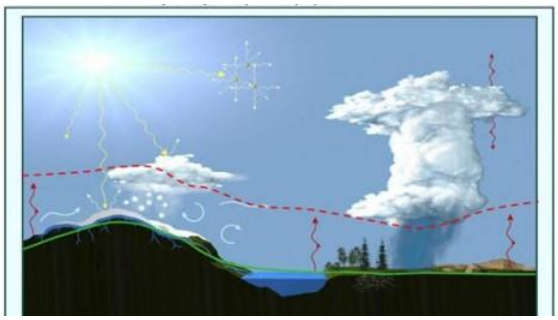
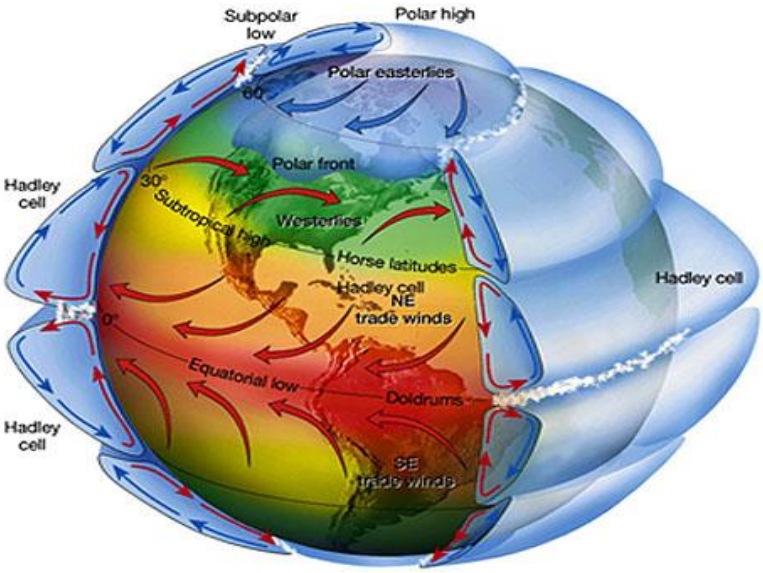
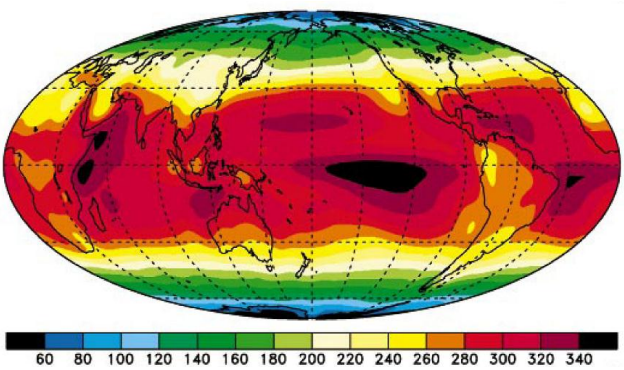
MAJOR WIND CURRENTS IN THE EARTH'S TROPOSPHERE



The major wind currents on Earth have been classified into 3 main air cells: the "Hadley cell" that occurs from the Equator to latitude 30 ° north and south, the "Ferrel cell" that occurs from the latitude 30 ° to the 60 ° in both north and south hemispheres, and the "polar cell" that commonly occurs from latitude 60 ° north and south towards the magnetic poles of the Earth.

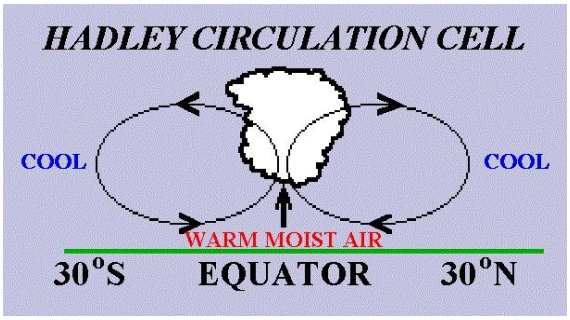


The air currents in the “Hadley Cell” originate during the day in the equator of the electromagnetic field of the Earth where most of the interaction with the energy coming from the sun occurs.

