PILGRIM SAILING

BASIC WEATHER FOR SAILORS

GLOBAL SCALE (PLANTETARY)

Size: Global
Time: Days to weeks

TOPICS:

- Atmosphere
- Convection and air circulation
- Coriolis effect and its impact
- Seasons

MACRO SCALE (SYNOPTIC)

Size: 100s to 1000's km
Time: Days

TOPICS:

- Synoptic charts
- Pressure gradients
- Fronts
- Clouds

MESO SCALE (REGIONAL)

Size: km's
Time: Minutes to hours

TOPICS:

- Coastal weather (winds/squalls/fog)
- Ocean currents

MICRO SCALE (LOCAL)

Size: metres
Time: seconds to minutes

TOPICS:

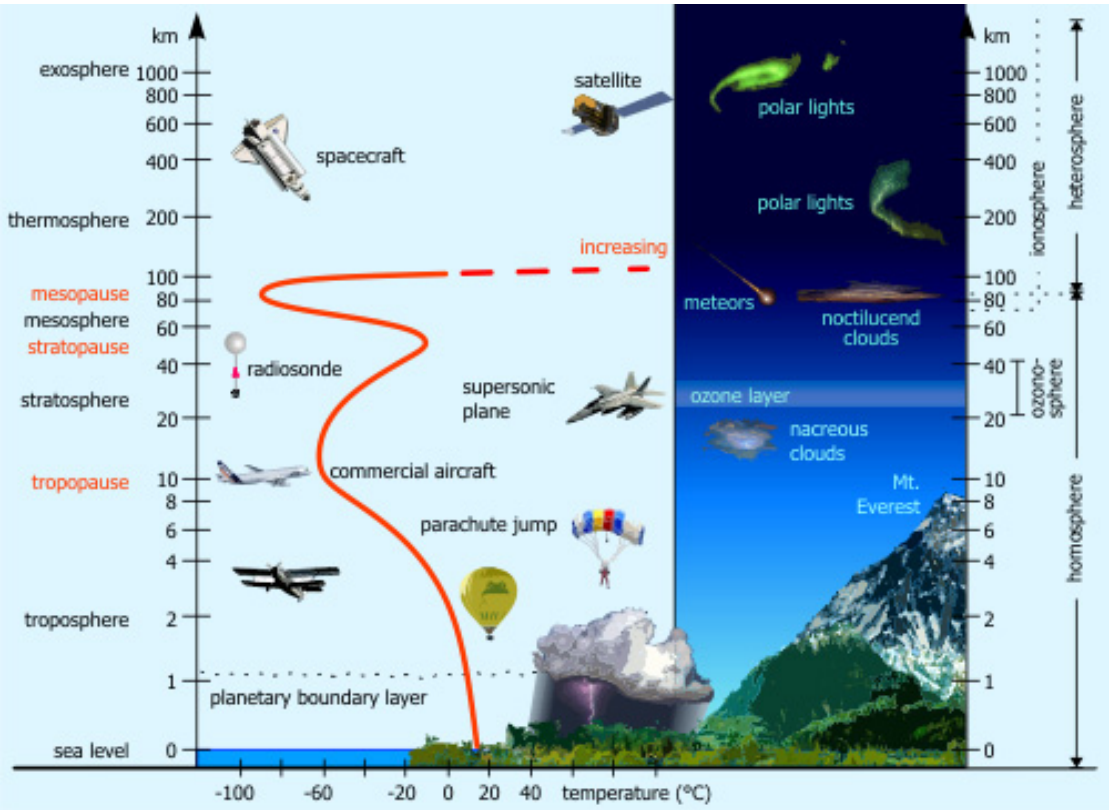
- Wind
- Squalls & gusts

GLOBAL SCALE

- Atmosphere comprises of air mixed with dust/soot particles and water in some state (vapour, snow or hail)
- The gases in the atmosphere have the following properties:
    - Temperature (ISA at sea level is 15 C)
    - Pressure (ISA at sea level is 1013.5
    - Density
    - Humidity

  (ISA is the International Standard Atmosphere)

- All weather forms in the tropopause because temperature, density & pressure decrease with altitude reducing the impact of the variation in each property.



- The altitude of the tropopause varies with latitude. It is approx. 8-9km high above the poles but 15-18km high above the equator.
- The temp at the tropopause is approx. 57 C

