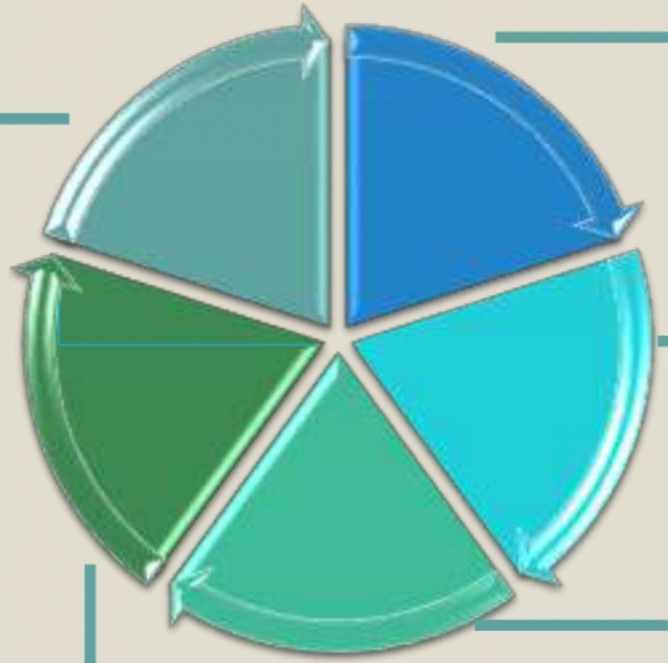
CERTIFIED PHYSICAL & HUMAN GEOGRAPHY (GC LEONG)

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The Earth & the Universe (Part II)

