1 Data used in figures

- The folder „Data_For_Figures.zip“ contains csv files for all data used to produce the plots within the manuscript.

2 Supplementary figures

- Figure S1:
  Difference between Keeling-Plot intercepts based on all inlets and based on only the lower inlets
- Figure S2:
  Example relationship between the standard error of the Keeling-Plot intercept and the CO_2 concentration range
- Figure S3:
  Distributions of the Keeling-Plot intercepts and their standard errors based on differently long measurement periods
- Figure S4:
  Number of accepted data points after filtering and boxplots of standard errors for differently long measurement periods
- Figure S5:
  Example nighttime Keeling-Plots with typical R^2 values

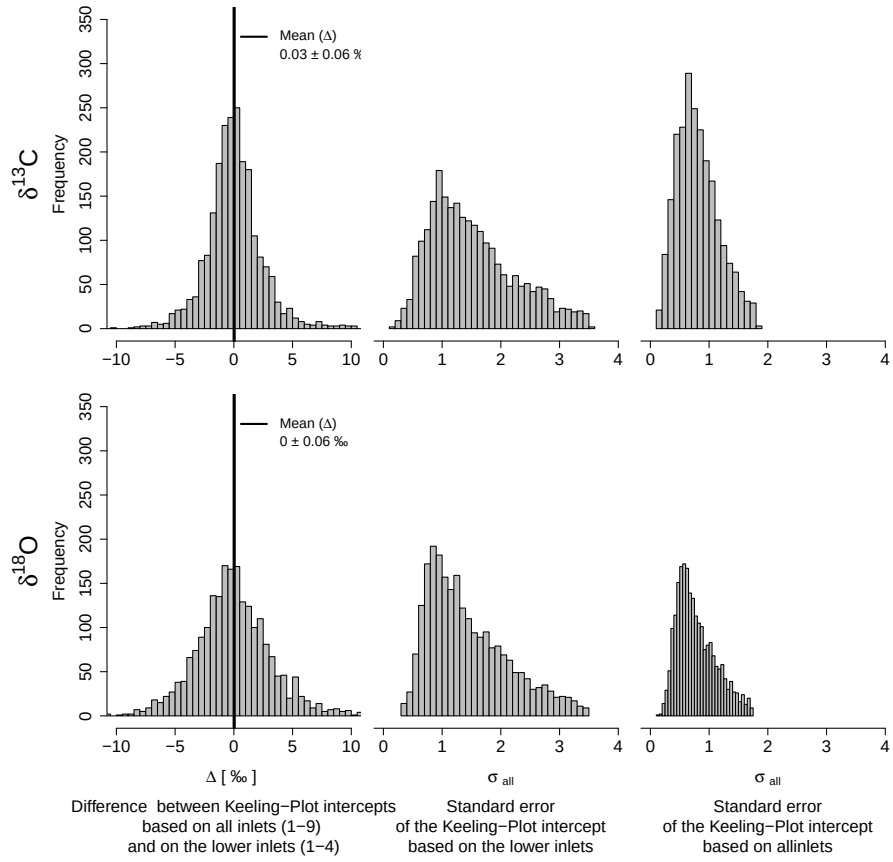

Figure S1. Left panels: Frequency distributions (grey bars) and mean value (black lines) of the difference $\Delta[\,‰\,]$ between the Keeling-Plot intercepts based on all inlets (all, heights 1-9) and based on only the lower inlets (low, heights 1-4). Middle and right panel: Frequency distributions for the corresponding standard errors of the Keeling-Plot intercepts σ_{low} and σ_{all}. First column: δ^{13}C; Second column: δ^{18}O. For both isotopic species, Δ shows a symmetric distribution around 0 and the large range of Δ can be explained by the comparatively large standard errors σ of the Keeling plot intercepts σ_{low} and σ_{all}. All data shown here refers to a measurement time of 90 min, thus including 3 measurement cycles into a single Keeling Plot.