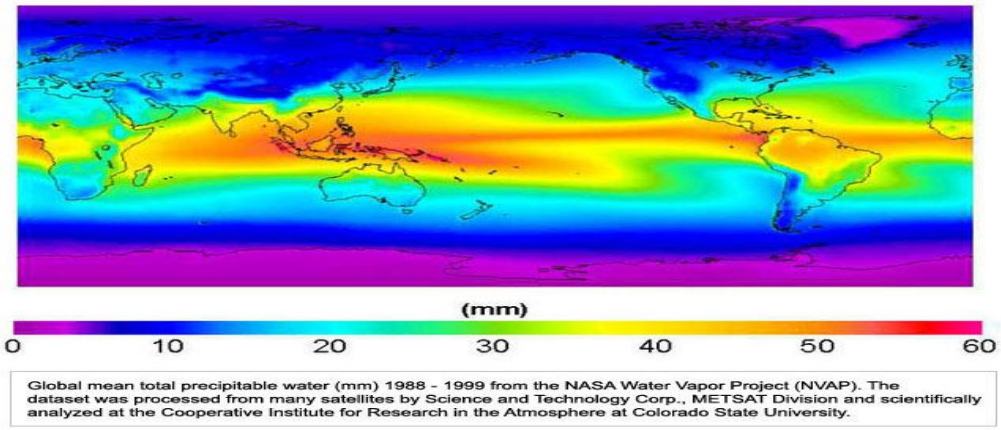


The heat on the surface mostly from the ocean, water bodies, shallow aquifers, and icebergs will cause most of the generation of steam of water and will excite other compounds of carbon, nitrogen and other volatile elements, causing the formation of volatile dense air masses in the surface and its accumulation in the stratosphere .

At sea level, air density is 1.29 kg/m3, however, its density increases as it loses heat and expansion coefficient increases.

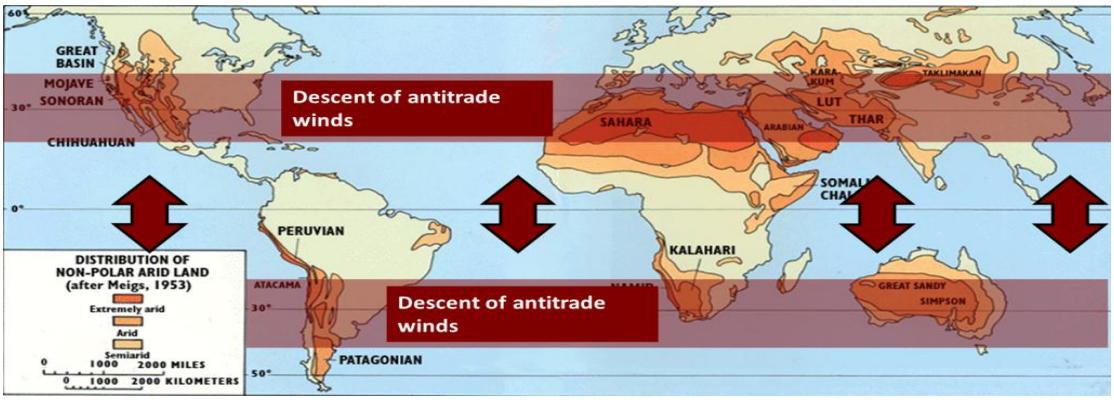


These warm air masses form a strip of hot, dense air in the Earth's magnetic equator emerging as the Earth rotates and starts the day and tends to rise to 10 to 15 km of altitude with the direction of the upper troposphere and the tropopause.

