Global Wind Systems

General Circulation of the Atmosphere

Although the global scale circulation of the earth's atmosphere is influenced by several factors, the most fundamental process driving general circulation is uneven heating of the earth's surface by solar radiation. Although the energy received by the earth as a whole is balanced by energy radiated back into space, this is not true for every specific location. Some locations receive more heat energy than they emit, some receive less. The tropics, for instance, receive much more heat from the sun than is radiated back into space. The Polar Regions receive much less energy than they emit. Global circulation patterns are a way of redistributing energy from areas of the earth with an energy surfeit to areas with an energy deficit, through the atmosphere. The oceans have very similar patterns that exist for the same reasons. In an attempt to better understand general circulation, scientists have developed computer models of global-scale atmospheric circulation. When these models are combined with ocean current models they are referred to as *coupled* models.

The *single-cell model* is the most basic model of general atmospheric circulation. The single-cell model assumes a non-rotating earth covered entirely by water (such a uniform surface would insure even heating for each point at a given latitude) and that the sun is always at equinox. This model predicts an enormous pattern of circulation from the equator to the poles. This circulation is called a *Hadley Cell* (after British meteorologist George Hadley). In a Hadley cell air rises from the equatorial regions, spreads pole ward at the tropopause, converges and sinks near the Polar Regions, then moves back toward the equator at the earth's surface. Although this simple model has some utility, it fails to describe observed large-scale circulation accurately, largely because it fails to take into account the