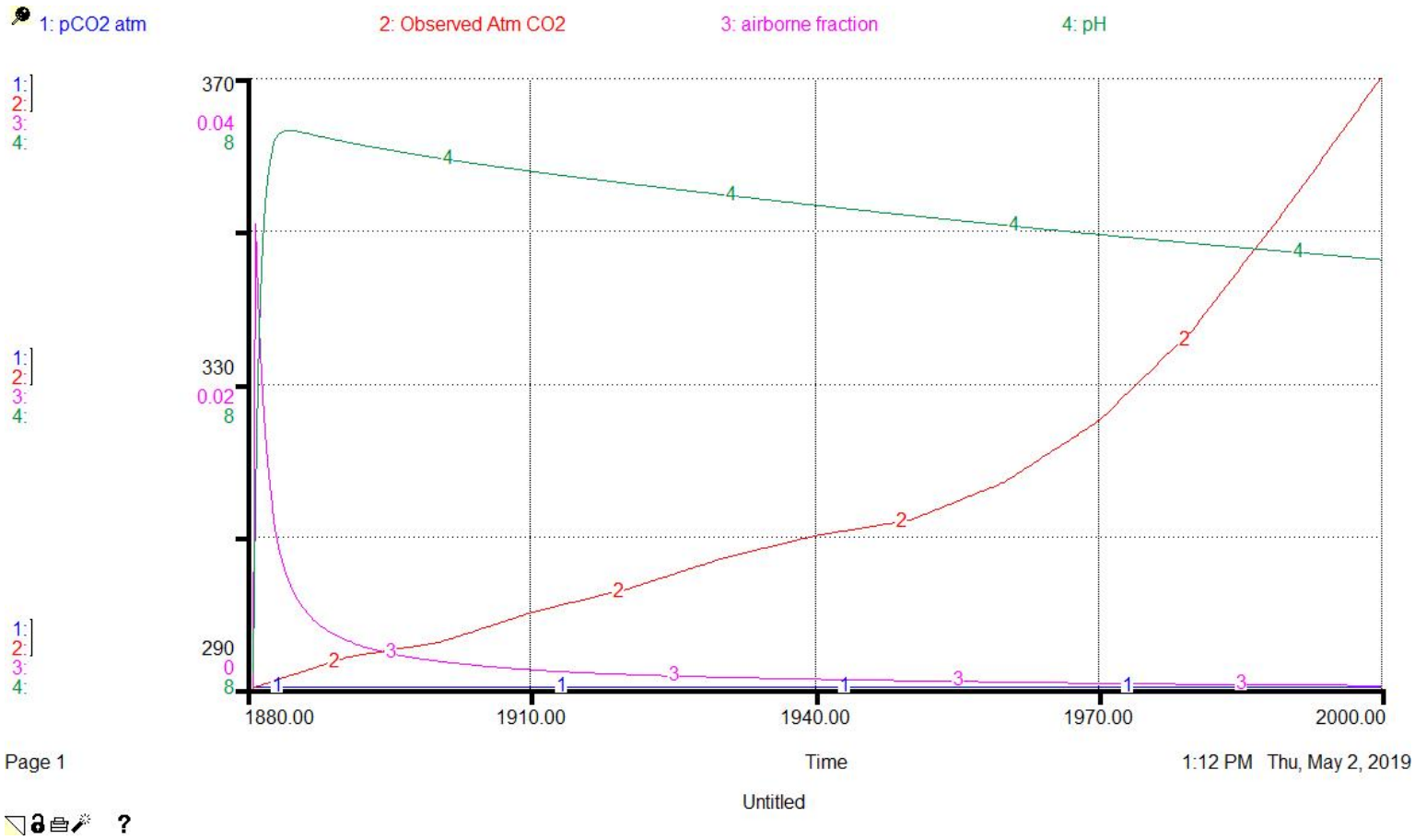
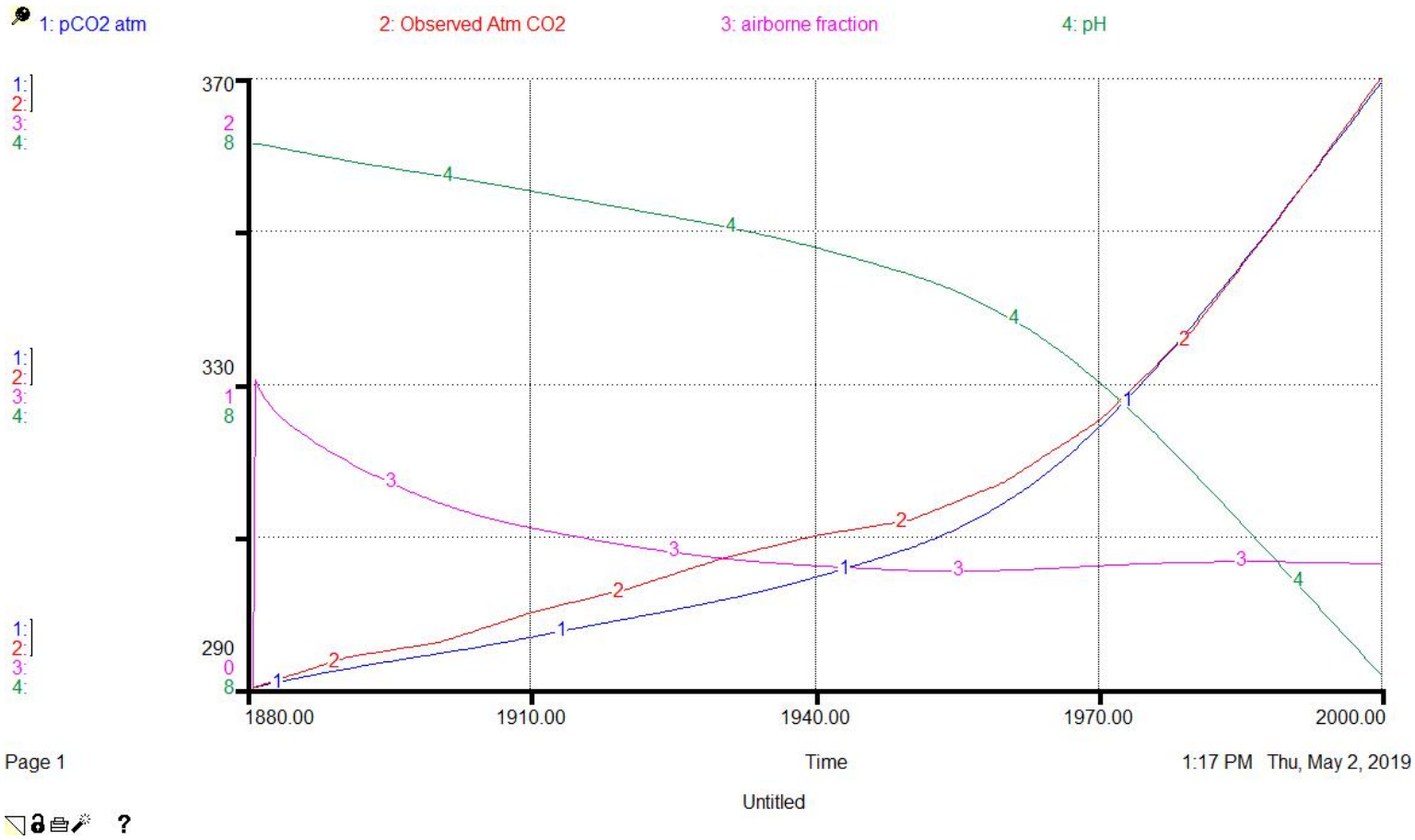
The carbon cycle