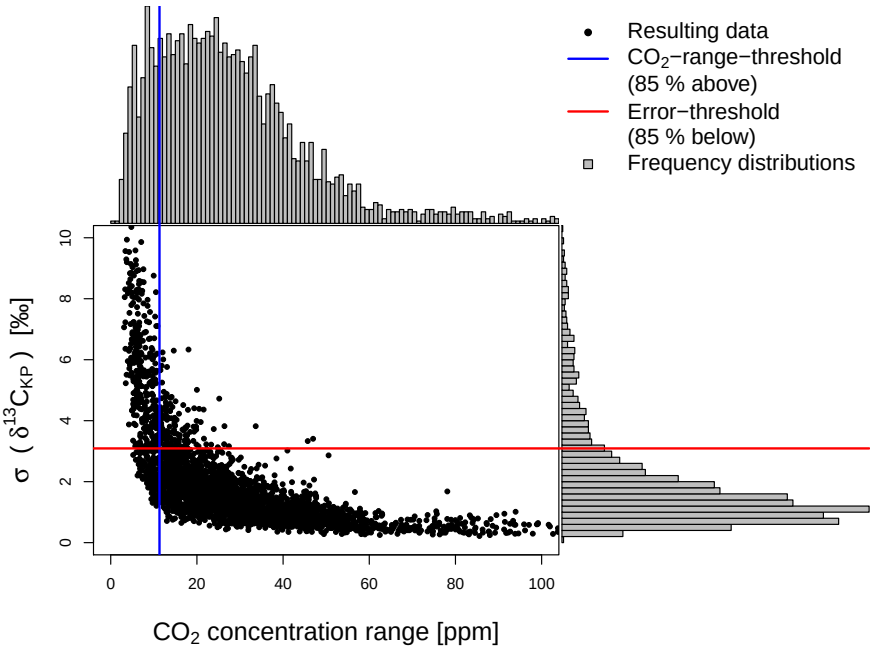

Figure S2. An example for the relationship between the standard error σ of the Keeling-Plot intercept $\delta^{13}C_{\mathrm{KP}}$ and the CO_2 concentration range. Each individual Keeling-Plot included here is based on a 30 min measurement period. The gray shaded areas are frequency distributions for both variables. The blue and the red line illustrate different approaches to exclude bad quality data based on 1) to low CO_2 range (blue) and 2) to large intercept standard error σ (red). This plot illustrates how a CO_2 concentration range based filtering would negatively effect data quality. The equivalent plot for ^{18}O (not presented here) shows similar behavior.

