d = 1901.937 | LMPL = | 741.53 | | |

### 7.2. *CAMS*

| | **Median** | **2.50%** | **97.50%** | **n.effective** | **Geweke.diag** |
|---|---|---|---|---|---|
| **(Intercept)** | -0.016 | -0.051 | 0.020 | 3246 | -0.9 |
| **biodiver** | 0.006 | -0.112 | 0.120 | 2273.9 | -3.3 |
| **I(biodiver^2)** | 0.016 | -0.020 | 0.051 | 3214.7 | 0.9 |
| **mean.ndep.tot** | **-0.185** | **-0.280** | **-0.091** | 1804 | 2.4 |
| **tmps.mean** | **0.141** | **0.003** | **0.282** | 516.3 | -1.8 |
| **pres.mean** | -0.017 | -0.114 | 0.080 | 2531.4 | 0.6 |
| **tmps.mean.trend** | **0.091** | **0.020** | **0.159** | 2239.4 | 0.7 |
| **pres.mean.trend** | -0.025 | -0.066 | 0.018 | 3826 | 1.3 |
| **tmps.pv.ar1.trend** | **0.075** | **0.019** | **0.131** | 2093.2 | 1.2 |
| **pres.pv.ar1.trend** | 0.034 | -0.003 | 0.072 | 4918 | 1.4 |
| **mean.forested** | **-0.149** | **-0.211** | **-0.089** | 3057.8 | 0.5 |
| **mean.croped** | **0.082** | **0.030** | **0.133** | 4725.6 | 0.9 |
| **mean.urbaned** | -0.020 | -0.107 | 0.068 | 3849.2 | -0.4 |
| **trnd.forested** | -0.033 | -0.085 | 0.020 | 3871 | 0.1 |
| **trnd.croped** | 0.040 | -0.009 | 0.090 | 3192.8 | -1.2 |
| **trnd.urbaned** | 0.044 | -0.036 | 0.125 | 3828.9 | 0.2 |
| **nu2** | 0.005 | 0.002 | 0.015 | 2466.8 | 0.1 |
| **tau2** | 11.846 | 9.649 | 13.720 | 27259.2 | -1.4 |
| **rho** | 0.818 | 0.658 | 0.941 | 26704.7 | -1.3 |
| DIC = -3547.387 | p.d = 1850.76 | LMPL = 602.75 | | | |

### 7.3. *CarboScope*

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | 0.0408 | 0.0214 | 0.0598 | 4349.9 | 1 |
| **biodiver** | -0.0146 | -0.0792 | 0.0484 | 2202.3 | 2.9 |
| **I(biodiver^2)** | **-0.0408** | **-0.0597** | **-0.0216** | 4313.9 | -1 |
| **mean.ndep.tot** | **-0.0913** | **-0.1435** | **-0.0385** | 1921.5 | -1 |
| **tmps.mean** | **0.283** | **0.2037** | **0.3699** | 439.8 | 2.1 |
| **pres.mean** | -0.0146 | -0.066 | 0.0374 | 3297.8 | -1.6 |
| **tmps.mean.trend** | **-0.2173** | **-0.2551** | **-0.1788** | 2453.9 | -2.8 |
| **pres.mean.trend** | **-0.0301** | **-0.0522** | **-0.0081** | 4963.5 | -0.2 |
| **tmps.pv.ar1.trend** | **0.0435** | **0.0127** | **0.0743** | 2548.5 | -1.1 |
| **pres.pv.ar1.trend** | 0.0007 | -0.0191 | 0.0207 | 5762.7 | -0.4 |
| **mean.forested** | 0.0273 | -0.0053 | 0.0596 | 3835.7 | -1 |
| **mean.croped** | **0.0284** | **0.0011** | **0.0562** | 5623.6 | -0.2 |
| **mean.urbaned** | 0.0299 | -0.0165 | 0.0759 | 4528.6 | -2.7 |
| **trnd.forested** | -0.0676 | -0.0962 | -0.0393 | 4533.3 | -1.3 |
| **trnd.croped** | 0.0117 | -0.015 | 0.0384 | 3886.3 | 2.4 |
| **trnd.urbaned** | -0.0013 | -0.0441 | 0.0418 | 4647.8 | 3 |
| **nu2** | 0.0017 | 0.0010 | 0.0031 | 7614.8 | -0.9 |
| **tau2** | 4.0587 | 3.8213 | 4.3143 | 72063 | 2.3 |
| **rho** | 0.9870 | 0.9661 | 0.9970 | 41442.2 | 2.8 |

DIC = -5692.17 p.d = 2079.633 LMPL = 1867.3

## 8. Additional model to check the potential confounding effect of climate on the relationship between mean NBP and biodiversity (both atmospheric inversions combined)

| | Median | 2.50% | 97.50% | n.effective | Geweke.diag |
|---|---|---|---|---|---|
| **(Intercept)** | **0.215** | **0.18** | **0.2503** | **1595.8** | **0.7** |
| **biodiver** | **0.2641** | **0.1905** | **0.3399** | **2294.5** | **-1.3** |
| **mean.ndep.tot** | **0.2307** | **0.1626** | **0.3003** | **1570.2** | **2** |
| **I(biodiver^2)** | **-0.0827** | **-0.1215** | **-0.044** | **3956.1** | **2** |
| **tmps.mean** | 0.0558 | -0.0394 | 0.1514 | 1091 | -2 |
| **pres.mean** | **0.0936** | **0.0118** | **0.175** | **2150.6** | **1.5** |
| **tmps.pv** | **0.7465** | **0.6494** | **0.84** | **913.1** | **1.5** |
| **pres.pv** | -0.0334 | -0.0673 | 0.0006 | 3368.3 | 0.5 |
| **mean.forested** | **0.0531** | **0.0185** | **0.087** | **2729.8** | **0.8** |
| **mean.croped** | **0.05** | **0.0185** | **0.0808** | **4414.8** | **0.1** |
| **mean.urbaned** | -0.0147 | -0.041 | 0.0119 | 4086.5 | 0 |
| **biodiver:mean.ndep.tot** | **0.1085** | **0.0736** | **0.1444** | **2105.5** | **-0.9** |
| **biodiver:tmps.mean** | 0.0028 | -0.0903 | 0.0978 | 2635.1 | 1.3 |
| **biodiver:pres.mean** | **0.0823** | **0.0387** | **0.1261** | **3413.3** | **-0.3** |
| **tmps.mean:pres.mean** | **-0.1749** | **-0.2623** | **-0.0875** | **2662.4** | **-1.1** |
| **biodiver:tmps.pv** | **0.3363** | **0.2493** | **0.426** | **3002.7** | **1.9** |
| **biodiver:pres.pv** | 0.0289 | -0.0023 | 0.0601 | 4288.4 | 0.7 |
| **tmps.pv:pres.pv** | **-0.0424** | **-0.0788** | **-0.0057** | **3295** | **1.1** |
| **nu2** | **0.0025** | **0.0013** | **0.0052** | **3174.2** | **0.7** |
| **tau2** | **4.5314** | **4.1535** | **4.8771** | **34656.6** | **0.4** |
| **rho** | **0.9487** | **0.8773** | **0.9873** | **30361.2** | **1.3** |

**DIC = -4910.2 p.d = 2022.36 LMPL = 1464.75**