1. Turn off fossil fuel and land use change switches



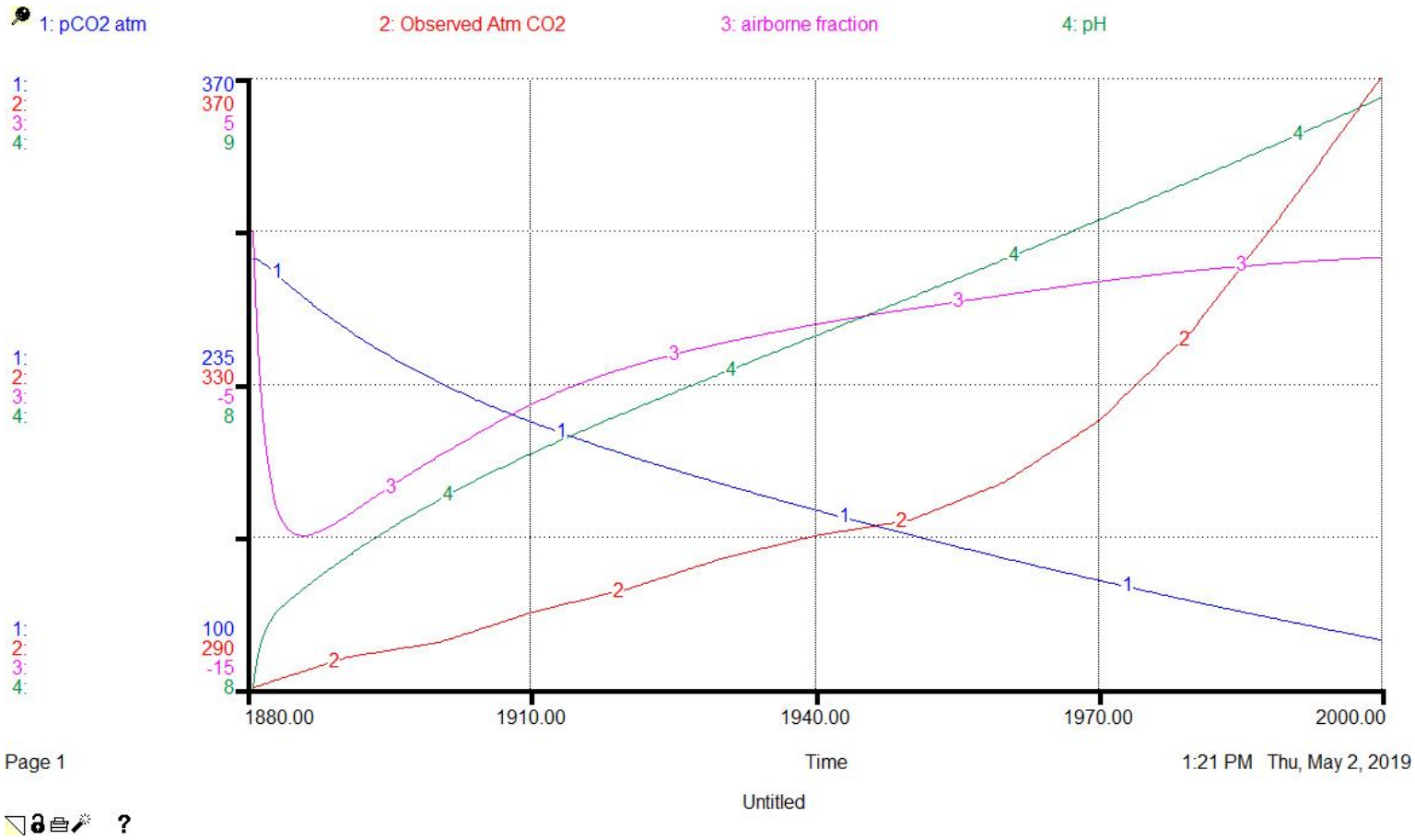
- System is in a steady state.

