

# The Global Carbon Cycle

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# THE MODERN CARBON CYCLE

Earth	$32.0 * 10^{23}$ g C
Upper Mantle	$7.0 * 10^{22}$ g C
Organic C	$1.6 * 10^{22}$ g C
Carbonates C	$5.4 * 10^{22}$ g C
Fossil Fuels	$4.0 * 10^{18}$ g C
Microbial Biomass	$1.0 * 10^{17}$ g C
Active Pool of C	$40.0 * 10^{18}$ g C

(see Figure 11.1)

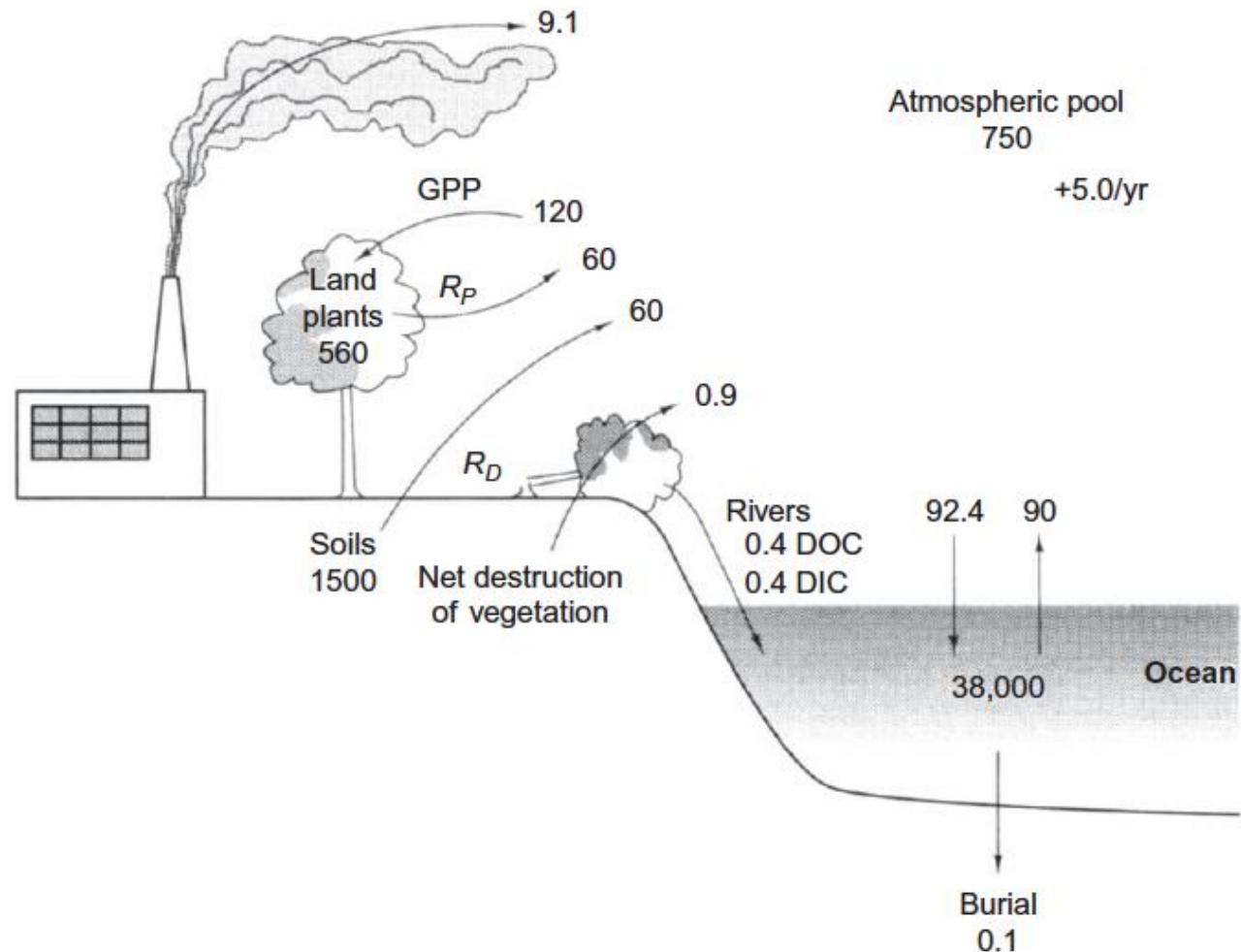
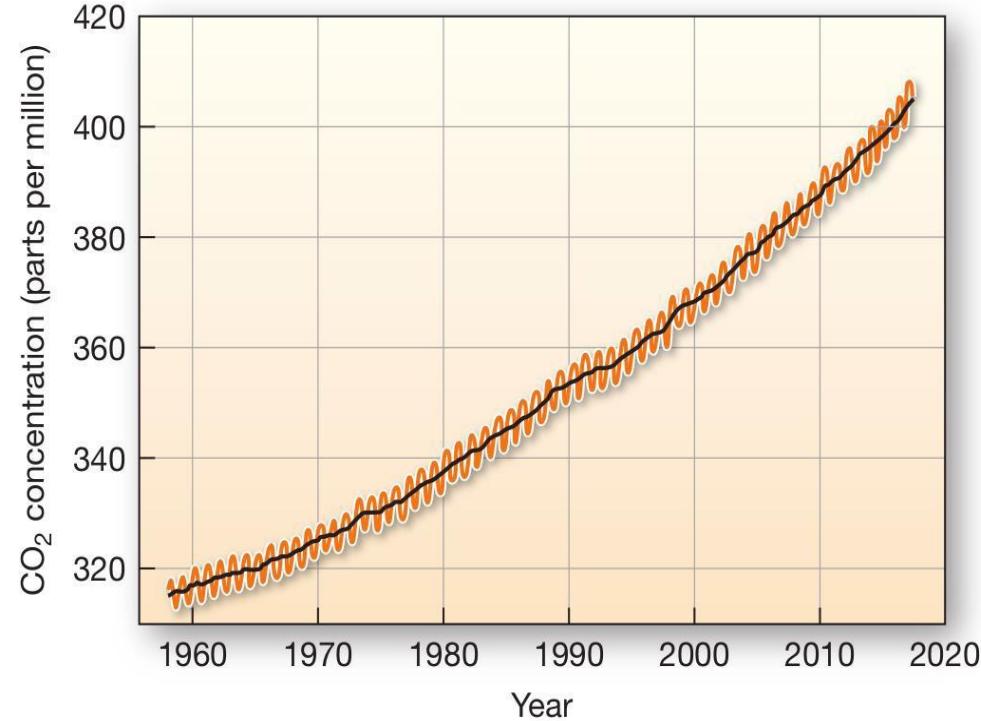
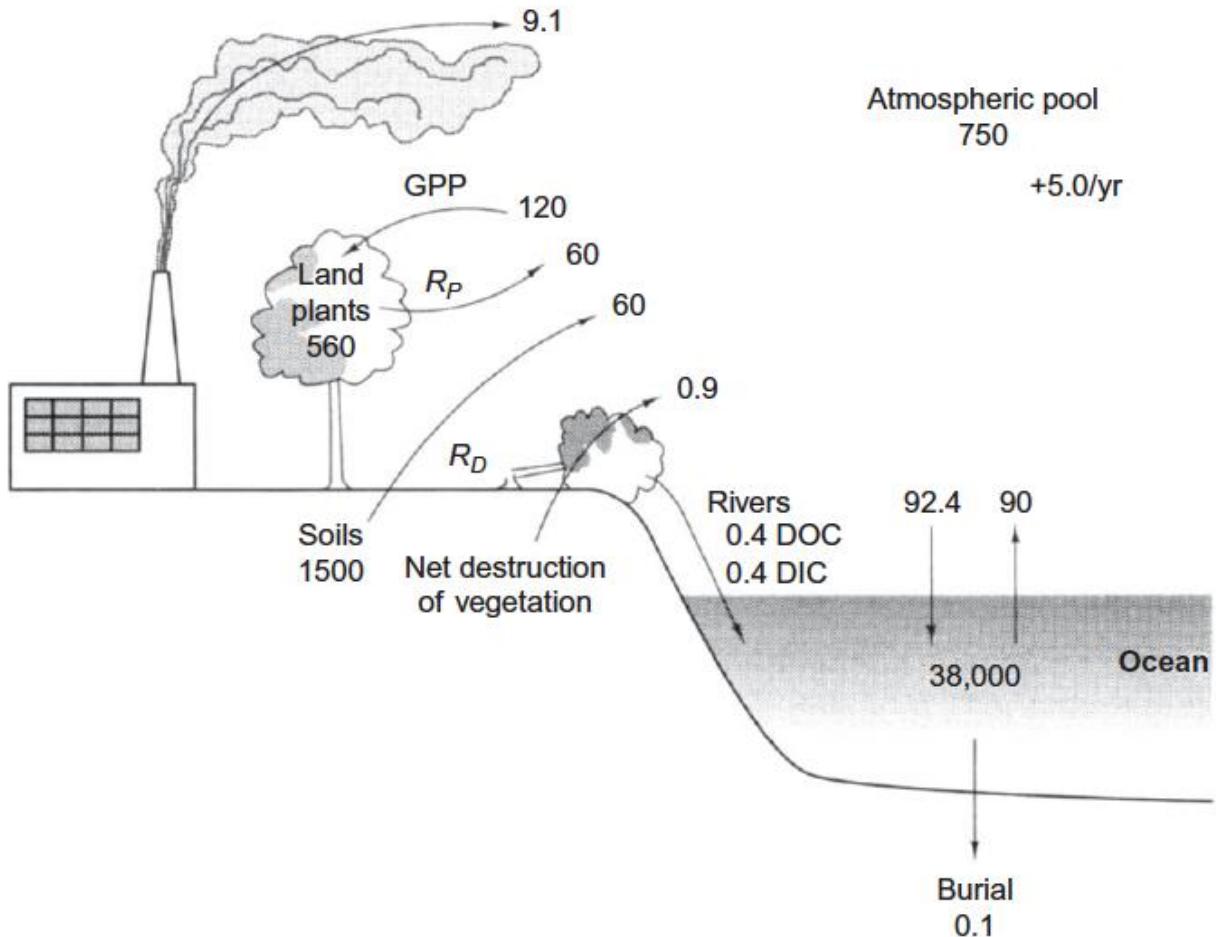


