

Introductory met for mariners

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Introductory met for mariners

Overview

Air Masses

Pressure System and winds

Coding

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Cloud types

Weather Maps Review

MIA Meteorological Office webpage – interpretation

Contacting the Met Forecaster

Air mass

An **air mass** is a **large body of air** whose **temperature** and **moisture content** are fairly **similar in any horizontal direction**.

Newly formed air masses **reflect their breeding ground**. Old air masses **differ** from the properties at their place of origin.

Air masses will eventually **become modified by the effect** of the underlying surface. Some move at **high speeds**, others **stationary**.

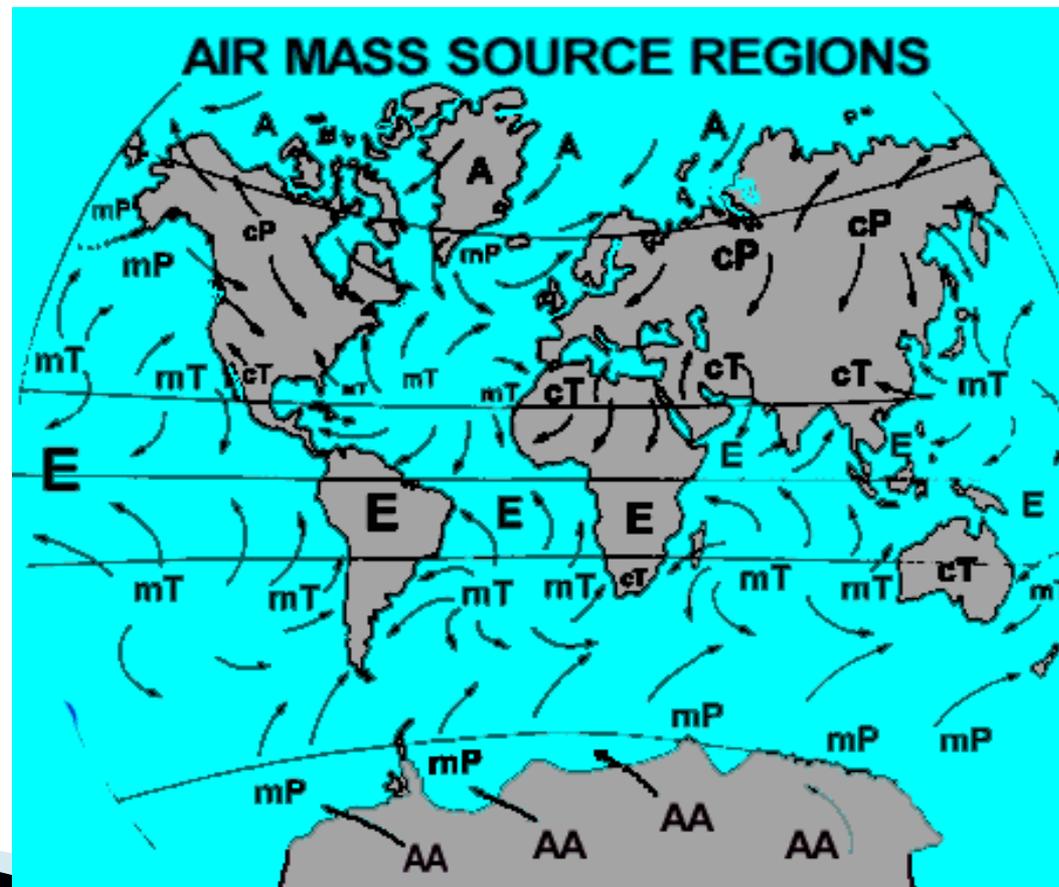
Air Masses are separated by **transition zones known as weather fronts** -
- **warm, cold, stationary** and **occluded fronts**.

These fronts lead to **subtle transitions** (e.g just a shift in wind direction) and are hardly noticed as they pass.

Others are **vigorous zones** where conflicts between warm and cold air masses produce very heavy weather -- **severe thunderstorms**, high **winds**, rapidly **changing temperatures** and **precipitation** of all varieties.

The ideal **source region** is one **with light winds**, so that the air mass remains in **place long enough** to **acquire the temperature and moisture properties** of the underlying surface throughout the air mass.