1. Turn switches on



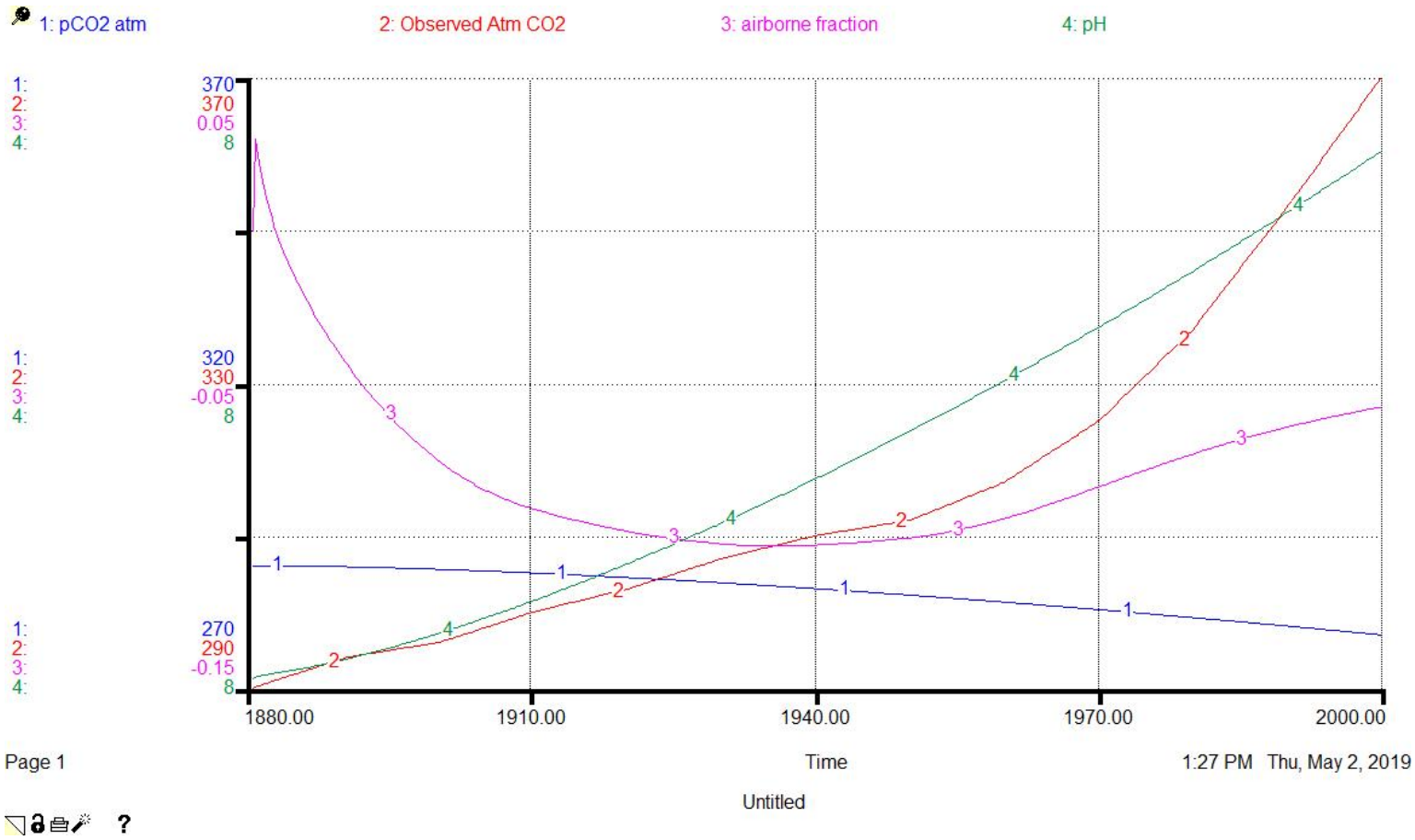
- Observed and modeled CO_2 are about the same
- Similar starting and ending values; slightly different pathways

