Exercise 3 Answers

(a) Section 8.1.2 of *The Cretaceous World* cites an estimate of 2.75×10^{12} tonnes for **Ouestion 3.1** the coal reserves of that age in the Alaskan North Slope. With the given assumptions, the average rate of burial would thus have been $(2.75 \times 10^{12} \times 10^{3})/10^{7}$ kg C per year = 0.000275×10^{12} kg C per year. (b) The figure cited for the Late Cenomanian burial of carbonate carbon in the Tethyan platforms, in Section 8.2.1, is 0.09×10^{12} kg C per year. Hence the ratio of the two figures from (a) and (b) is approximately 1: 300. (c) Section 8.1.2 of The Cretaceous World states that 'Similarly large deposits of Cretaceous coal are known from across north-eastern Russia while smaller accumulations occur in western Canada, Svalbard, the western interior of the US, Germany, Hungary, Spain, northern China, North Africa, Australia and New Zealand'. If we were to assume roughly the same amount of Russian reserves as in Alaska, and the same amount again for the other Northern Hemisphere deposits combined, plus a corresponding total in the Southern Hemisphere, then the global figure for terrestrial Corg burial would be around six times that of Alaska. Crude though it is, this estimate nevertheless lies comfortably between one to two orders of magnitude less than the figure for C_{carb} burial in the Tethyan carbonate platforms, and that is before we even consider the Pacific platforms, and the Chalk, both of which are mentioned in Section 8.2.1 of The Cretaceous World. The latter Section also cites estimated ratios for C_{carb}/C_{org} burial in marine environments, for the Early and Late Cretaceous, of 4.7 : 1 and 7 : 1, respectively (i.e., both within one order of magnitude). Hence it seems likely that marine C_{carb} burial was overwhelmingly dominant, followed by marine Corg burial, and that in turn by terrestrial C_{org} burial, lagging at least an order of magnitude behind the rate of marine C_{carb} burial.

Question 3.2 Your diagram should have looked something like that shown below. Some aspects are simply derived from Figure 6.5c in *The Cretaceous World* (such as the silicate-weathering subcycle), though others refer more specifically to items discussed in Chapter 8 of *The Cretaceous World* (concerning the polar forests and carbonate platforms). Note the dual effect of the carbonate platforms, which provide a positive feedback to atmospheric CO_2 concentration in the short term (as shown in Figure 8.11 of *The Cretaceous World*), while leading to C_{carb} burial, hence the long-term consumption of CO_2 .



Cause and effect diagram for the answer to Question 3.2