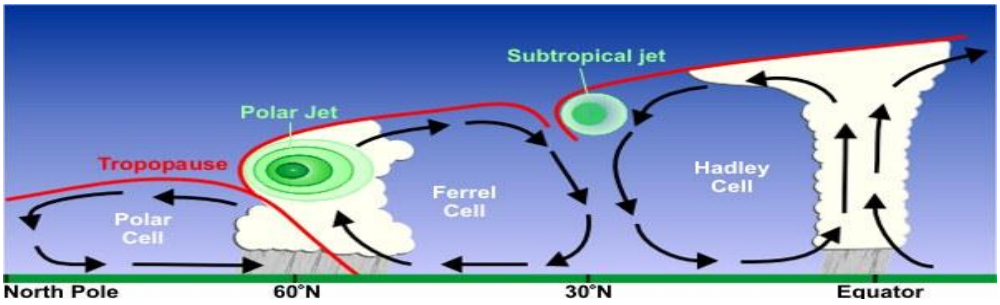


Global mean total precipitable water (mm) 1988 - 1999 from the NASA Water Vapor Project (NVAP). The dataset was processed from many satellites by Science and Technology Corp., METSAT Division and scientifically analyzed at the Cooperative Institute for Research in the Atmosphere at Colorado State University.

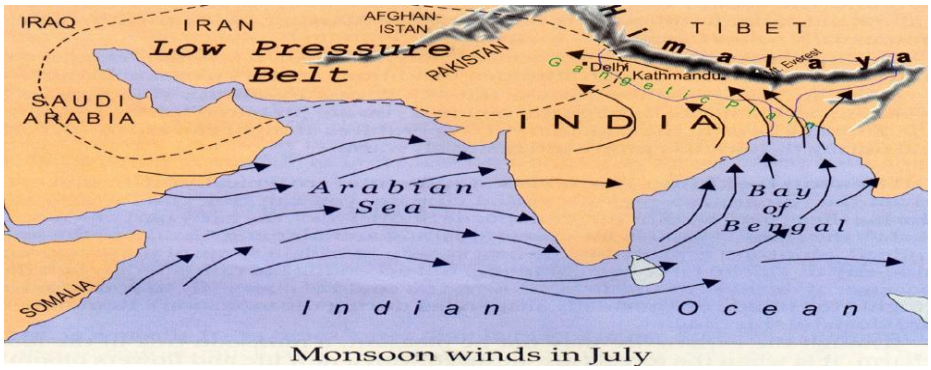
Due to the strong presence of N2 and NO2 molecules in the atmosphere, the orientation of these hot air mass will transport energy and heat to the tropopause moving into the northern and southern tropics generating the "antitrade winds" which descend to collide with areas high pressure on high at a latitude of 30 ° North and South where most of the dry and desert areas are on Earth.



These mixed winds are dry and descend vertically carrying energy, converging on the surface of the tropics, forming a dense mixed stream between 30 ° and 35 ° North and South latitude towards the equator where there is less pressure forming the “Trade Winds “and stretching westward both in continents and oceans at speeds of approximately 20 kilometers per hour influencing the temperature and humidity of the earth’s surface in a strip of just over 500 km.



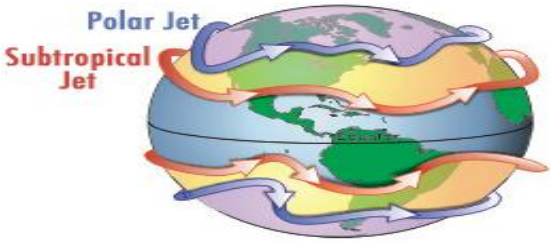
The intensity of these “trade winds” is higher in the summer and irregular in winter, even reaching calm and can be divided into “oceanic trade winds” if they occur in theocean, “continental” and “Monsoon”, which vary in intensity depending of the season of the year.



Monsoon winds in July

If these winds occur in the ocean being dry, they will be loaded with moisture causing rain and snow (cumunolimbos formed by updrafts) but also “hurricanes”, “cyclones” (swirling humid winds, hot and rising in areas of low pressure usually develop over tropical oceans) and “anticyclone” (dry, cold and falling winds in areas of high pressure)

In the “tropopause” at this latitude of 30 ° North and South will form a thin “jet stream” in opposite direction from west to east.