2.1. Turn off ocean mixing



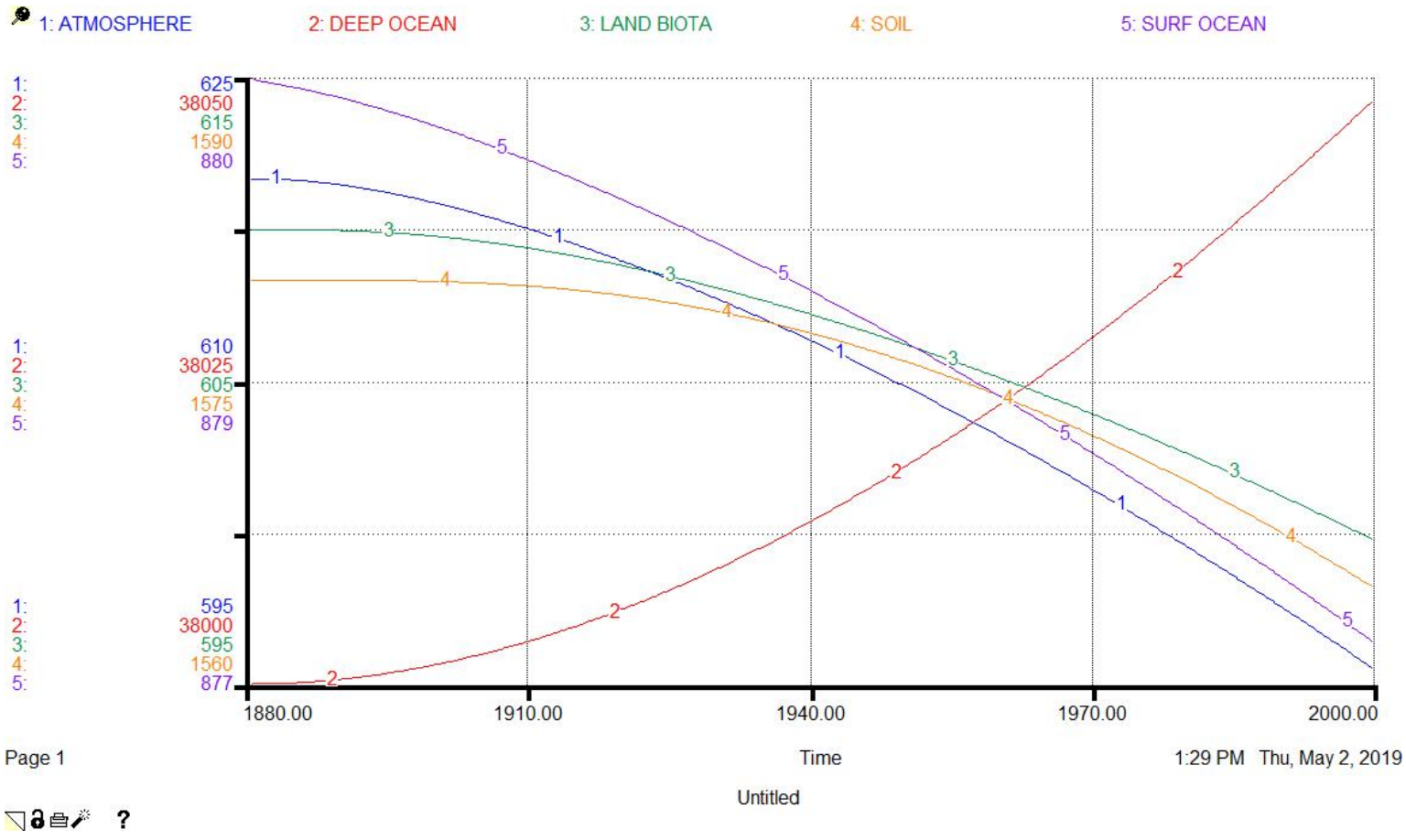
- Modeled CO_2 dropped by $\sim$200 ppm

2.2. Increase biological mixing with time



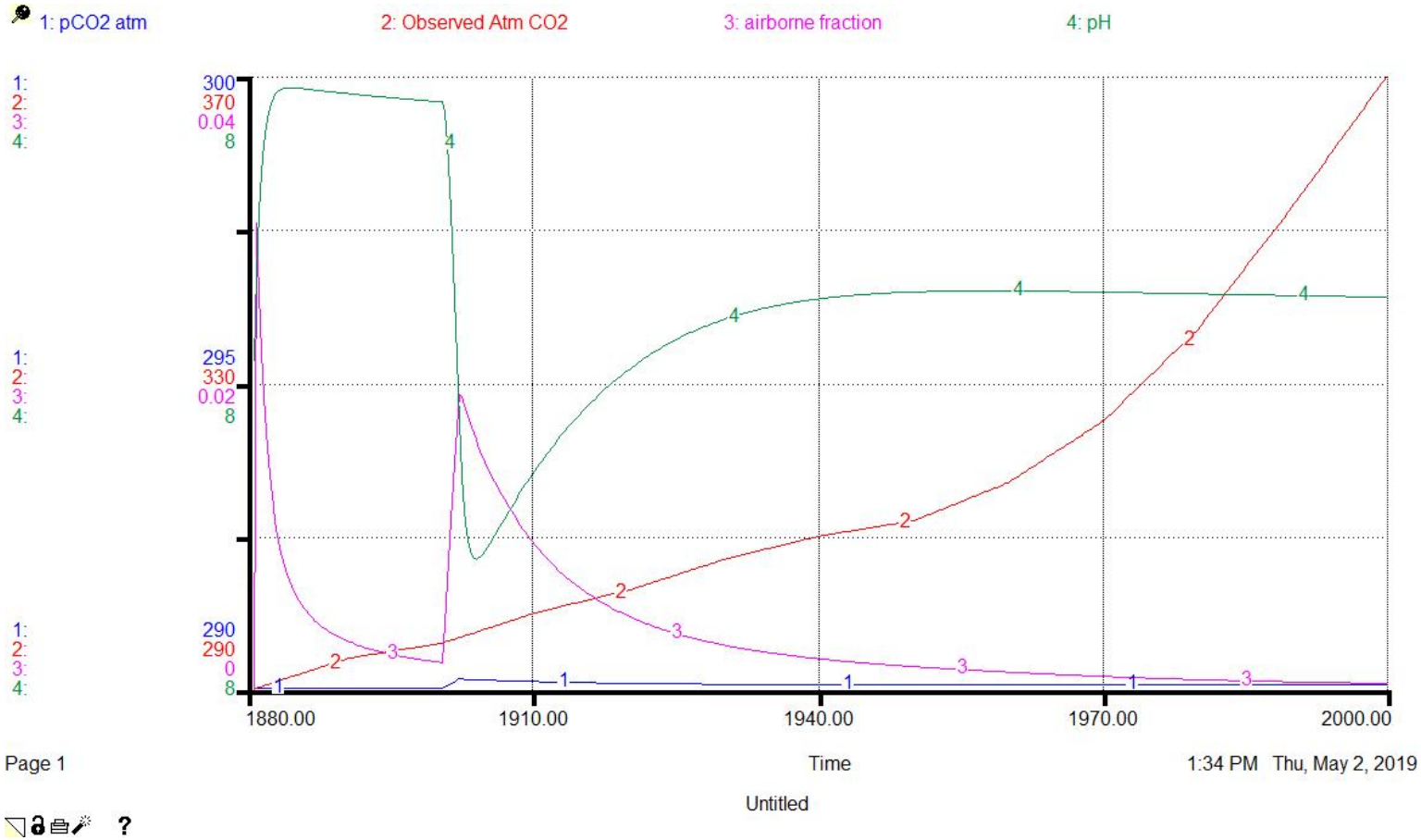
- CO_2 decreases by 200 ppm over 120 years