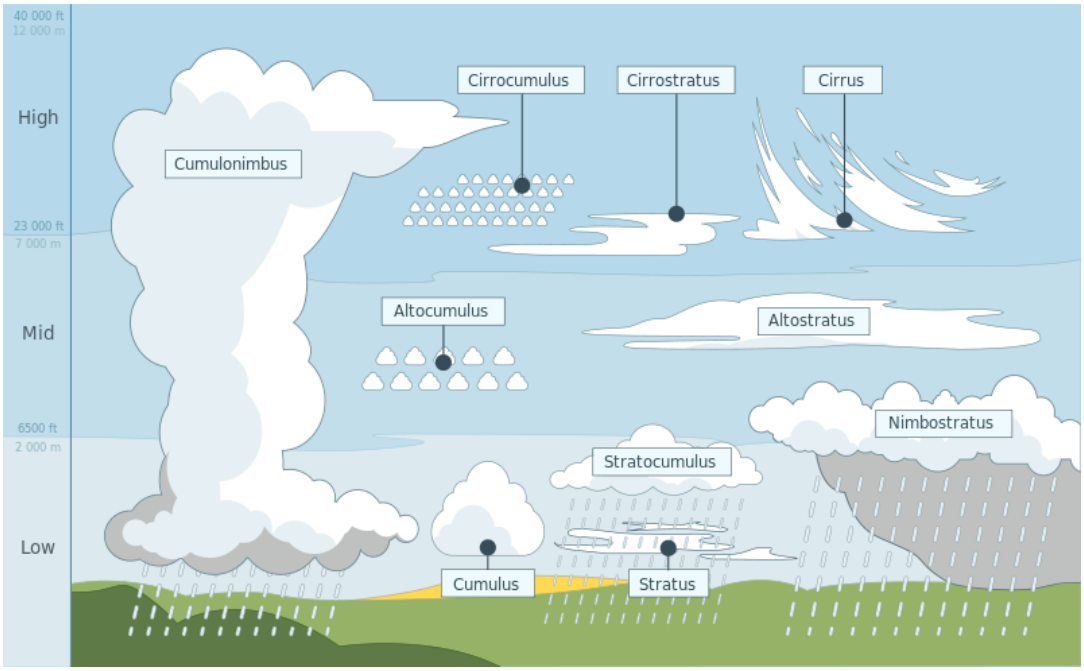
WHAT CAUSES WEATHER?

Things to consider:

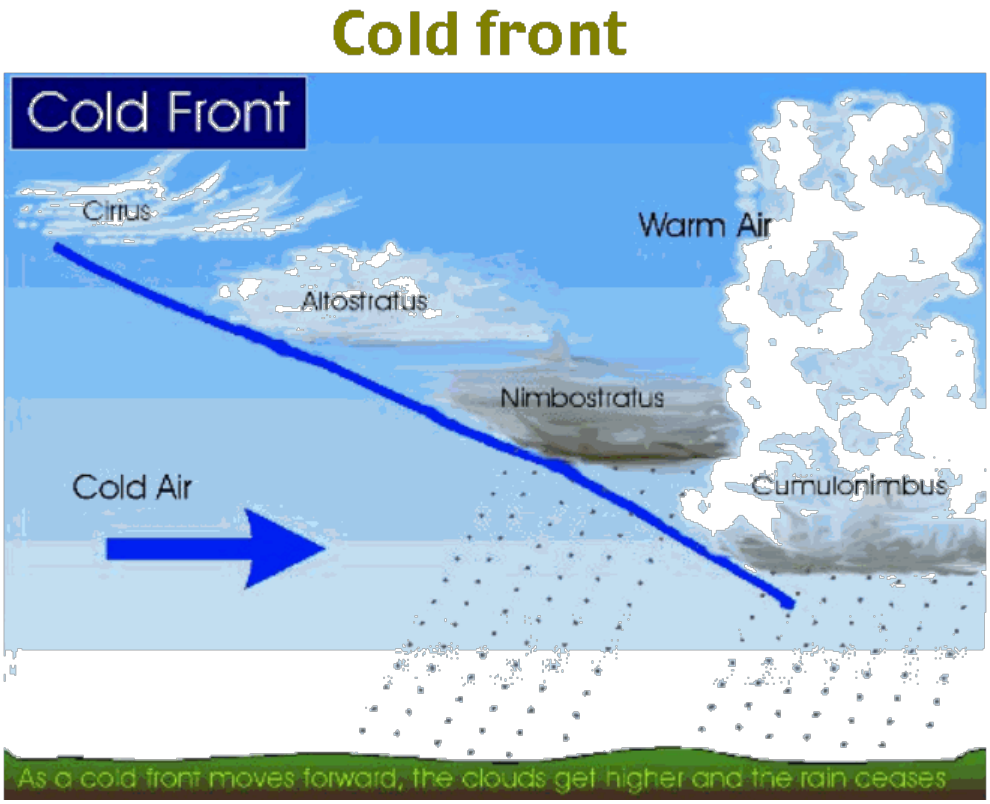
- Global effects of solar heating
- Global air circulation
- Pressure gradients
- Coriolis effect

MACRO SCALE

HOW DO CLOUDS FORM			
Clouds form by condensation of water vapour through cooling. **Cooling is caused by:**	**Summary of cause of cloud**	**Types of cloud generated**	**Types of weather generated**
CONVECTION	Heat of the land	Cumulus	No rain
Heat transfer by motion of fluid when the heated fluid is caused to move away from the source of heat carrying energy with it			
Convection above a hot surface occurs because hot air expands, becomes less dense, and rises			
SYSTEMATIC ASCENT OF MOIST AIR Air is forced up due to weather systems e.g.frontal activity, low pressure systems	Weather systems - low pressure & fronts	Associated cloud and weather may vary enormously according to the properties of the air masses, but tends to be concentrated near the front	Rain
OROGRAPHIC ascent	Mountains		Rain
Air is forced up by a barrier of mountains or hills.			
CONVERGENCE			
more air flows into an area at low levels than flows out, leading to forced rising of large air masses.		Large cloud clusters	Rain



