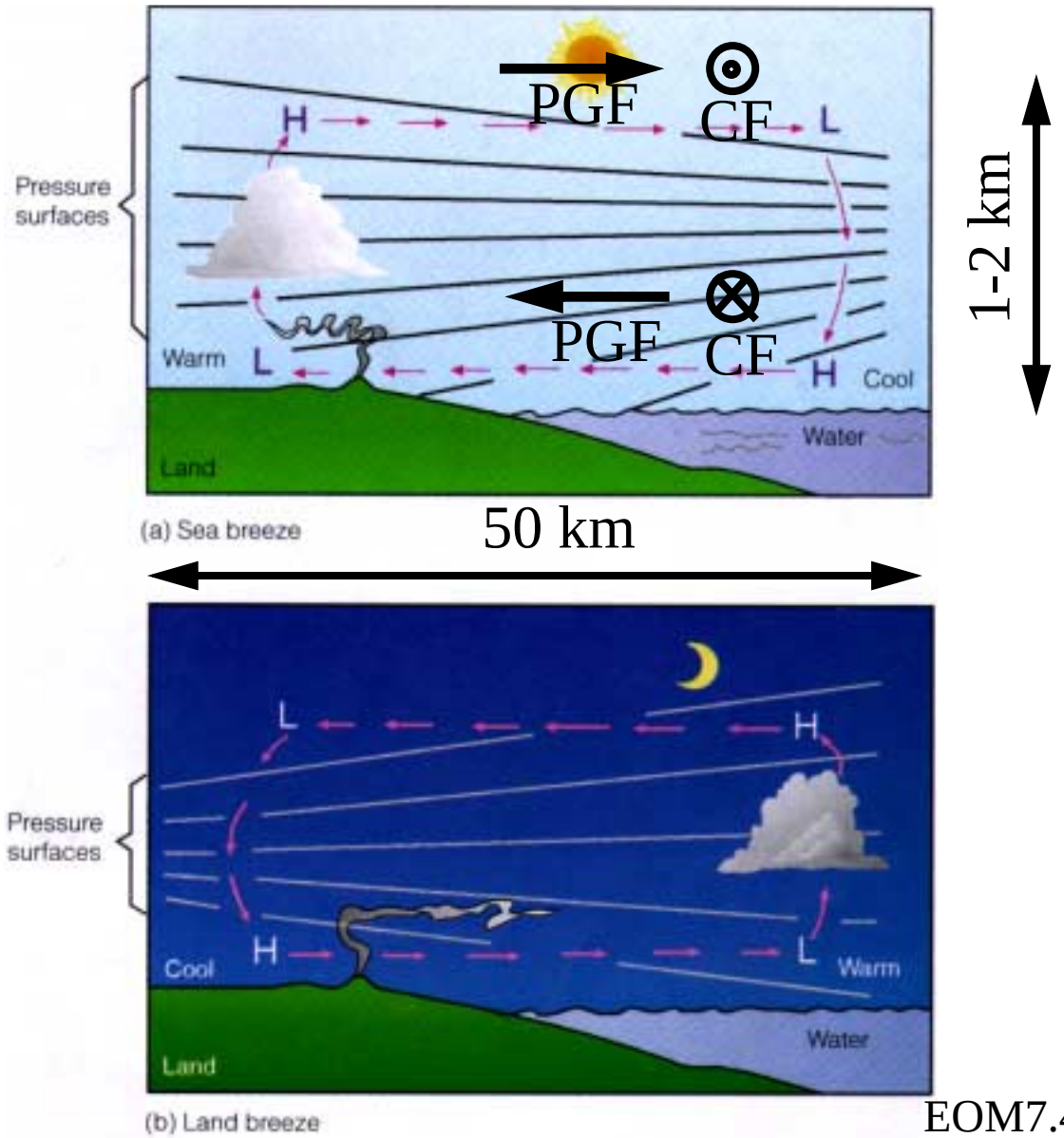
Lecture 11. Local Circulations II

Land/Sea Breeze - A Thermally Driven Circulation

- In colder air, pressure drops faster with height
- Air moves around circulation in a couple of hours, so Coriolis deflection not too important.



The Florida Sea Breeze

- During most summer days, Florida's weather consists of afternoon thunder-storms over the warm land, which first develop at the inland edge of the sea-breeze
- At night, thunder-storms develop over the ocean just off-shore of the land breeze.