2.2. Increase biological mixing with time



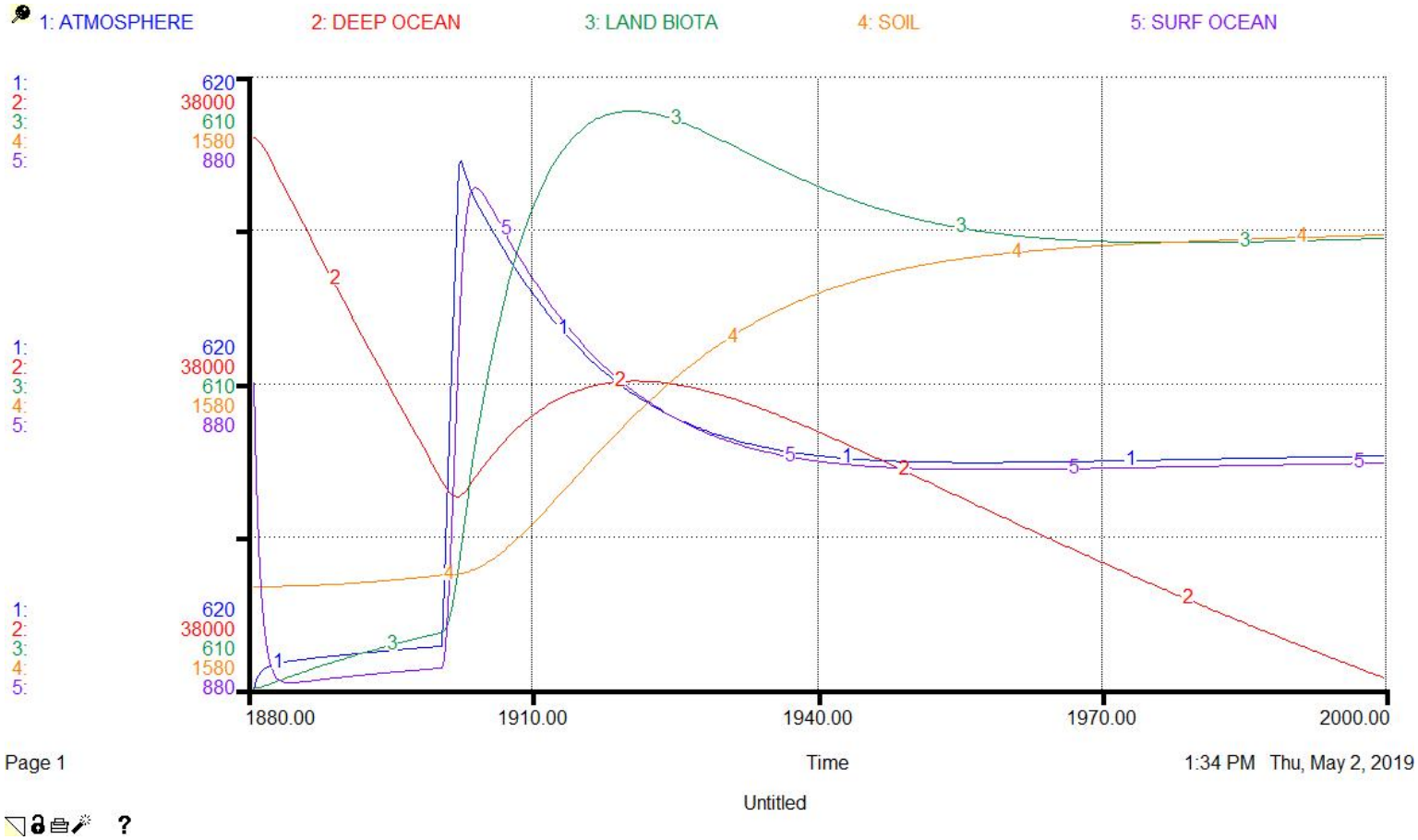
- All reservoirs except deep ocean gradually decrease with time