FIGURE 11.1 The global carbon cycle. All pools are expressed in units of  $10^{15}$  g C and all annual fluxes in units of  $10^{15}$  g C/yr, estimated for 2010. Values are taken from the text.



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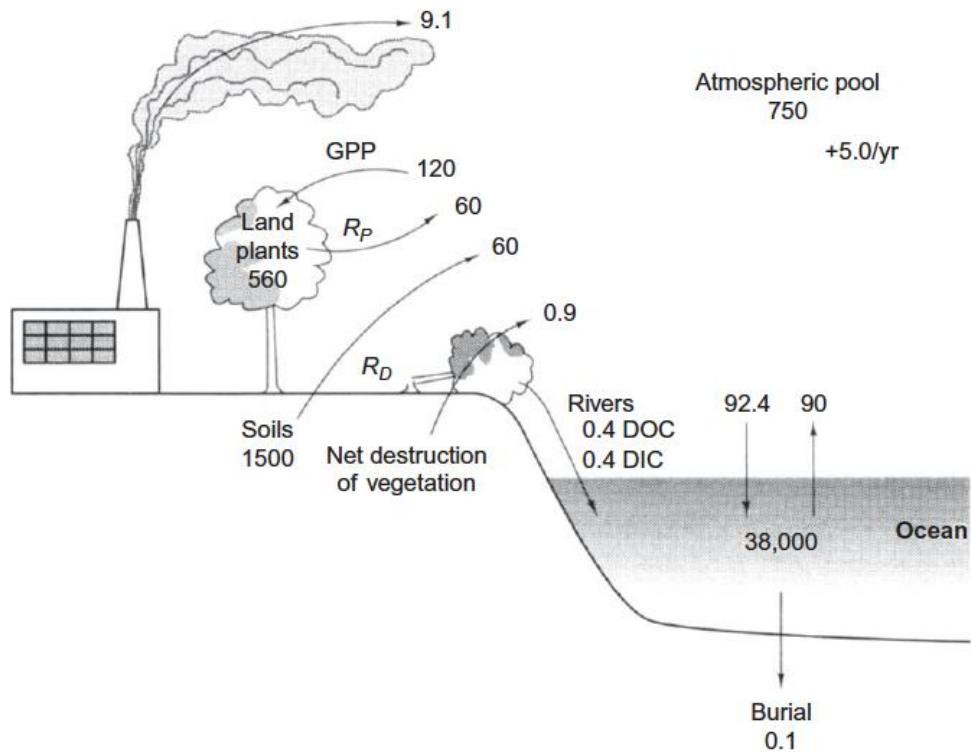