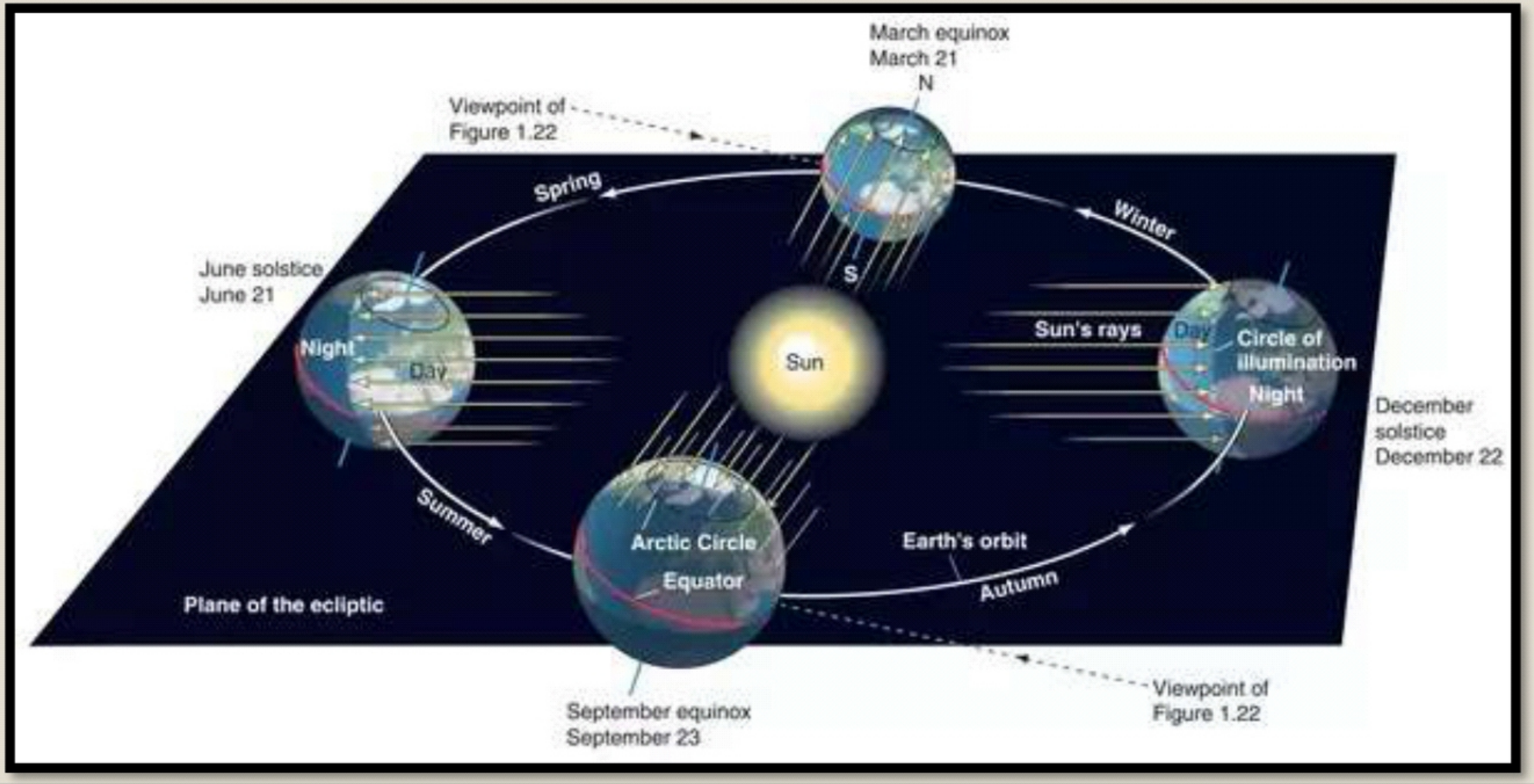
Chapter 1

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Varying Length of Day & Night

- Axis of earth is inclined to **plane of ecliptic** (plane in which earth orbits around the sun) at an angle of 66 ½ giving rise to different season & varying length of day and night. If axis were perpendicular to this plane, all parts of globe would have equal days & night at all times of years.
- In northern hemisphere, in winter (Dec), hours of darkness steadily increases as we go northwards. At Arctic Circle (66 ½ N), sun never rises & there is darkness for whole day in mid winter on 22 Dec.Beyond Arctic Circle, no. of days with complete darkness increases, until we reach North Pole (90N), when half the year will have darkness.Condition reversed in summer (June): daylight increases as we go polewards. Sun never sets at mid-summer at Arctic Circle.
- At mid-summer (21 June) & there is complete 24-hour period of continuous daylight. In summer the region north of Arctic Circle (called Land of Midnight Sun). At North Pole, there will be 6 continuous months of daylight.

- In southern hemisphere, same process takes place, except that the conditions are reversed. When it is summer in N.Hemisphere, southern continents experiences winter. Mid-summer at North Pole will be mid-winter at South Pole.



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The Altitude of Midday Sun

- In the course of year, earth's revolution round the sun with axis inclined at 66 ½ degree to plane of ecliptic changes the apparent altitude of midday sun.
- Sun is vertically overhead at the equator on two days each year. (21 March & 21 September –though the date changes because a year is not exactly 365 days – 2 days called Equinoxes meaning 'equal nights' because on these two days all parts of world have equal days & nights.