2.3. Volcanic eruption (increase by 0.2 for 2 years)



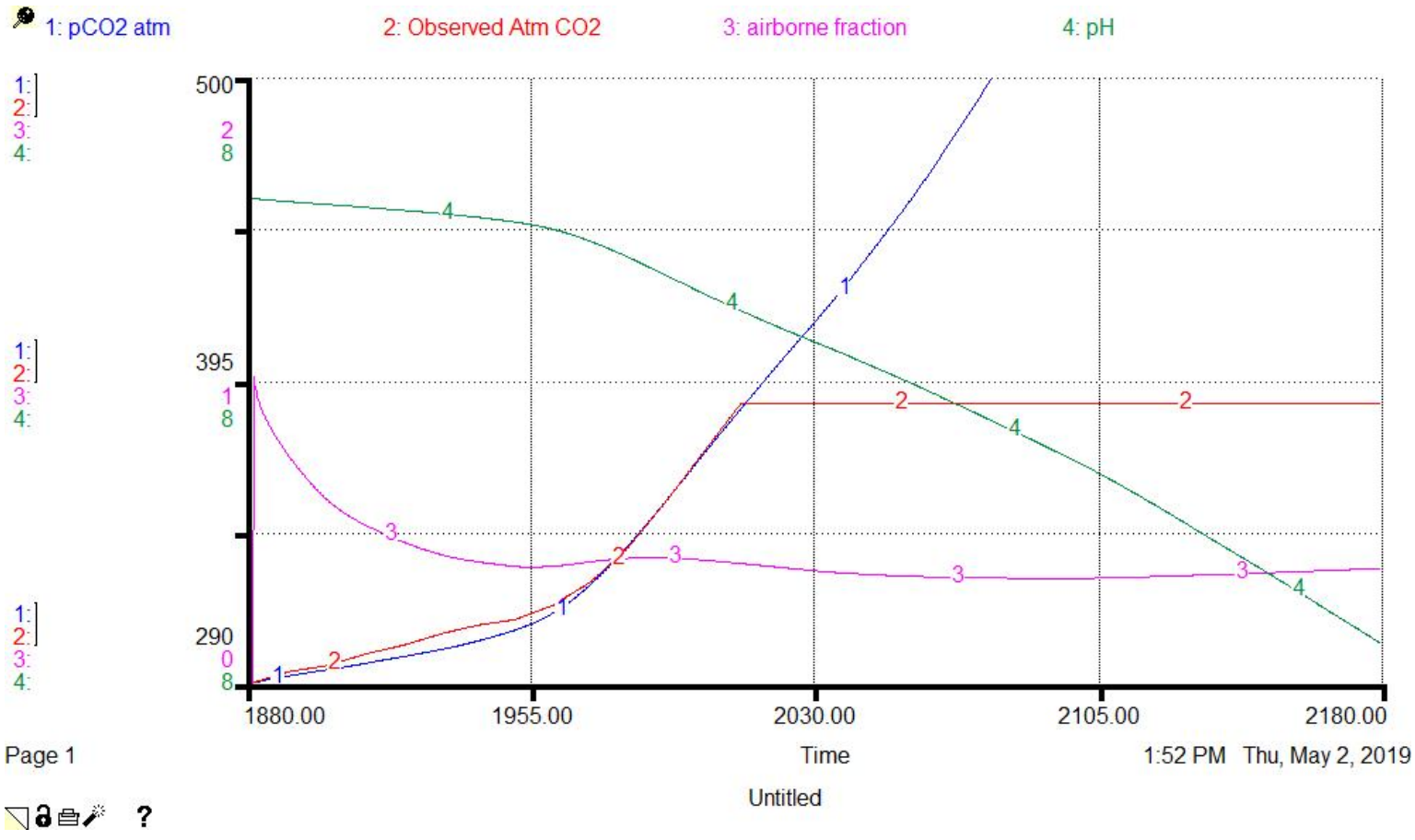
- Small change in atmospheric CO_2 concentrations
- e-folding time of $\sim$10 a

