# *Meteorology - Sky Surfers' lecture*

***Water vapour:*** evaporated water (not the same as mist, cloud, or tiny water droplets). The air can only hold so much water vapour, before it becomes "saturated". The higher the temperature, the more water vapour can be held.

***Iso:*** Prefix meaning "of the same". Eg. **Isobars** - lines linking areas of the same pressure (measured in bars) - close together = high winds. **Isothermal layer**: layer of atmosphere with same temp.

***Dew point*****:** the temperature at which the water vapour in the air would condense back into droplets. If dew point is the same as the actual temp, you're in a cloud. If dew point is close to actual temp, clouds are probably close above you.

***Relative humidity*****:** % saturation, eg. 100% if clouds are forming, 0% if completely dry. The relative humidity will increase as the temperature falls.

***Pressure change / height*****:** under 5000 ft, approx 1mb per 30ft

***Adiabatic process:*** heating or cooling due to change in pressure, as opposed to flow of heat or exchange of mass. Eg. diesel engines, or hot valve when pumping up bicycle tyres. Lifting a gas causes cooling as the gas expands, and the same amount of heat is held in a larger volume.

**Convection:** when heat is transferred through a fluid because lower parts are heated, expand, and then rise. The ground is heated through radiation (sunlight) which then heats the air near it, and this begins the convection in the air.

***Coriolis effect:*** When air flows towards a low pressure area, or away form a high, it doesn't move in straight line, it swirls around anti-clockwise around the low and clockwise around the high (in northern hemisphere). At high altitude (a couple of thousand feet) the air swirls along isobars. At ground level, it flows more directly into the low, or out of the high, about 30 degrees difference. (hence wind direction goes "right with height"). Remember: "time flies in the sunshine".

***Wind gradient:*** the general increase in wind strength with height. Caused by friction, typically.

***Backing and veering:*** Wind change clockwise is veering, anti-clockwise is backing. ***Remember: "turn the clocks back"***

***Buys Ballot's law:*** In northern hemisphere, with your back to the wind, low on your left, and high in your right. Remember this because prevailing wind in England is SW, it rains in north Wales (low) and it's sunny in southern France (high).

**Cloud types**

| | |
|---|---|
| Cirro | = high (6 - 11km) |
| Alto | = medium (2 - 6km) |
| Nimbo | = rainy |
| stratus | = layer |
| cumulus | = heap, formed from rising air |
| Lenticular | = like a lens, made from standing wave, high altitude. |
| Orographic | = from damp air forced up by ridge. |

***Low pressure system / depression:*** Characterised by low pressure, rising air, cloud and precipitation, frontal systems, and instability.

***High pressure system / anticyclone:*** Sunny, calm, descending air, inversions, haze, stability.

***Warm front:*** shown on charts as a line with semi-circles. Moves slowly. Shallow slope over 500 - 1000km. First sign is high cloud (cirrus), then descending and thickening cloud cover and rain. After front rain normally ceases but clouds stay. Wind veers about 60 degrees.

***Cold front:*** shown as a line with pointy triangles (remember as icicles). Moves faster. Steeper slope over 50 - 100km. Starts with possible line squalls or gust front, rain, hail then cloud base rises, cu-nimbs (if front is "active"), then cumulus. A day after cold front is probably good for thermals.

***Occluded front:*** when the cold front catches up with the warm front. Tend to share qualities of both types, but not as extreme.

***Close isobars on weather chart indicate:*** change of pressure over a small distance, meaning strong winds!

***Lapse rate:*** temperature change with altitude. Measured in degrees per 1000ft height gain, or 100m. It usually gets colder with height, if temp stays the same it's called an ***isothermal layer,*** if temp gets higher with altitude it's called an ***inversion***

***Environmental lapse rate (ELR):*** the rate of temperature change of the atmosphere. Typically 2**°** per 1000ft, but varies. Less than 0.5 means very weak thermals (stable day). As you approach 3 it gets super dangerously strong (too unstable). The perfect day might have 1.5 at lower levels, increasing to 2.5, then back down to 1 or less just beyond cloudbase. Use soaringmeteo.ch to check it out.

***Dry adiabatic lapse rate (DALR):*** The rate of cooling of a thermal as it rises, caused by reducing pressure, assuming the dew point has not been reached and so no cloud is forming. **3° per 1000ft**

***Saturated adiabatic lapse rate (SALR):*** rate of cooling when cloud is forming. Lower than DALR, because of the extra energy previously pumped in to make the water evaporate. About **1.5° per 1000ft**

***Tephigram:*** A graph showing temp at different heights, and dew point. Often also shows wind direction and strength. Anywhere the two lines meet gives stratus cloud. Where the temp line reads the same as ground level dew point you have cloudbase. By plotting as thermal releasing and cooling adiabatically, you can see what the day will be like (cloudbase height and depth, risk of thunderstorms, blue day, strong or weak thermals). Big difference between thermal temp and environmental temp means strong thermals.

***Foehn:*** Humid air blown over a mountain ridge will cool and form clouds. Hence some of its cooling will be at SALR. Assuming it rains or snows on top of the mountain, then the air that descends the other side will be drier, and as it re-pressurises it will warm up more at the DALR. For this reason, it will come down hotter.

***CAVOK:*** Ceiling and visibility OK. visibility is at least 10 kilometres, there are no clouds below 5000 feet or minimum sector altitude (whichever is higher), and there is no current or forecast significant weather such as precipitation.

***Sea breeze front:*** Thermals tend to form more easily over the land than the sea. So you end up with more air rising over the land, drawing in air off the sea at lower altitudes, perhaps with air cycling back over the sea at high altitude. The cooler sea air pushes under the warmer land air, and the point of contact creates "curtain clouds" as the warmer land air is cooled. Stay on the land side of the SBF for the best lift.

***Valley wind:*** mountains tend to heat up more in the sun (maybe because they're dark coloured, with some parts facing into the sun). This releases thermals (**anabatic**, on sunny slopes). And air is drawn in from the plains to replace the rising thermals. The new air flows up the valleys like a reverse river. Valley winds are strongest about 2pm. At the end of the day you might experience **katabatic** (down slope) winds as the slopes cool. **Valley suck:** during the hotter part of the day the anabatic winds going up the slopes are compensated by sink in the middle of the valley. At the end of the day you may experience the opposite **restitution, valley lift, or magic left,** as katabatic flows converge at the valley bottom.