

Supporting information

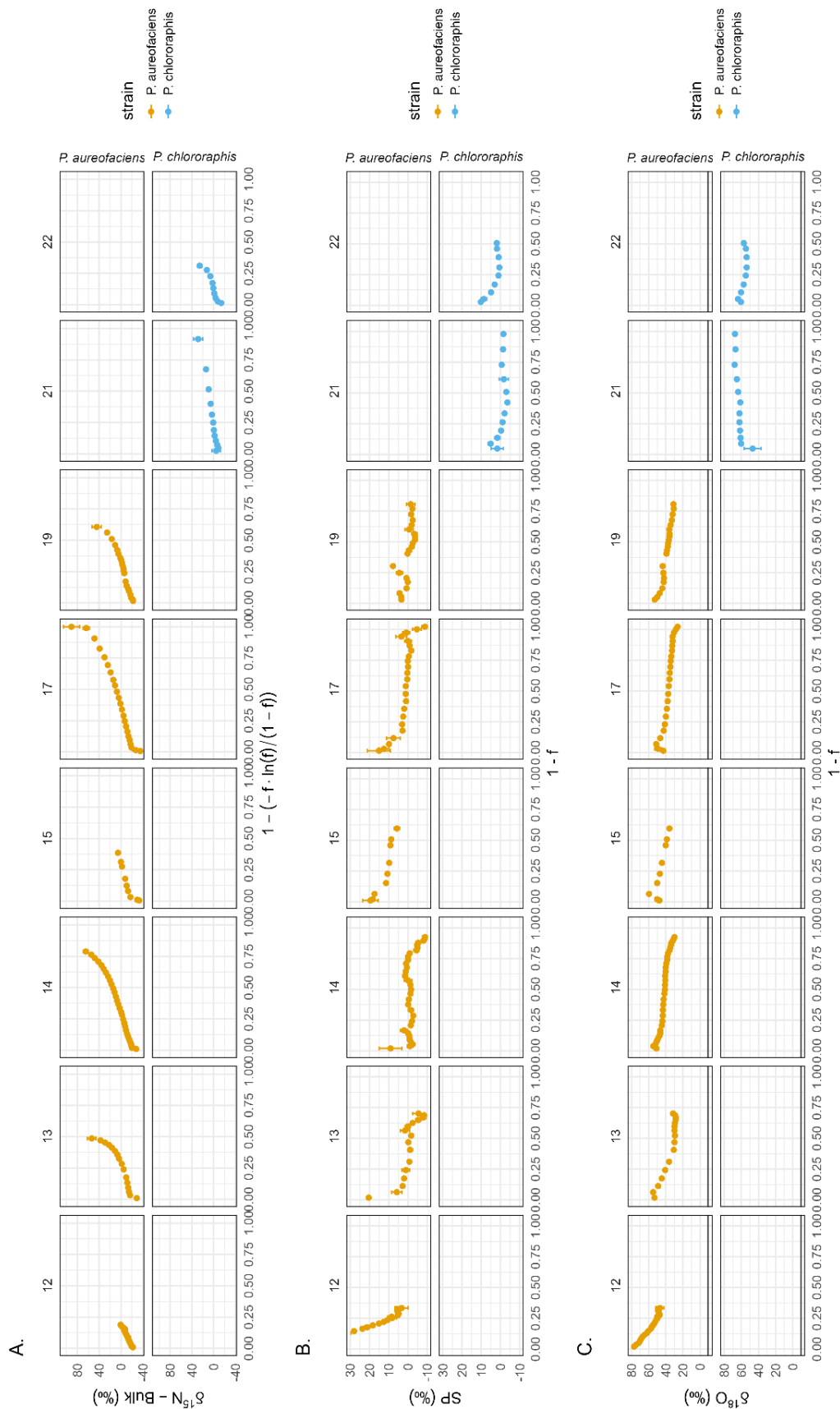


Figure S1. Individual time series for all gas-flushed active-growth incubation experiments shown in Fig. 3. Panels are faceted by strain and by experiment number (numbers at the top of each panel correspond to individual incubation IDs). A. $\delta^{15}\text{N}$ -bulk, B. site preference (SP), and C. $\delta^{18}\text{O}$ are plotted as a function of reaction progress, expressed as either $1 - f$ or $1 - (-f \ln f)/(1 - f)$, as indicated on the x-axis. Each point represents an individual measurement; vertical error bars denote analytical uncertainty, and horizontal error bars reflect uncertainty in reaction progress. No binning or normalization across experiments has been applied. In panel C, the short horizontal line in each subplot marks the $\delta^{18}\text{O}$ of water (-9.5‰). These plots illustrate experiment-to-experiment variability underlying the binned trends presented in the main text.