- After the March equinox the sun appears to move north & is vertically overhead at the Tropic of Cancer (23 ½ N) on about 21 June. This is known as **June or summer solstice**, when northern hemisphere will have its longest day & shortest night.
- The Tropics thus mark the limits of overhead sun, for beyond these, sun is never overhead at any time of the year. Such regions are marked by distinct seasonal changes (spring/summer/autumn/winter).

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- Beyond the Arctic (66 ½ N) and Antarctic (66 ½ S) where darkness lasts for 6 months & daylight is continuous for remaining half of year, it is always cold. For even during the short summer. Sun is never high in sky. Within the tropics, midday sun varies very little from vertical position at noon daily, four seasons are almost indistinguishable. Days & nights are almost equal all the year round.

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Seasonal Changes & Effects on Temperature

- Summer is usually associated with much heat & brightness and winter with cold & darkness. In summer, sun is higher in sky than in winter. When it is overhead, its rays fall almost vertically on earth, concentrating its heat on small area, temperature therefore rises & summers are always warm.
- In winter, the oblique rays of sun, come through the atmosphere less directly and have much of their heat absorbed by atmospheric impurities and water vapour.
- Sun's rays fall faintly and spread over a great area. –hence little hear & low temp. Days are longer than nights in summer & more heat is received over the longer daylight duration.
- Nights are shorter & less heat is lost. There is a net gain in total heat received & temp. rises in summer. Shorter days & longer nights in winter account for reverse effects.