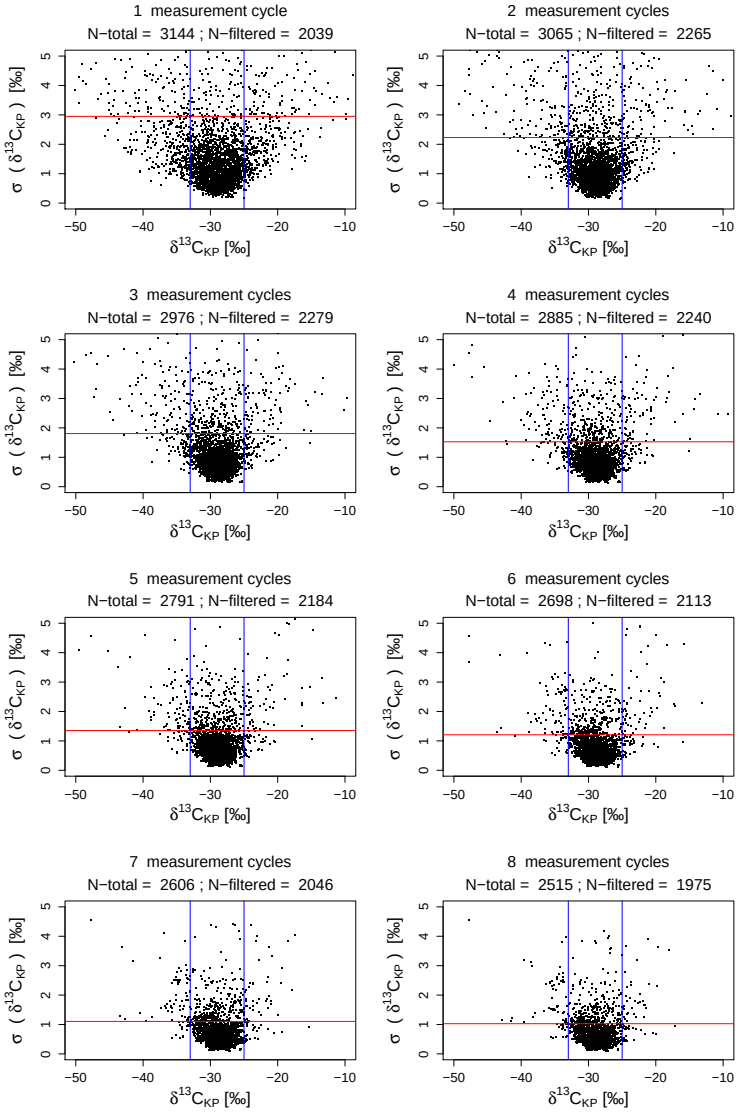

Figure S3. The distribution of the Keeling-Plot intercepts $\delta^{13}C_{KP}$ and its standard errors σ changes when more measurement cycles are included into a single Keeling-Plot. The red lines show the 85-percentile of standard errors. We used this 85-percentile threshold to filter out data with bad quality linear regressions. The blue lines mark the absolute values of -33 ‰ and -25 ‰. The more measurement cycles are included into a Keeling Plot, the fewer data points are out of this range, which should not depend on the number of measurement cycles that are used. These values are chosen as absolute thresholds to detect and exclude outliers.