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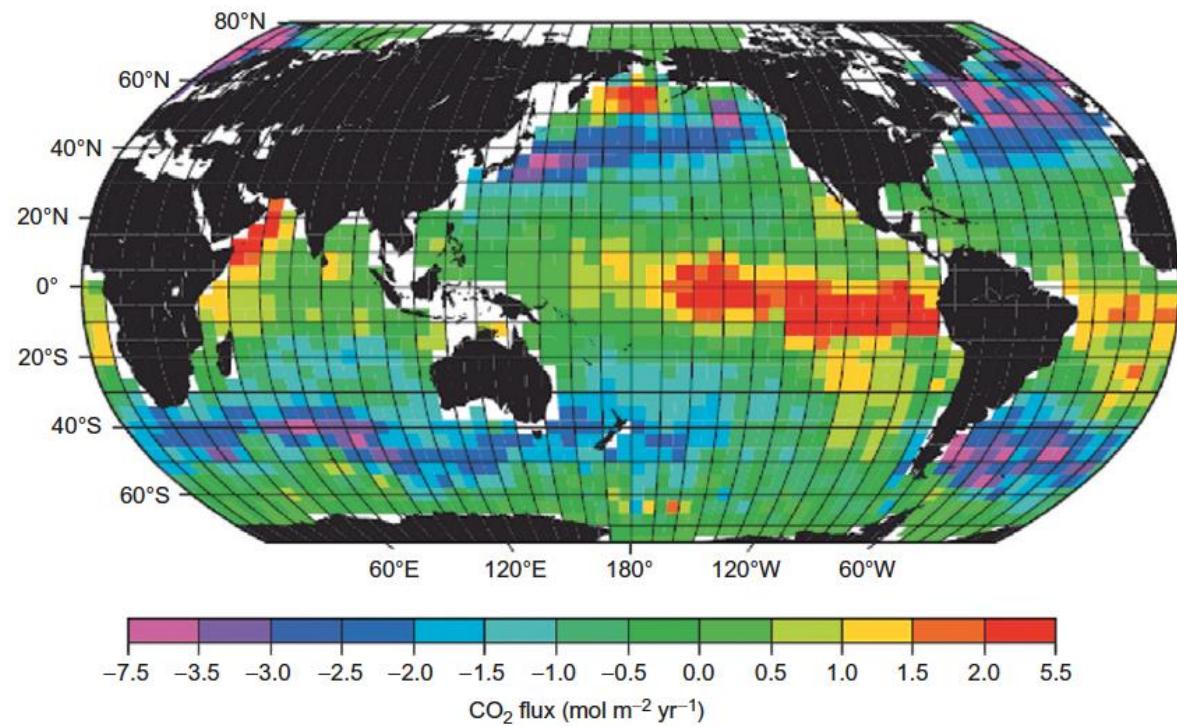