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Dawn & Twilight

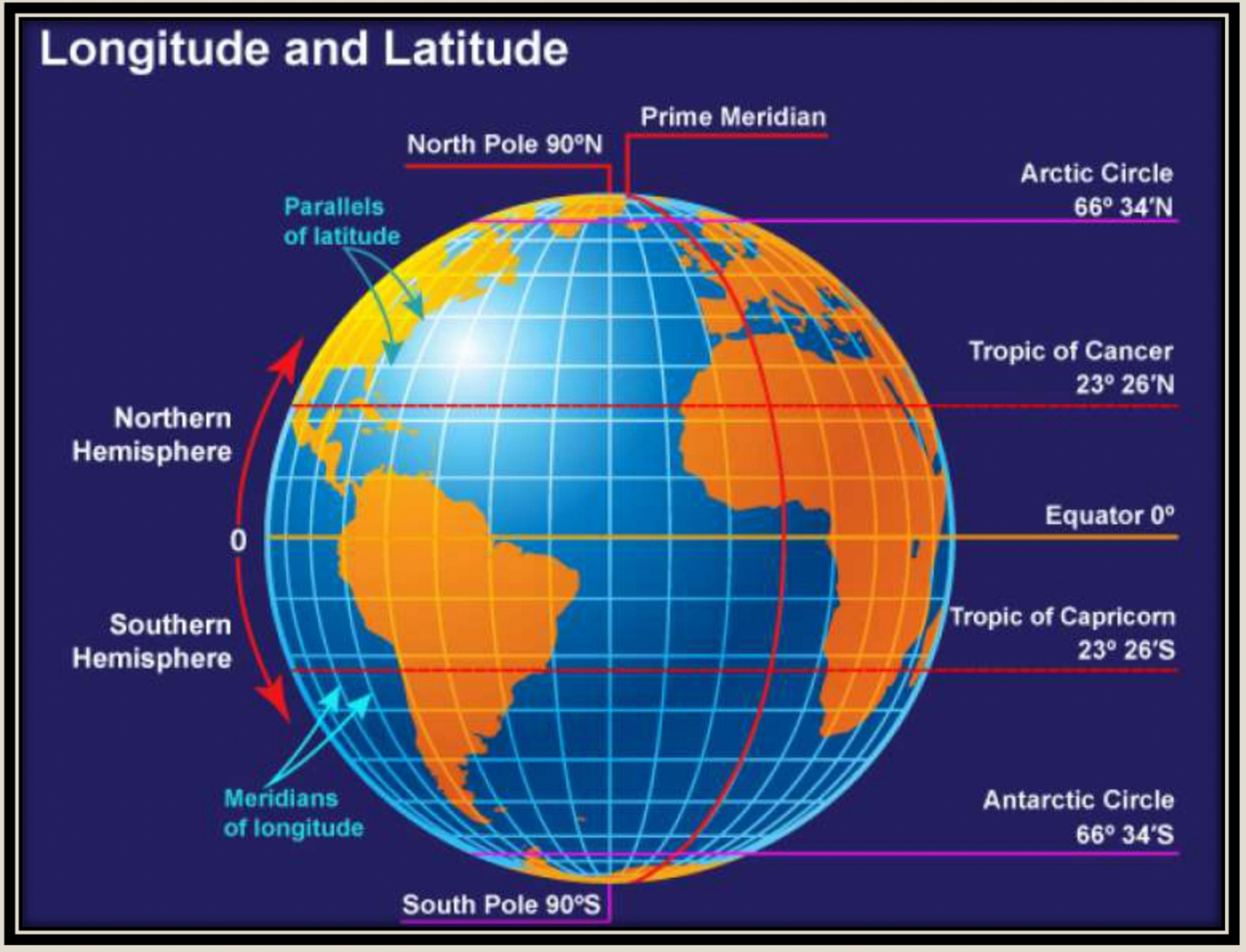
- Brief period b/w sunrise & full daylight is called **dawn**& that b/w sunset & complete darkness is termed **twilight**. (caused by the fact that during period of dawn & twilight earth receives diffused or refracted light from sun whilst it is still below horizon.
- Since sun rises & sets in vertical path at equator the period during which refracted light is received is short.
- In temperate latitudes, sun rises/sets in oblique path & period of refracted light is longer (much longer at poles, so that winter darkness is really only twilight most of the time)

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Mathematical Location of Places on the Globe

- **I**maginary lines have been drawn on globe.
- **Lines of Latitudes:** set of running east to west, parallel to equator.
- **Lines of Longitudes:** runs north & south passing through poles
- Intersection of latitude & longitude pin-points any place on earth's surface.