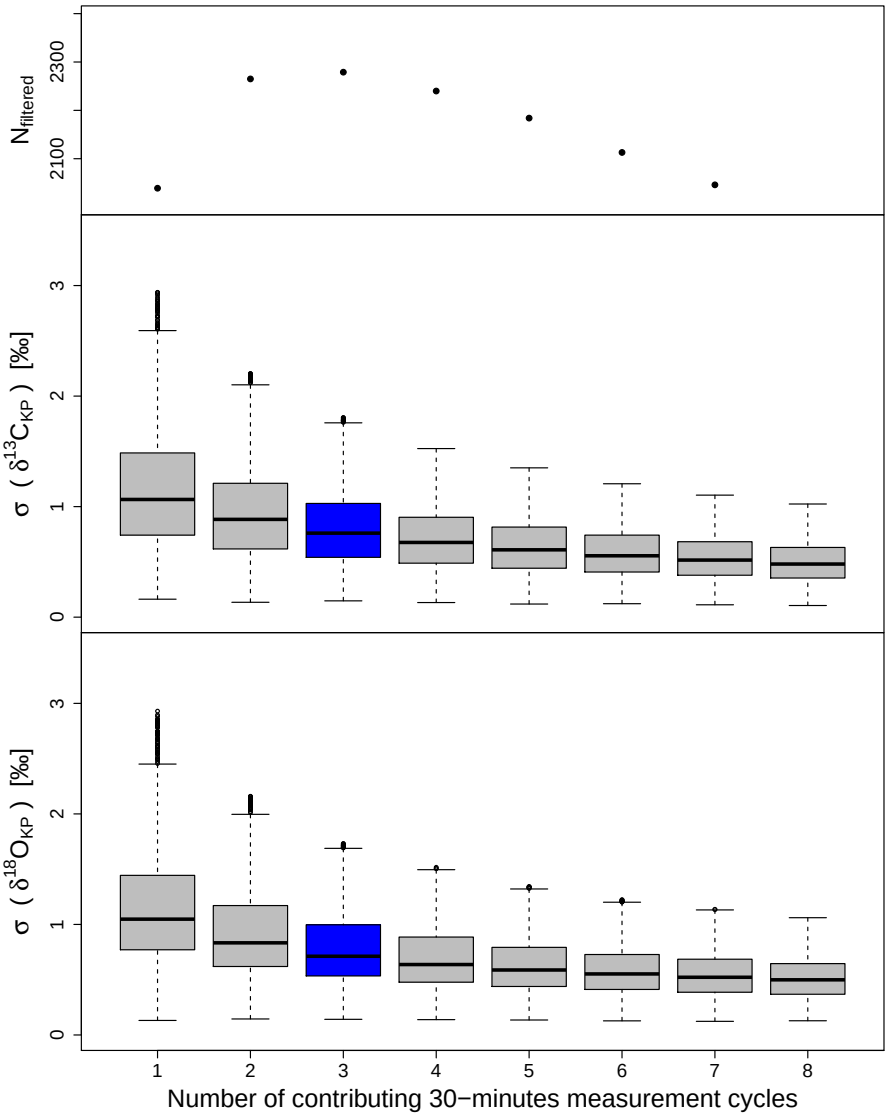

Figure S4. Top panel: The number of accepted data points $N_{filtered}$ (after filtering and outlier removal) depends on the number of measurement cycles that are included into each Keeling plot. Middle and bottom panel: Illustration of the distribution and the range of the standard error σ of the Keeling-Plot intercepts using Box-Whiskers-Plots (whiskers following the definition of a Tukey boxplot), we choose to use three measurement cycles in each Keeling-Plot, the corresponding Box-Whiskers-plot is marked in blue.

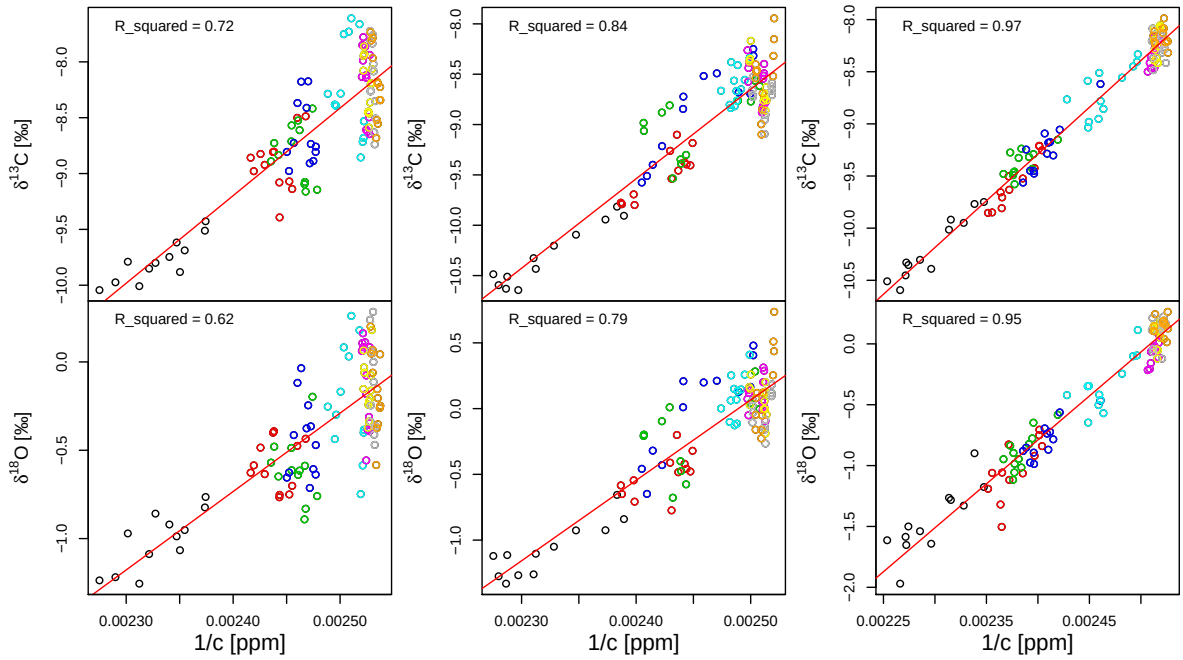

Figure S5. Example nighttime Keeling-Plots with typical R^2-values (spanning the range of the mean $\pm\sigma$. Each Keeling-Plot is based on 90 min input data. Different colors represent different inlet heights