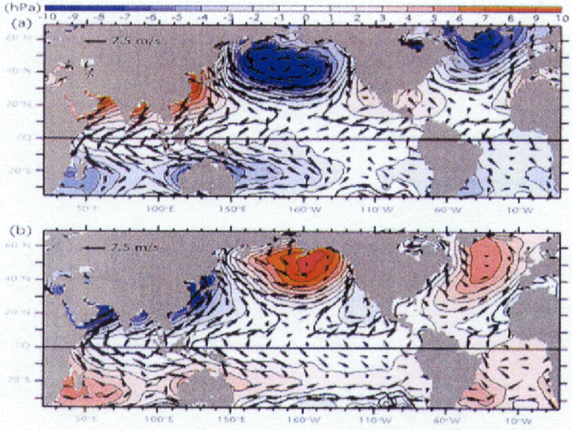

Figure A.7
Departure of monthly sea level pressure and monthly wind from their local annual mean for a) January — Asian winter monsoon; and b) July — Asian summer monsoon. SLP departure is in hPa with positive departures shaded red and negative departures blue.
(Harrison and Larkin, 1996)

with the annual cycle of solar heating and the seasonally changing monsoon circulations.

- During January (Figure A.8a), solar heating is strongest in the Southern Hemisphere and deep tropical atmospheric convection (as indicated by low values of outgoing longwave radiation — yellow to red shading) is mainly south of the equator, especially over Africa and South America. Convection over the Southwest Pacific extends southeastward from Papua New Guinea as the "South Pacific convergence zone". Tropical convection is experienced north of the equator over the Western Pacific and as a line of convection that extends eastward across the Pacific Ocean, outlining the intertropical convergence zone. There is a very marked "dry zone" (as indicated by high values of outgoing longwave radiation — blue to mauve shading) over the eastern Pacific Ocean and extending westward along the equator.
- By April (Figure A.8b) the regions of tropical convection over Africa and South America have shifted northward as they follow the seasonal movement of maximum solar heating. Also, the intertropical convergence zone of the Pacific Ocean is more active north of the equator and the South Pacific convergence zone is weaker.
- The Asian monsoon is well developed by July (Figure A.8c) and extensive convection is experienced over the Indian subcontinent, Indo-China and the Malay Peninsula. The intertropical convergence zone across the Pacific Ocean is active north of the equator, particularly over the western Pacific Ocean, including the Philippines, and off Central America. Deep convection is

Monitoring of convection

Clouds, the oceans and land surfaces (including vegetation) emit longwave radiation and the intensity of emission is a function of the temperature of the emitting surface. Wam surfaces have high emission rates and cooler surfaces have lower emission rates. In the earth-atmosphere system part of the outgoing longwave radiation is absorbed by water vapour and carbon dioxide in the atmosphere but for selected wavelengths the longwave radiation is emitted to space with little attenuation.

The intensity of outgoing longwave radiation from the earth-atmosphere system is measured by satellite instruments and is a good indicator of the presence of deep atmospheric tropical convection.

- The temperarures of the tops of tropical deep atmospheric convective clouds are very cold (–70°C to –80°C) and these cold cloud tops emit relatively low values of longwave radiation to space. The satellite instruments measure low values of outgoing longwave radiation over deep convective clouds.
- The temperatures of the sea surface and land areas of the tropics and subtropics are relatively warm (generally higher than 25°C) and these surfaces emit high values of longwave radiation. The satellite instruments measure high values of outgoing longwave radiation over relatively cloud-free areas of the tropics and subtropics.

In the tropics and subtropics, therefore, high values of outgoing longwave radiation are indicative of areas of clear sky; low values of outgoing radiation are indicative of high cold clouds, including the tops of deep convective clouds.

Over periods of months to seasons, tropical areas with persisting higher than normal or lower than normal values of outgoing longwave radiation have respectively less than or more than normal deep atmospheric convection and rainfall. Measurement of outgoing longwave radiation using satellite instruments is an effective tool for monitoring seasonal shifts in the tropical distribution of deep atmospheric convection, and of departures from the normal seasonal cycle.