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Longitude and Latitude
Prime Meridian
North Pole 90°N
Arctic Circle
66° 34′N
Parallels
of latitude
Tropic of Cancer
23° 26′N
Northern
Hemisphere
0
Equator 0°
Southern
Hemisphere
Tropic of Capricorn
23° 26′S
Meridians
of longitude
Antarctic Circle
66° 34′S
South Pole 90°S

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- **Latitude:**is angular distance of a point on earth's surface, measured in degree from earth's centre. It is parallel to a line, the equator (lying midway b/w poles)—hence called parallels of latitude & on globe are actually circles, becoming smaller polewards.
- Equator represents 0 degree & N & S poles are 90N & 90S. B/w these points, lines of latitude are drawn at intervals of 1 degree. Each degree sub-divided into 60 minutes & each minutes into 60 seconds –for better understanding on map.
- Imp. lines of latitude are: Equator, Tropic of Cancer (23 ½ N), Tropic of Capricorn (23 ½ S), Arctic Circle (66 ½ N), Antarctic Circle (66 ½ S). As earth is slightly flattened at poles, linear distance of a degree of latitude at pole is little longer than that of equator.

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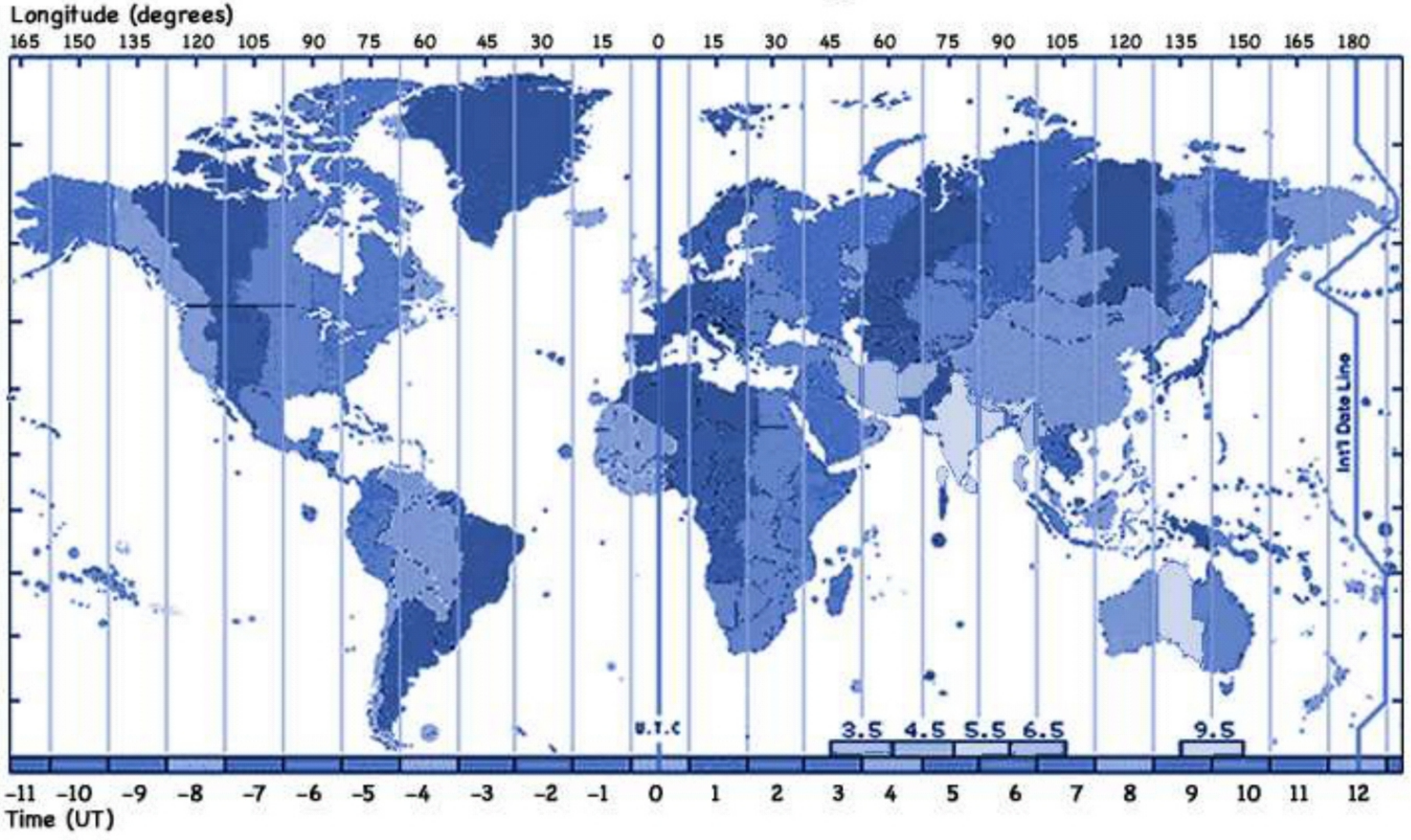
- **Longitude:** Angular distance measured in degrees along the equator east or west of Prime (first) Meridian. Shown in globe as series of semi-circles, running from pole to pole passing through the equator. Such lines are called **meridians**.
- Unlike equator which is centrally placed b/w the poles, any meridian could have been taken to begin the numbering of longitude. It was decided in 1884, by international agreement to choose zero meridian the one which passes through the Royal Astronomical Observatory at Greenwich near London . This is **Prime Meridian**(0 degree) from which all other meridians radiate eastwards & westwards upto 180 degree.
- Each of these longitudes is 25000 /360 = 69.1 miles (As earth is spherical, Circumference: 250000 miles. As the parallels of latitude become shorter polewards, so meridian of longitude, which converge at poles narrower space.