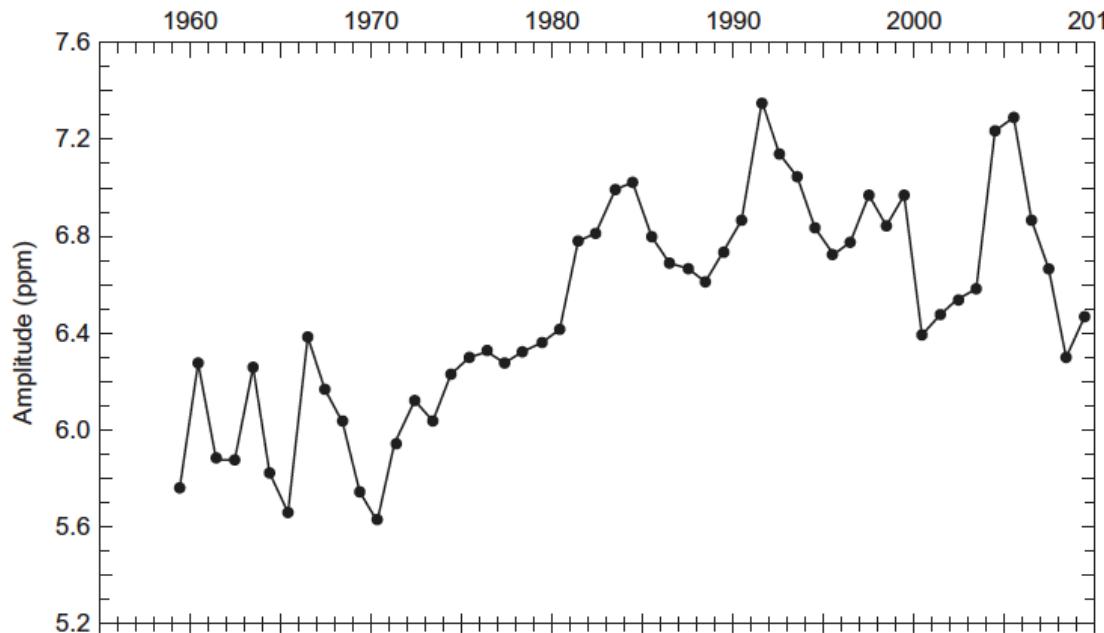
FIGURE 11.2 Estimates of the flux of  $\text{CO}_2$  between the atmosphere and the oceans' surface for 1995. Source: From Denman et al. (2007). Used with permission of Cambridge University Press.