COLD FRONT			
Weather phenomenon	**Prior to the Passing of the Front**	**While the Front is Passing**	**After the Passing of the Front**
Temperature	Warm	Cooling suddenly	Steadily cooling
Atmospheric pressure	Decreasing steadily	Lowest, then sudden increase	Increasing steadily
Winds	Northwest to northeast (southern hemisphere)	Gusty; shifting	South to west, usually southwest (southern hemisphere)
Precipitation/ conditions*	Light patchy rain can be produced by s	Prolonged rain (nimbostratus) or thund	Showers, then clearing
Clouds*	Often preceded by cirrus, cirrostratus then altostratus like a warm front (but usually with smaller amounts of these clouds). Areas of cirrocumulus and altocumulus within cirrostratus and altostratus more commonly seen than at a warm front. Larger cumulus clouds under the higher cloud types than at a warm front, where stratocumulus and cumulus humilis usually occur. Some of these cumulus clouds may produce showers ahead of the front.	Cumulonimbus and cumulus congestus producing frequent showers, with a sheet of upper altostratus, through which the sun can sometimes be seen. Less commonly nimbostratus occurs with continuous rain.	Patchy altocumulus or stratocumulus and higher cirrus clouds along with fast moving stratus fractus then eventually scattered cumulus and sometimes cumulonimbus.
Visibility*	Fair to poor in haze	Poor, but improving	Good, except in showers
Dew Point	High; steady	Sudden drop	Falling



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CLOUD & OBSERVATION INTEPRETATIONS		
OBSERVATION OR TREND	WHAT'S HAPPENING	WEATHER POSSIBILITY
Falling air pressure:	Low-pressure system moving in.	stronger winds
slow, on-going drop in air pressure	Low pressure approaching slowly	extended period of poor weather; some precipitation likely
3 hPa in 3 hours	Low approaching quickly	wind stronger in 6–12 hours, possibly gale-force
6 hPa in 3 hours	Low approaching very quickly	gale force winds within 6 hours.
9 hPa in 3 hours	centre of Low is nearby.	storms, gale force winds, precipitation, likely within 3 hours
Rising air pressure and rising temperature, wind more southerly and veering, air feels drier, haze increasing	High pressure system moving in	Light winds and dry, but hazy weather
Ci, Cs, Cc, pressure decreasing	possible approach of warm front or cold front.	Becoming more cloudy, change likely within 24 hours
then As, Ac, temperature increasing, wind veering N to NE	almost definitely a warm front approaching	becoming overcast
followed by Sc, Cu, St and Ns, temperature rising, wind backing NE, N to NW	warm front is passing	persistent moderate rain with lighter and heavier periods
Ci, Cs, Cc, pressure decreasing	possible approach of warm front or cold front	becoming more cloudy, change likely within 24 hours
then, pressure and temperature decreasing, wind speed increasing, some Sc and Cu.	almost definitely a cold front approaching.	becoming overcast
followed by, pressure and temperature decreasing, Ns, Cb, temperature falling rapidly, wind backing NW to SW and increasing	cold front is passing	heavy rain, possibly hail and/or snow, lightning and thunder
Stratus type clouds getting lower, warm, moist air mass moves over colder, dry air mass: warm front	Warm front is approaching	Weather steadily deteriorating to rain and drizzle
High clouds preceding cumulus nimbus; cold air mass moving into a warm air mass: cold front	Warm, less dense air is forced up, cools, and condensation occurs. Violent uplift produces electric charges	Lightning forms in thunderstorms precipitation: type of precipitation depends on the temperature, see above

CLOUD & OBSERVATION INTEPRETATIONS		
OBSERVATION OR TREND	WHAT'S HAPPENING	WEATHER POSSIBILITY
Falling temperatures	Cold front may be approaching (air holds less moisture)	If dew point is reached and condensation nuclei are present, if the temperature is:
		above freezing, rain forms;
		below freezing, snow forms;
		colder as the rain falls, sleet forms.
		If the:
		water droplets are swirled up and down repeatedly, hail forms;
		dew point temperature is below freezing, frost will form.
Rising temperatures	Warm front approaching (warm air holds more moisture)	May indicate fair weather (if air pressure is stable)
Dew point temperature	If the difference between the dew point and temperature is small, there is more moisture in the air	Clouds and fog are more likely to form. Precipitation is likely
Dew point temperature rising	increase in relative humidity	clouds and fog are more likely to form, precipitation is more likely
Wind speed	If winds are light, air masses will not move quickly	Weather conditions stay the same over a wide area
	If winds are strong, air masses move more quickly	Weather conditions change quickly and are not long-lasting
Wind direction	If an air mass comes from an area that is warmer and over a body of water, humidity and dew point increase	Warm air rises, cools, and condenses to form clouds. Updrafts could cause thunderstorms
Stationary front	air masses do not move	weather remains the same