

**Supplementary Figure 1:** A comparison of simulated reaction kinetics data with both uniform  $T_1$ s and non-uniform individual  $T_1$ s following normalization to the initial signal. For simulations with uniform  $T_1$ s, each species was assigned a  $T_1$  of 55 seconds. For simulations with individual  $T_1$ s, pyruvate and intermediate were assigned a  $T_1$  of 55 seconds, and  $\text{CO}_2$ , bicarbonate, and peroxymonocarbonate were assigned  $T_1$ s of 40 seconds. Because the  $T_1$ s of intermediate and peroxymonocarbonate have not been previously measured, they are assigned  $T_1$ s equal to the  $T_1$ s of the species with which they are in rapid exchange. It is apparent from the figure that after being normalized, differences in  $T_1$  do not lead to significantly different apparent kinetics.