Global Carbon Cycle Simulation

Based on Chameides & Perdue
1. Atmosphere (600 Pg)

2. Terrestrial Biosphere (830 Pg) → 48 litter

3. Dead biomass terrestrial (1500 Pg)

4. Surface Ocean (1000 Pg)

5. Deep Ocean (38,000 Pg)

6. Marine biomass (1.8 Pg)

7. Organic C Sediments (20,000,000 Pg)

8. Carbonate sediments (70,000,000 Pg)
Steady State Model

1. Enter all pool sizes and fluxes, calculate rate constants;
2. Define $\Delta t$ based on largest rate constant;
3. Calculate $M_t$ and $dM/dt$ for each pool for a period of 10 years;
4. Verify that $dM/dt$ is zero for all pools for the duration of the 10 years.
Model with Emissions

- Use Excel Solver to fit emissions data (Col.Y) to time (Col.X) using equation: \( E = a \cdot M_7^{b(t-1860)} \)
- Calculate the predicted emissions and plot these as well as the measured emissions;
- Add the emissions term to \( dM_1/dt \). This will create an imbalance in the fluxes and cause all of the pools to begin to change over time.
- Calculate all pools for the period 1860-2000
- Plot M1 vs. year. Think about why it does not match the known historical trajectory in M1. Your graph should look like the next slide.