2.3. Volcanic eruption (increase by 0.2 for 2 years)



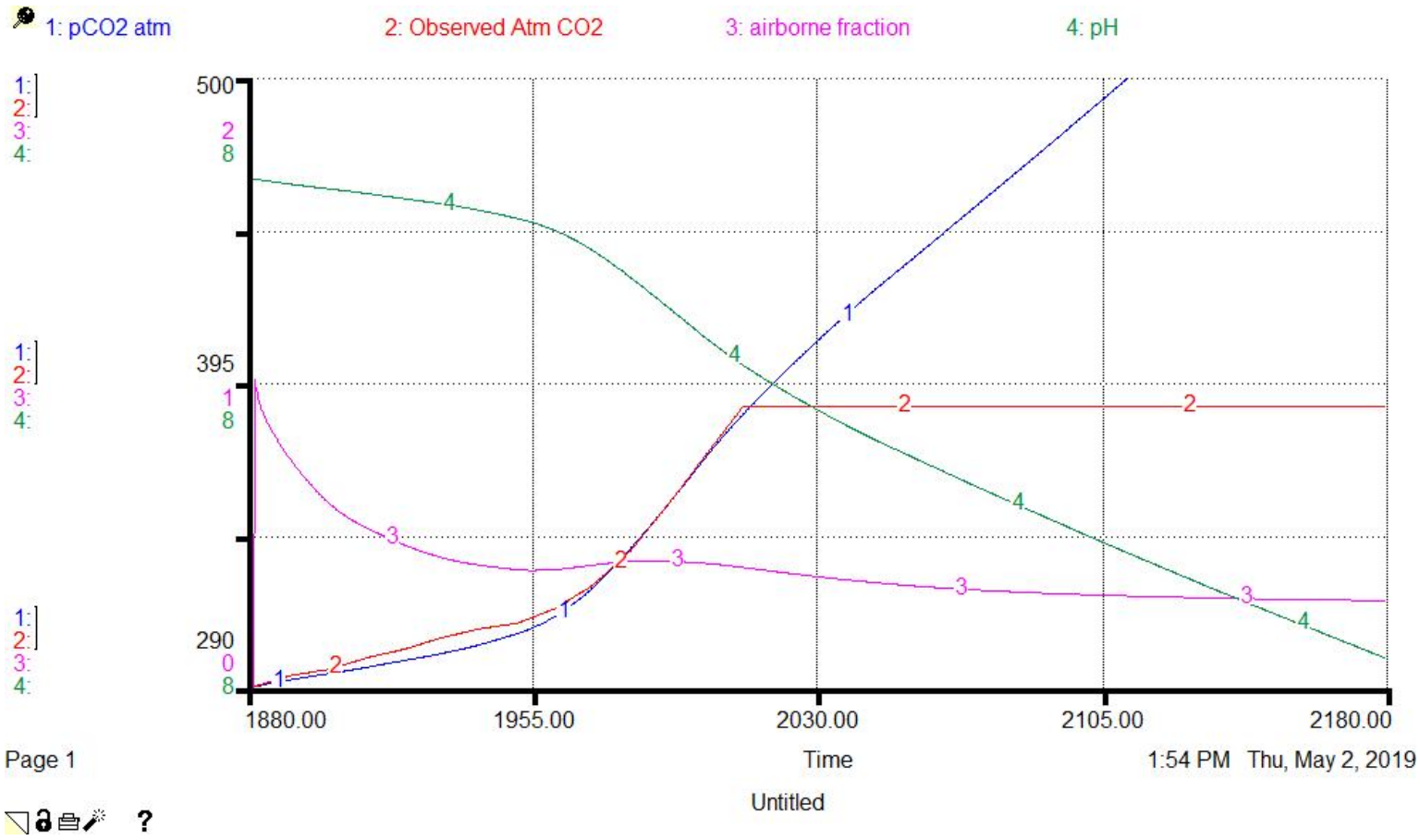
- Surface ocean absorbed much of the CO_2