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- Degree of longitude hence decreases in length. (Longest at equator- 69.172 miles & o miles at equator). Large difference in length of degrees of longitude outside the tropics –hence not used for calculating distances unlike latitude. But they determine local time in relation to GMT (called **World Time**)
- **Longitude & Local Time:**earth makes 360 degree revolution in 1 day, it passes through 15 degree in 1 hour or 1 degree in 4 minutes. Earth rotates from W to E, hence local time advances by 1 hour after every 15 degree we go eastwards. & conversely retarded by 1 hour if we go westwards.
- Hence places east of Greenwhich see sun earlier & gain time (in west, see later and lose time. If we know GMT, to find local time, we add/subtract the difference of hours from given longitude. Out of many ways, simplest way to determine longitude of a place is to compare local time with GMT by listening to BBC.

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Time and Longitude



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Standard Time & Time Zones

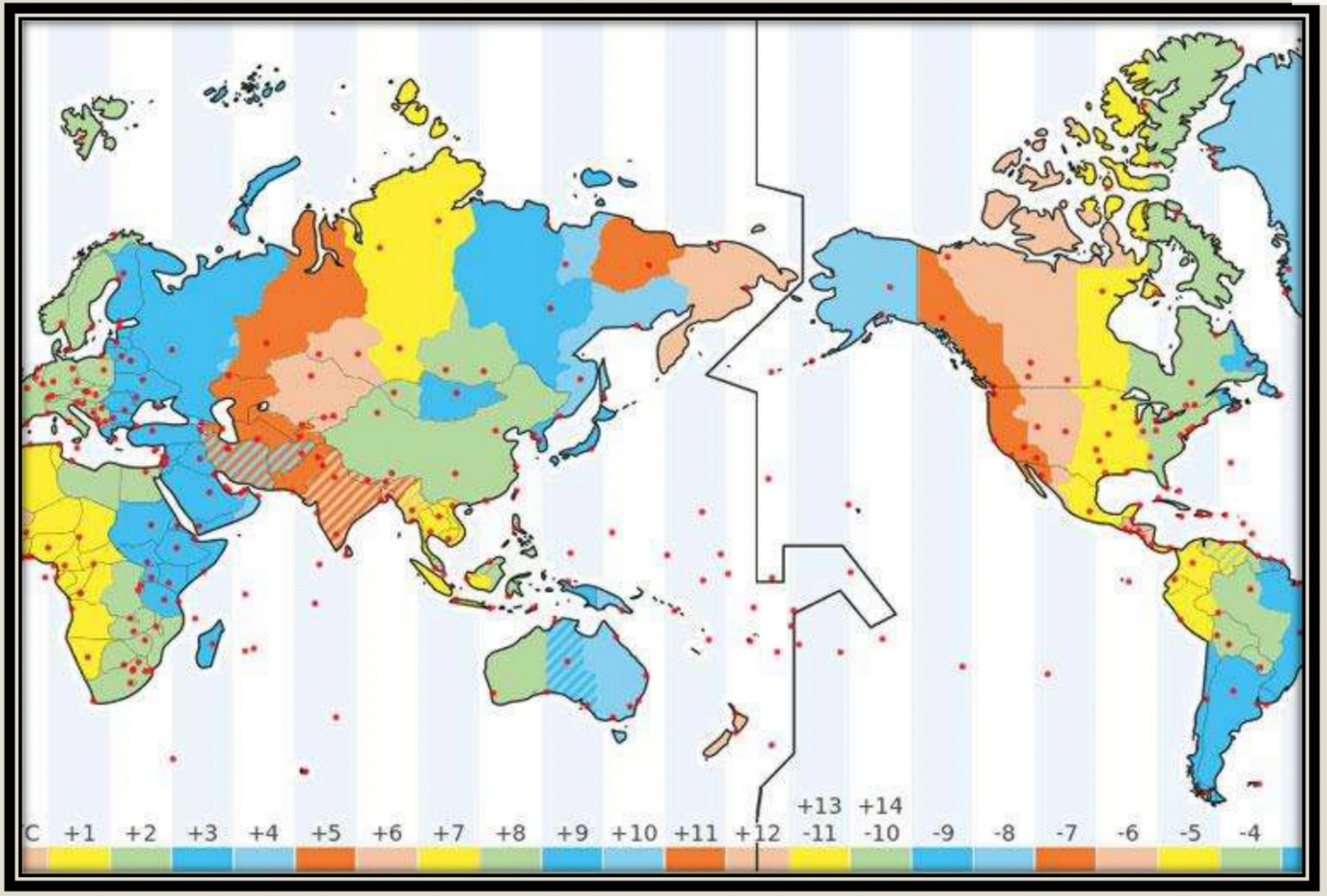
- If each town were to keep the time of its own meridian → much difference in local time b/w one town & other (will drive people mad in larger countries (Canada/USA/India)
- To avoid these difficulties, standard time is observed by all countries. Most adopt from central meridian of their countries . (Indian Gov. accepted meridian of 82.5 east, which is 5 hr 30min ahead of Greenwich Mean Time
- Whole world divided into 24 Standard Time Zones., each differing by 15 degree in longitude by next. Most countries adhere to this division→ still deviation is there from standard time zones due to their peculiar shapes/locations. Larger countries (USA/Canada/USSR) have great east-west stretch to adopt several time zones for practical purpose.
- USSR (largest country) extends through almost 165 degree of longitude is divided into 11 time zones. Canada/USA have 5 time zones (Atlantic/Eastern/Central/ Mountain/Pacific time zones). Difference between local time of Atlantic & Pacific coasts is 5 hours.

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International Date Line

- There is total difference of 24 hours or a whole day b/w two sides of 180 degree meridian. This is International Date Line where date changes by exactly one day when it is crossed.
- A traveler crossing date line from east to west loses a day (because loss in time he has made) and while crossing the dateline from west to east, gains a day (because of the gain in time he encountered).
- International Date line in mid-Pacific curves from normal 180 degree meridian at Bering Strait, Fiji, Tonga, other islands to prevent confusion of day/date in some of island groups that are cut through by meridian. Some of them keep Asiatic or NZ standard time, other follows American date/time.

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