**Supplementary Information**

**Table S1a:** Extracted POC-masses from blank ice samples produced by freezing of ultrapure water and prepared like normal samples in the REFILOX system.

|  |  |  |
| --- | --- | --- |
| **Sample name** | **Ice mass [g]** | **POC mass [µgC]** |
| Blank ice 1 800°C total | 335 | 0.5 ± 0.3 |
| Blank ice 2 800°C total | 330 | 2.5 ± 0.3 |
| Blank ice 3 340°C | 250 | < 0.3 ± 0.3 |
| Blank ice 4 340°C | 250 | < 0.3 ± 0.3 |
| Blank ice 5 340°C | 400 | 0.3 ± 0.3 |
| Blank ice 5 800°C | 400 | 3.3 ± 0.3  |
| Blank ice 6 340°C | 375 | < 0.3 ± 0.3 |
| Blank ice 6 800°C | 375 | 7.0 ± 0.3 |
| Blank ice 7 340°C | 1280 | < 0.3 ± 0.3 |
| Blank ice 8 340°C | 320 | < 0.3 ± 0.3 |

**Table S1b:** Sample masses and 14C-contents of standard material samples combusted in the REFILOX system.

|  |  |  |  |
| --- | --- | --- | --- |
| **Material type** | **Sample mass input [µg]** | **Sample mass****output [µgC]** | **14C content****[F14C]** |
| Cellulose (800°C) | 55 ± 5 | 7.8  | 1.245 ± 0.022 |
| Cellulose (800°C) | 80 ± 5 | 28.0  | 1.265 ± 0.011 |
| Cellulose (800°C) | 120 ± 5 | 46.6 | 1.284 ± 0.014 |
| Cellulose (800°C) | 120 ± 5 | 36.9 | 1.301 ± 0.013 |
| Cellulose (800°C) | 65 ± 5 | 19.1 | 1.318 ± 0.020 |
| Oxalic acid (800°C) | 270 ± 5 | 34.8 | 1.347 ± 0.014 |
| Oxalic acid (340°C) | 230 ± 5 | 22.7 | 1.339 ± 0.013 |
| Oxalic acid (340°C) | 180 ± 5 | 17.3 | 1.314 ± 0.015 |
| Brown coal (800°C) | 160 ± 5 | 60.2 | 0.023 ± 0.002 |
| Brown coal (800°C) | 90 ± 5 | 38 | 0.042 ± 0.002 |
| Brown coal (800°C) | 40 ± 5 | 13.5 | 0.076 ± 0.005 |

**Table S2a:** Organic carbon concentrations retrieved in the REFILOX system from aerosol filters compared to carbon concentrations extracted with the CARBOSOL system

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sample name** | **TC** **CARBOSOL****[µgC/m3]** | **TC** **REFILOX** **[µgC/m3]** | **OC1+OC2****CARBOSOL****[µgC/m3]** | **REFILOX 340°C****[µgC/m3]** | **EC+PC+OC3****CARBOSOL****[µgC/m3]** | **REFILOX****380°C+800°C****[µgC/m3]** |
| SBO 32 | 1.91 | 1.72 | 0.60 | 0.57 | 1.31 | 1.15 |
| AVE 03 | 4.37 | 5.64 | 1.01 | 1.32 | 3.37 | 4.32 |
| SIL 02/08 | 0.87 | 0.82 | 0.14 | 0.27 | 0.72 | 0.55 |
| SIL 3/24 | 4.07 | 4.56 | 1.05 | 1.62 | 3.02 | 2.94 |
| SIL 3/28 | 3.99 | 4.37 | 1.04 | 1.32 | 2.95 | 2.86 |
| SIL 3/28-W | 3.99 | 2.43 | 1.04 | 1.26 | 2.95 | 1.17 |
| HU 04 | 4.80 | 4.48 | 0.77 | 1.32 | 4.03 | 3.15 |
| HU 04-W | 4.80 | 2.71 | 0.77 | 0.89 | 4.03 | 1.82 |

**Table S2b:** Radiocarbon contents retrieved from different combustion temperature fractions compared to average values by (May et al. 2009), 1error ranges are shown.

| **Sample name** | **F14C** | **Average F14C** | (May, et al., 2009) **F14C** |
| --- | --- | --- | --- |
| SBO 32-340°C | 0.902 ± 0.027 | 0.818 ± 0.014 | SBO summer average0.794 ± 0.018 |
| SBO 32-380°C | 0.875 ± 0.033 |
| SBO 32-800°C  | 0.751 ± 0.019 |
| AVE 03-340°C | 1.011 ± 0.017 | 0.747 ± 0.007 | AVE summer average0.772 ± 0.006 |
| AVE 03-380°C | 0.804 ± 0.019 |
| AVE 03-800°C | 0.620 ± 0.009 |
| SIL 02/08-340°C | 1.044 ± 0.023 | 0.753 ± 0.014 | SIL winter average0.731 ± 0.006 |
| SIL 02/08-380°C | 0.833 ± 0.028 |
| SIL 02/08-800°C | 0.453 ± 0.016 |
| SIL 3/24-340°C | 0.933 ± 0.011 | 0.804 ± 0.006 | SIL summer average0.856 ± 0.005 |
| SIL 3/24-380°C | 0.915 ± 0.016 |
| SIL 3/24-800°C  | 0.679 ± 0.008 |
| SIL 3/28-340°C | 0.939 ± 0.009 |  | SIL 3/28 (May 2009)0.820 ± 0.006 |
| SIL 3/28-380°C  | 0.870 ± 0.012 | 0.782 ± 0.005 |
| SIL 3/28-800°C | 0.615 ± 0.007 |  |
| SIL 3/28-W-340°C | 0.922 ± 0.012 |  | SIL 3/28 (May 2009)0.820 ± 0.006 |
| SIL 3/28-W-380°C | 0.750 ± 0.025 | 0.694 ± 0.009 |
| SIL 3/28-W-800°C | 0.407 ± 0.009 |  |
| SIL 3/28-W-total | 0.706 ± 0.008 |  |  |
| HU 04-340°C | 0.977 ± 0.019 |  | KPZ summer average0.873 ± 0.012 |
| HU 04-380°C | 0.964 ± 0.033 | 0.843 ± 0.009 |
| HU 04-800°C | 0.769 ± 0.010 |  |
| HU 04-W-340°C | 0.886 ± 0.020 |  | KPZ summer average0.873 ± 0.012 |
| HU 04-W-380°C | 0.664 ± 0.027 | 0.660 ± 0.010 |
| HU 04-W-800°C | 0.513 ± 0.012 |  |



**Figure S1:** Linear correlation between measured carbon masses of 100 samples in the measuring volume and the pressure in the extraction line after heating up of the cooling traps and release of CO2 to the gas phase. This correlation was used for determination of the very small blank masses.