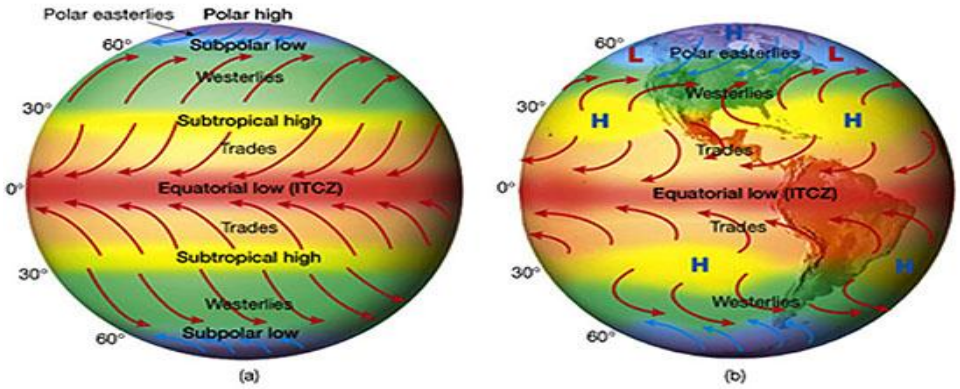


The descending wind carries energy down and will form convection currents which cause cyclones and anticyclones in sub-tropical latitudes toward higher latitudes

with hot winds, because the horizontal winds will try to move toward the poles, while cold winds will move towards the equator.

The sub-tropical anticyclones are reinforced when the continents are relatively cold in winter, and are weakened in the summer when the land masses are warmer.

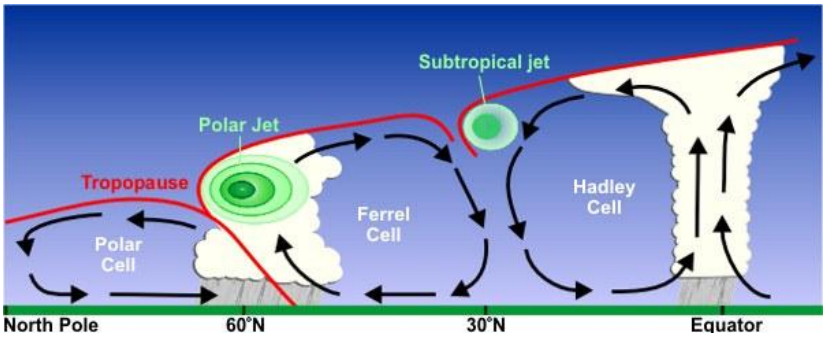
The trade winds (which are relatively cold) from the southern and northern latitudes converge on latitudes 10 ° North and South, enabling the development of the “Intertropical Convergence Zone” (ITCZ) which is a belt of low pressure with calm winds. In these areas the wind rises or falls vertically.



The wind will spread into the equator (forming the “trade winds”) on one hand and on the other hand towards temperate latitudes (forming the “winds of the West”)

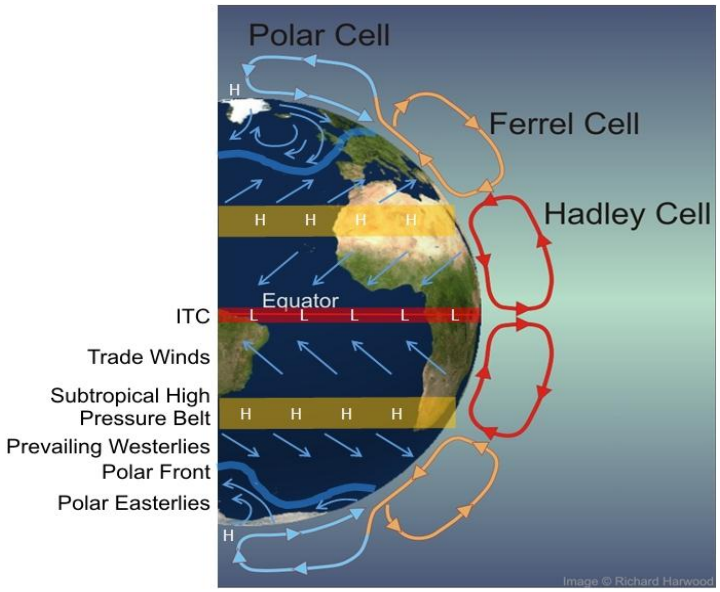
If the behavior of these winds change, it will cause changes in the tropics and ecosystems that receive these currents.