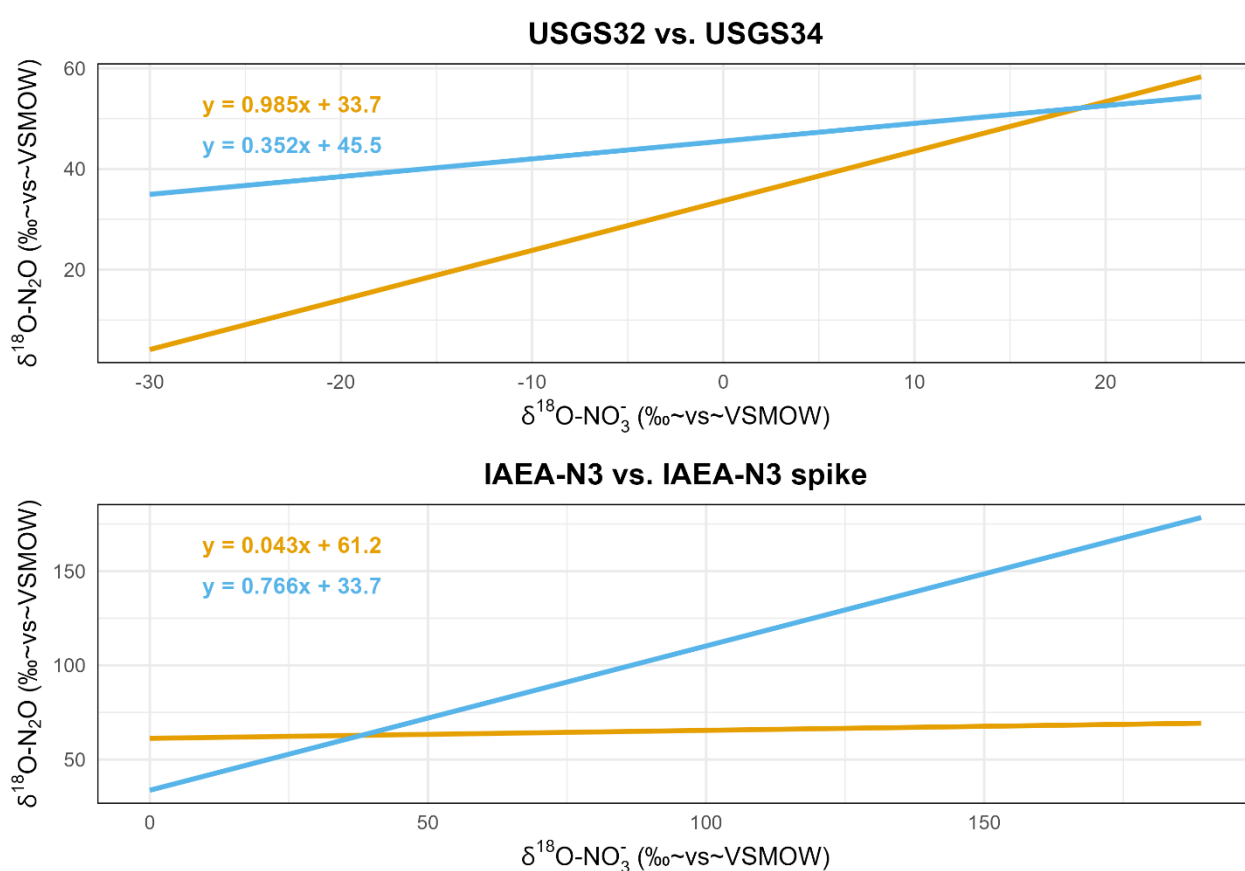


Figure S2. Relationship between $\delta^{18}\text{O-N}_2\text{O}$ and $\delta^{18}\text{O-NO}_3^-$ in resuspension incubations with international nitrate standards (USGS32/USGS34; IAEA-N3 vs. $\delta^{18}\text{O}$ -enriched IAEA-N3 spike) for *P. aureofaciens* (orange) and *P. chlororaphis* (blue). Regression slopes quantify the fraction of nitrate-derived oxygen retained in N_2O . For USGS32/USGS34 comparisons, water exchange is calculated as $1 - \text{slope}$, yielding 1.54 % exchange for *P. aureofaciens* (slope = 0.9846) and 64.8 % for *P. chlororaphis* (slope = 0.3524). For IAEA-N3/spike comparisons, water exchange is estimated directly from the slope, yielding 4.26 % exchange for *P. aureofaciens* (slope = 0.043) and 76.6 % for *P. chlororaphis* (slope = 0.766).