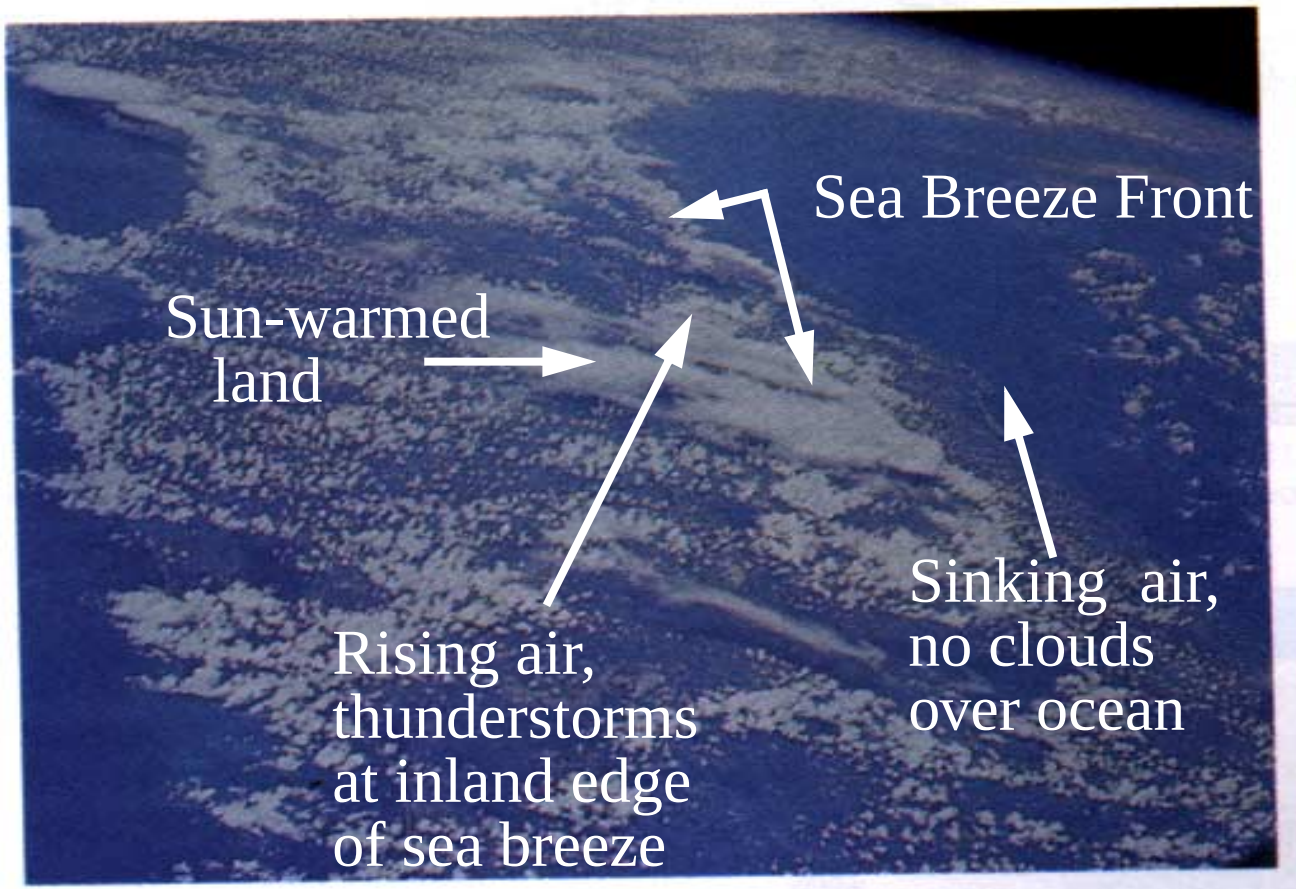


Figure 5.10
Cumulus clouds building over the warm Florida landscape. Each tiny cloud represents a region where thermals are rising from the surface. The clear areas between the clouds are regions where the air is sinking. Clouds are notably absent over the slightly cooler water.