There are several such regions of extensive, **semi-permanent high pressure** around the globe



Wet air masses form over the oceans and equator,

Dry air masses, form over the **continents** and **poles** (their temperatures are so low that even at saturation, the absolute humidity is very low)

Air Mass Type	Temperature Characteristic	Moisture Characteristic
Arctic or Antarctic (A or AA)	Extremely cold , formed over poles.	Very dry due to extreme cold.
Polar Continental (cP)	Very cold , having developed over sub-polar regions.	Very dry , due to the cold and having developed over land.
Polar Maritime (mP)	Very cool because of the high latitude but not cold, due to moderating influence of the sea and the warm ocean currents at these latitudes.	Moderately moist because of the cool temperature, but not as dry as polar continental air because of evaporation from the water surface.
Tropical Continental (cT)	Very warm because of the lower sub-tropical latitude of formation.	Dry because it formed over land
Tropical Maritime (mT)	Very warm because of the sub-tropical latitudes at which it forms.	Very humid because of the warm tropical waters below.

Pressure Systems

What is air pressure?

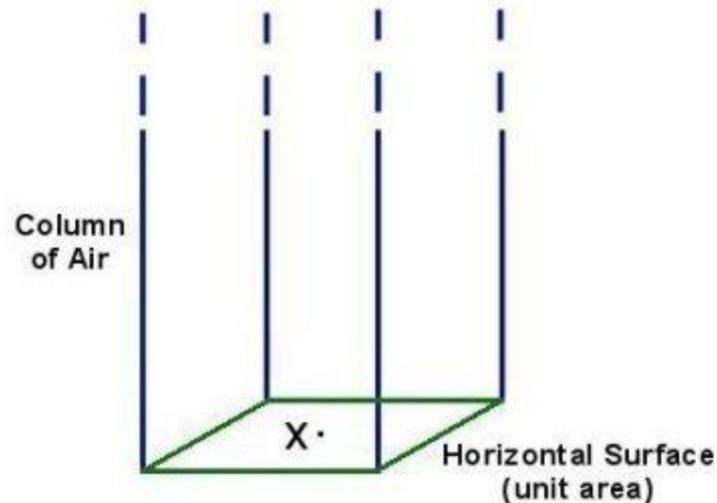
How to measure air pressure?

Use in general forecasting the weather

What is air pressure? It is the **weight of the column of air above a horizontal surface of unit area** (e.g. one m²). The column of air extends to the top of the atmosphere. The pressure is lower because the column of air is reduced.

What is the unit of pressure?

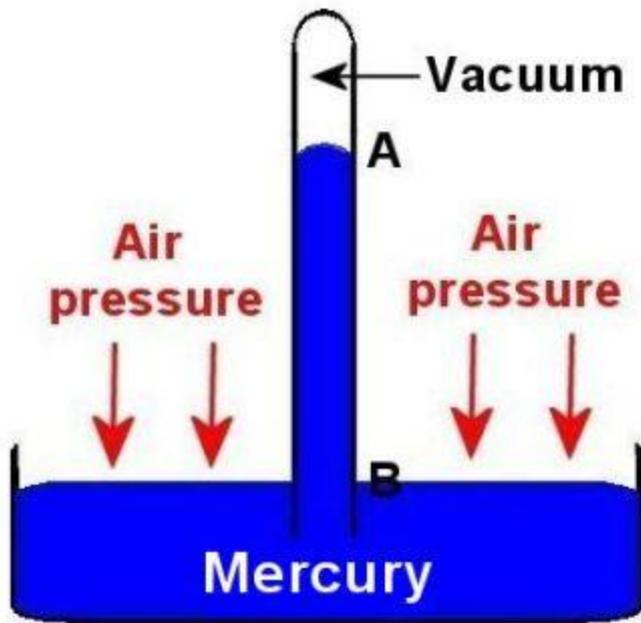
The meteorological community uses hecto-Pascal (hPa) as the unit of pressure. It is the same as 1 millibar, a unit of pressure no longer used nowadays.



The pressure at point X is the weight of the column of air above the horizontal surface of unit area.