## Biological processes stimulated

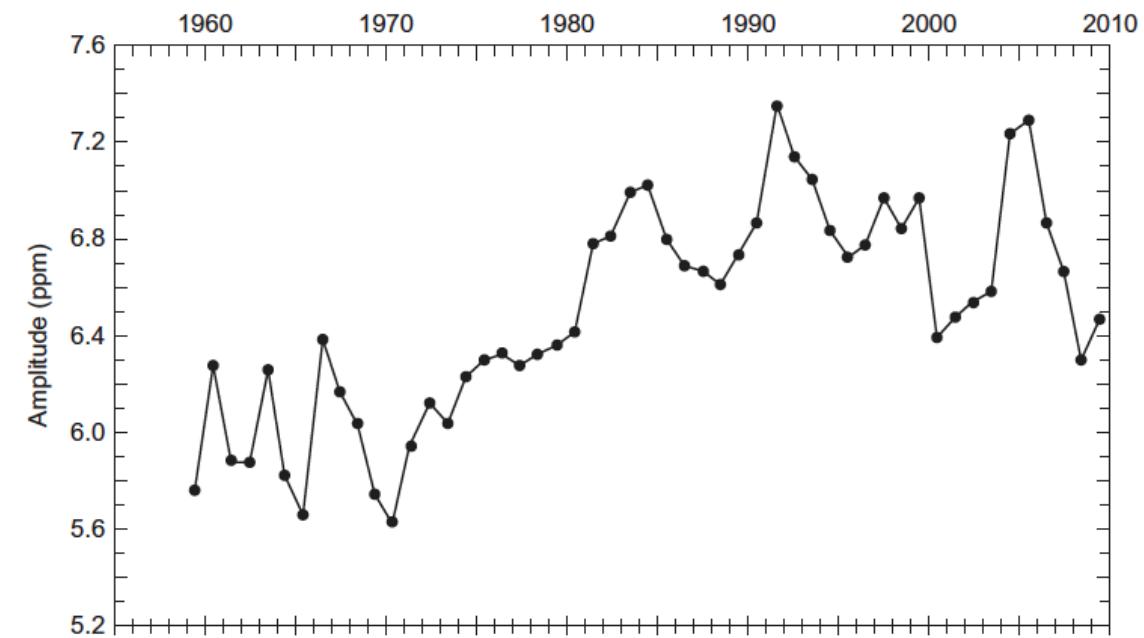
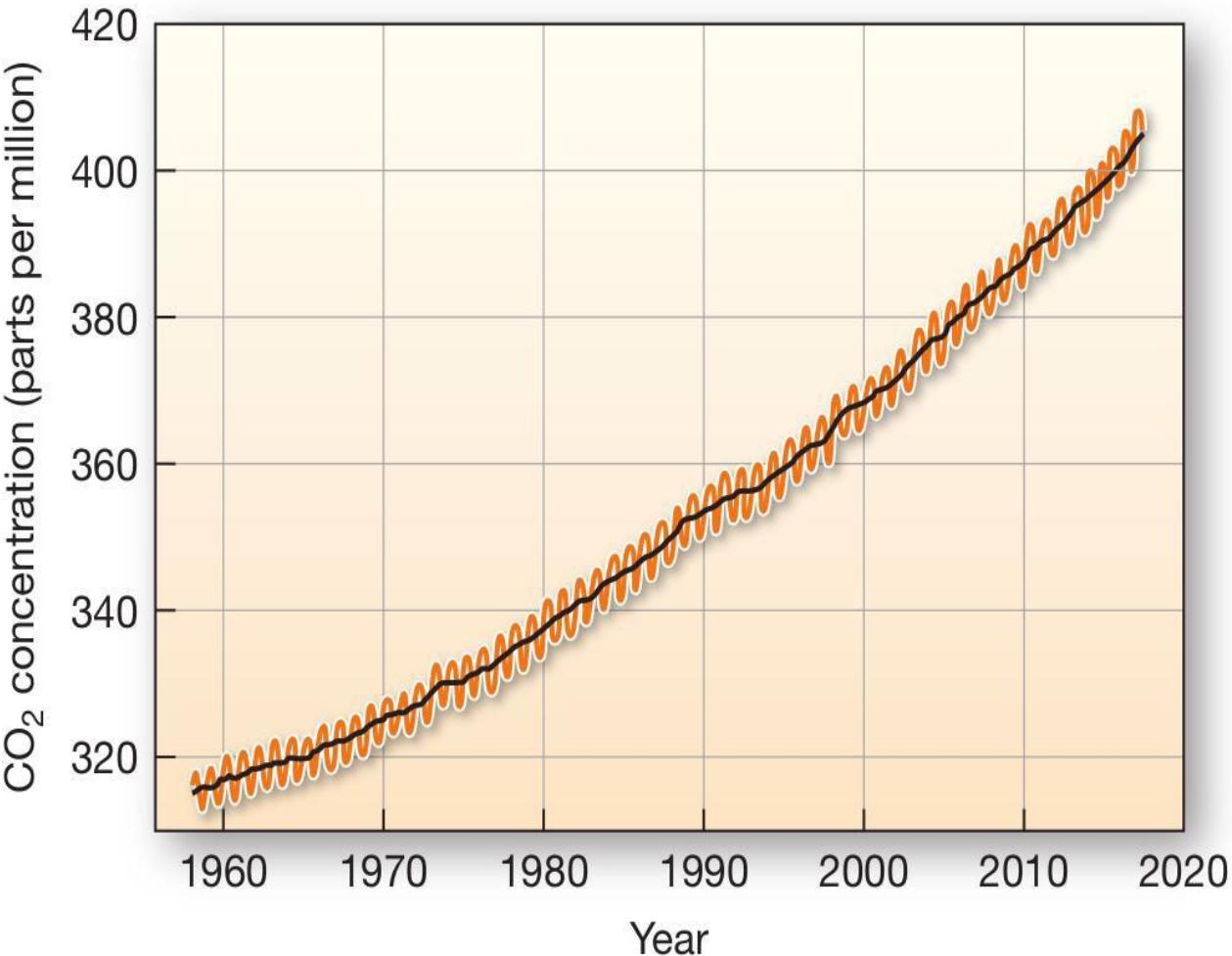
How might this affect the level of C stored in Terrestrial ecosystems

In sum, whole-ecosystem response will be determined by various factors—CO<sub>2</sub>, nutrient availability, and global patterns of temperature and rainfall, which are all affected by human activities. Although it seems unlikely that enhanced growth by terrestrial vegetation will ultimately stem the rise of CO<sub>2</sub> that is derived from fossil fuels (see Idso and Kimball 1993), the response of the terrestrial biosphere could have a dramatic impact on the future composition of the atmosphere.

In our view of the global carbon cycle, it is important to recognize that the annual movements of carbon, rather than the amount stored in various reservoirs, are most important. De-



**FIGURE 11.3** Increasing amplitude of the seasonal oscillations in atmospheric CO<sub>2</sub> at Mauna Loa, Hawaii. Source: From Steve Piper, personal communication (2012).



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