3.1. Business as usual



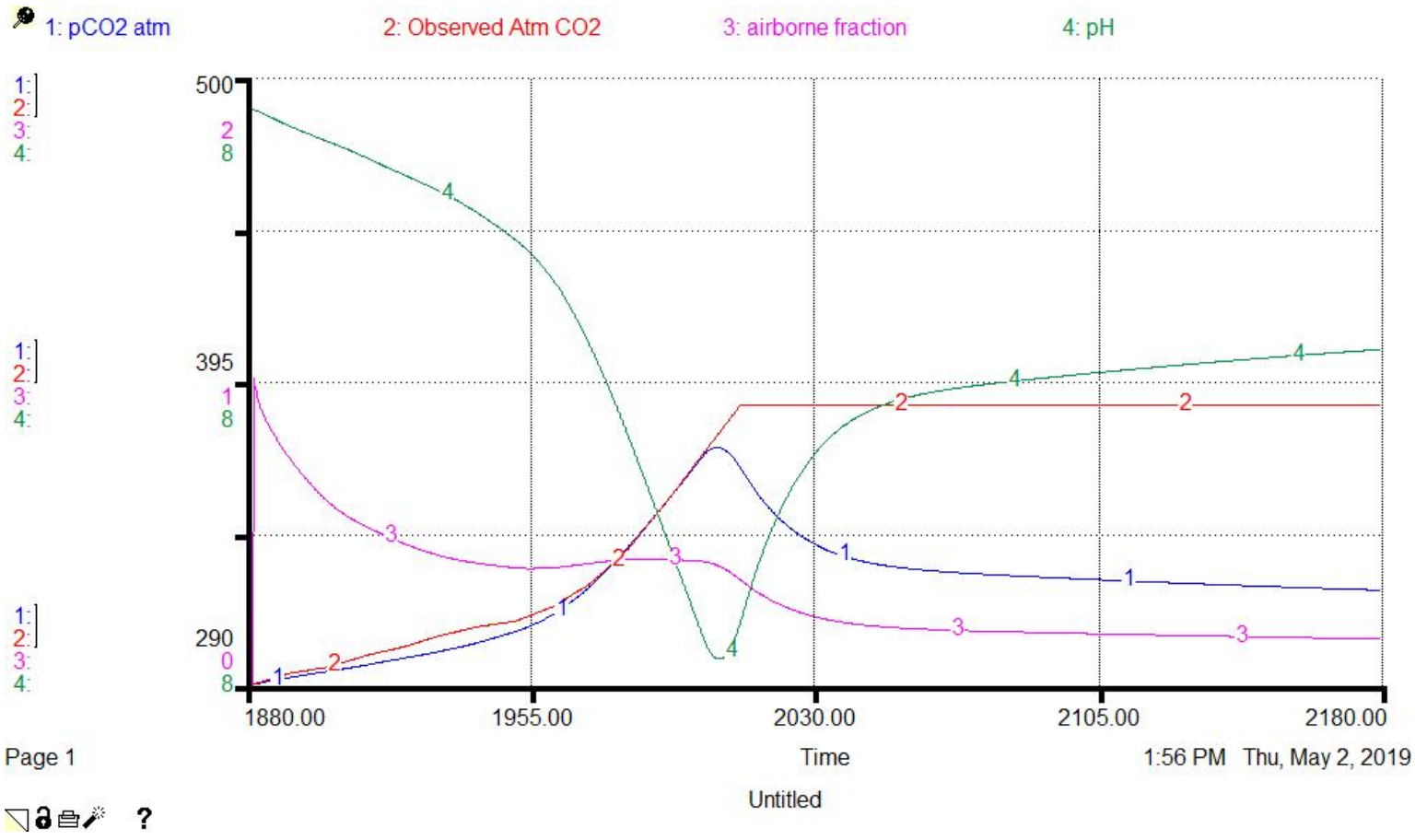
- CO_2 levels rise at accelerating rate

3.2. Stabilization



- CO_2 continues to rise quickly; will take centuries to stabilize to new steady state

3.3. Reduction



- CO_2 nearly stabilizes after 100 years from present