Between latitudes 30 ° and at latitudes 60 ° north and south it will be form a “mixing zone” known as the “Ferrel cell” being the most dynamic region of the atmosphere with winds moving from west to east with direction to the poles, also called “antitrade winds”

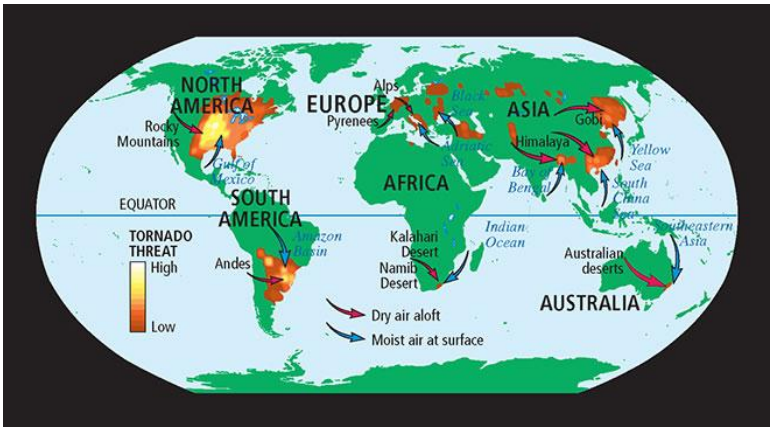


These winds are directed poleward from west to east, while reaching the latitude of 60 ° north and south they will collide and mix with winds from the poles, energizing them and increasing their pressure.

The mixture will rise with strong and variable winds at high altitudes of the troposphere where warm currents continue their journey toward the poles, while the colder portions take a direction toward the the equator, colliding at the latitude 30 ° with the warm winds of the troposphere from the the equator, to mix and form the trade winds.

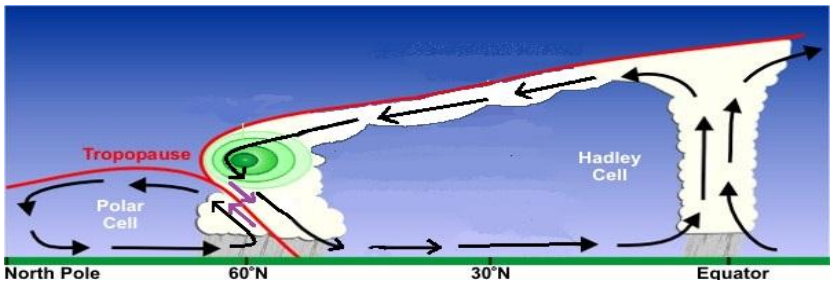


Because in this area strong turbulence occur between wet and dry winds from the sea, so tornadoes will be formed (Permanent air swirls with large funnels and powerful forces)



From latitude 60 ° to the poles, it can be described the “polar cell” or “polar vortex”. The “air masses” with energized particles coming from the “solar wind”,

with molecules composed of nitrogen and carbon, will follow the Earth's electromagnetic field toroidal behavior at the top of the "troposphere" added to the mix of warm winds that will continue the direction to the Earth's magnetic poles.



Upon reaching the poles they will be limited vertically to 8 km of altitude in the tropopause and will collide with other winds coming from different latitudes around Earth's magnetic pole where these masses will cool, vertically sink and will displace the dry air which is relatively warmer to the magnetic equator in several directions.

These winds at the bottom, while having a lower temperature will become more dense than air, and will therefore have an offset differential rotation slower than the rotation of the Earth, generating harmonic and ultra long waves, giving the appearance of moving from East to West and from the the equator as a result of the Coriolis effect reaching latitudes 60 ° north and south.

Source: http://www.artinaid.com/2013/04/major-wind-currents-in-the-earths-troposphere/