Mountain/Valley Circulations

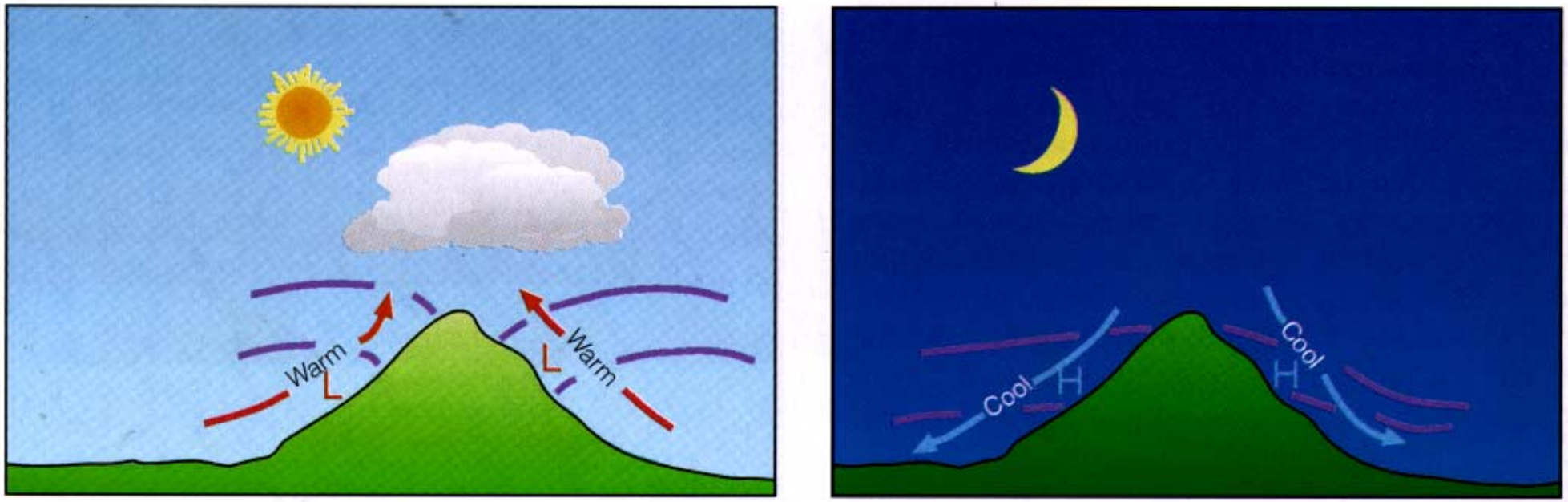


Figure 7.8 EOM
Valley breezes blow uphill during the day; mountain breezes blow downhill at night. (The Ls and Hs represent pressure, while the purple lines are pressure surfaces.)

- Day: Air near slopes warms, rises
  Pressure surfaces further apart where air warm, less dense
  Horizontal pressure gradient pulls air toward mountain during day.
- Night: Air near slopes cools, sinks

Monsoons

- Winds reverse direction *seasonall*y as tropical continents become warmer, then colder than nearby ocean:

- Most pronounced over SE Asia; also occurs over Mexico and SW US deserts, and N Australia

- Like a giant land/sea breeze

  Summer: Low pressure over hot land
  Moist air flows from ocean to land,
  then rises, making heavy rain.

  Winter: High pressure over cold land
  Dry air flows from out from land,
  and rain now mainly over ocean

The SE Asian Monsoon

Cherrapunji -- 425 in of rain annually, mostly in July and August

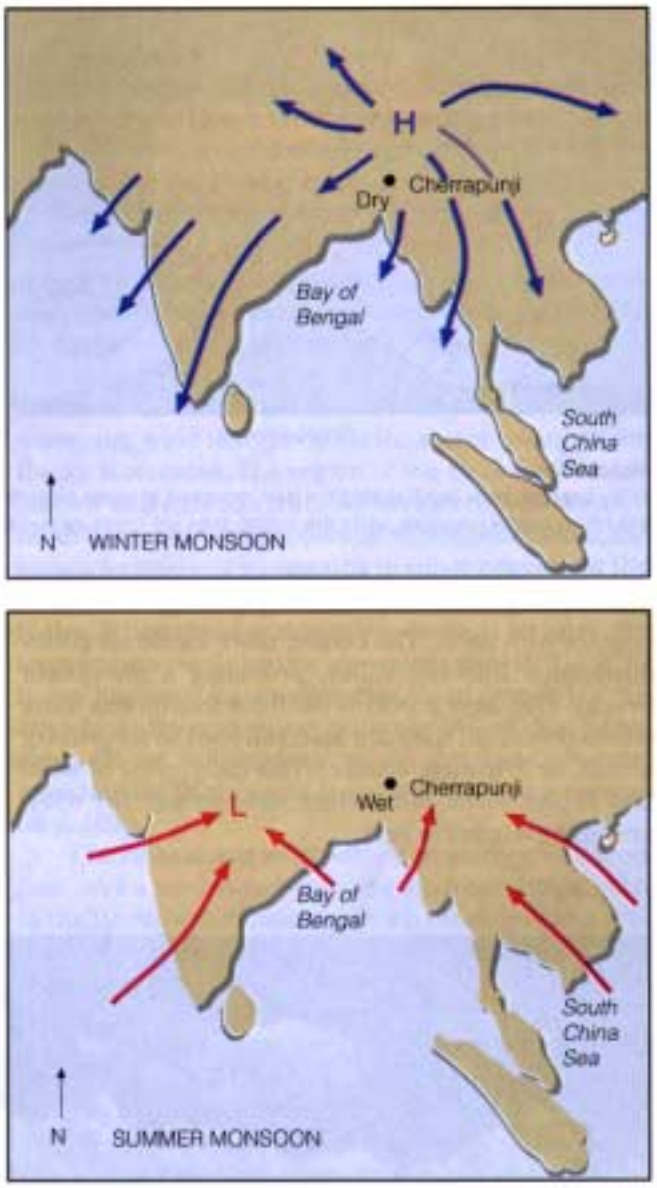


Figure 7.7
Changing annual wind flow patterns associated with the winter and summer Asian monsoon.