How to measure air pressure? Mercury barometer and aneroid barometer are commonly used to measure air pressure.

The height of the mercury column AB will vary according to the air pressure. The higher the air pressure, the greater will be the height of the mercury column. By measuring the height of the column AB, the air pressure at the base of the column can be determined.



The air pressure is determined by the height of mercury column.

An aneroid barometer consists of a **disk-shaped capsule** made of a thin metal membrane. The capsule is **partially vacuum**. Changes in atmospheric pressure **change the size of the capsule**, which in turn moves the pointer. In this way, pressure changes are **recorded continuously** as the pointer moves over a rotating drum.



How can you use the barometer

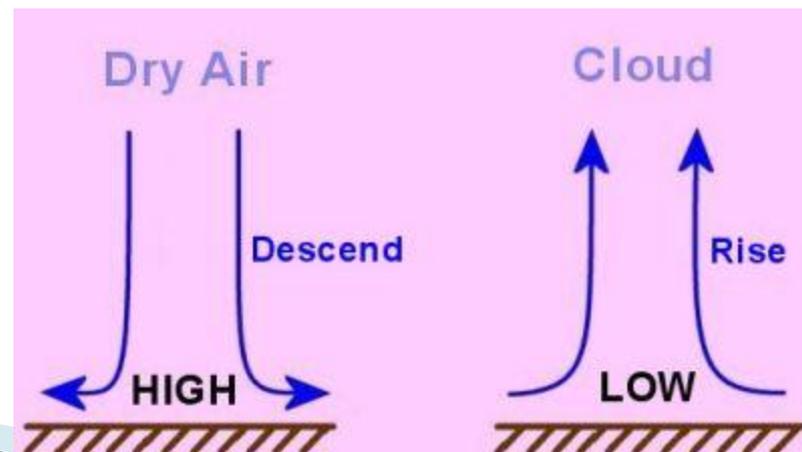
as a weather watching
aid?

Why is bad weather usually associated with low pressure and good weather with high pressure?

In an area of low pressure, **air from neighbouring areas** (which are of higher pressure) **moves in**. It has nowhere to go but up.

Upward movement of air causes **condensation of water vapour**, leading to the development of **cloud and rain**. Hence, a low pressure area usually **associated with bad weather**.

In contrast, in an area of high pressure, the air at low levels spreads outward and air descends from aloft. **Downward motion warms up the air and is favourable for evaporation**. Hence, a high pressure area usually has fine and dry weather.



Steps

Adjust your barometer to SLP,

Mark the current pressure, sail and wait

Write down the hourly pressure.

If $P <$ than say 1000-1004 mb, current weather is likely influenced by a **low-pressure system**.

If $>$ than say 1020 mb, **high pressure** is the likely local weather influence.

For pressures above or below these limits, the **more extreme the influence of storminess or clear skies**.

Barometric Pressure Chart



How has

the pressure changed?

Has it **risen**, **fallen**, or **remained unchanged**? **By how much** has it changed?

This change with time is what is referred to as the ***pressure tendency***.

If **no change**, the weather you are seeing is not changing much

This is not a hard rule because a **number of weather changes can occur** with very small or **no observable pressure changes** — eg. an isolated shower,

The **wind speed depends on pressure gradient** (The greater the gradient, the stronger the wind).

Definition of Pressure Tendency Terms

Term

Pressure Tendency Over 3 Hours

Steady

Less than 0.1 mb

Rising or falling slowly

0.1 to 1.5 mb

Rising or falling

1.6 to 3.5 mb

Rising or falling quickly

3.6 to 6.0 mb

Rising or falling very rapidly

More than 6.0 mb

GENERAL RULES FOR USING THE BAROMETER TO FORECAST LOCAL WEATHER

▼ **Barometric pressure** : coming stormy weather, rain, wind

▲ **Barometric pressure**: fair, dry, colder weather.

Slow, regular and moderate fall : low pressure area is passing at a distance.
Any marked change in weather unlikely.

Sudden decrease, even if small: nearby disturbance; normally bringing wind, and short showers.

Large pressure drop: coming storm in 5 to 6 hours.

Large, slow and sustained decrease: a long period of poor weather.

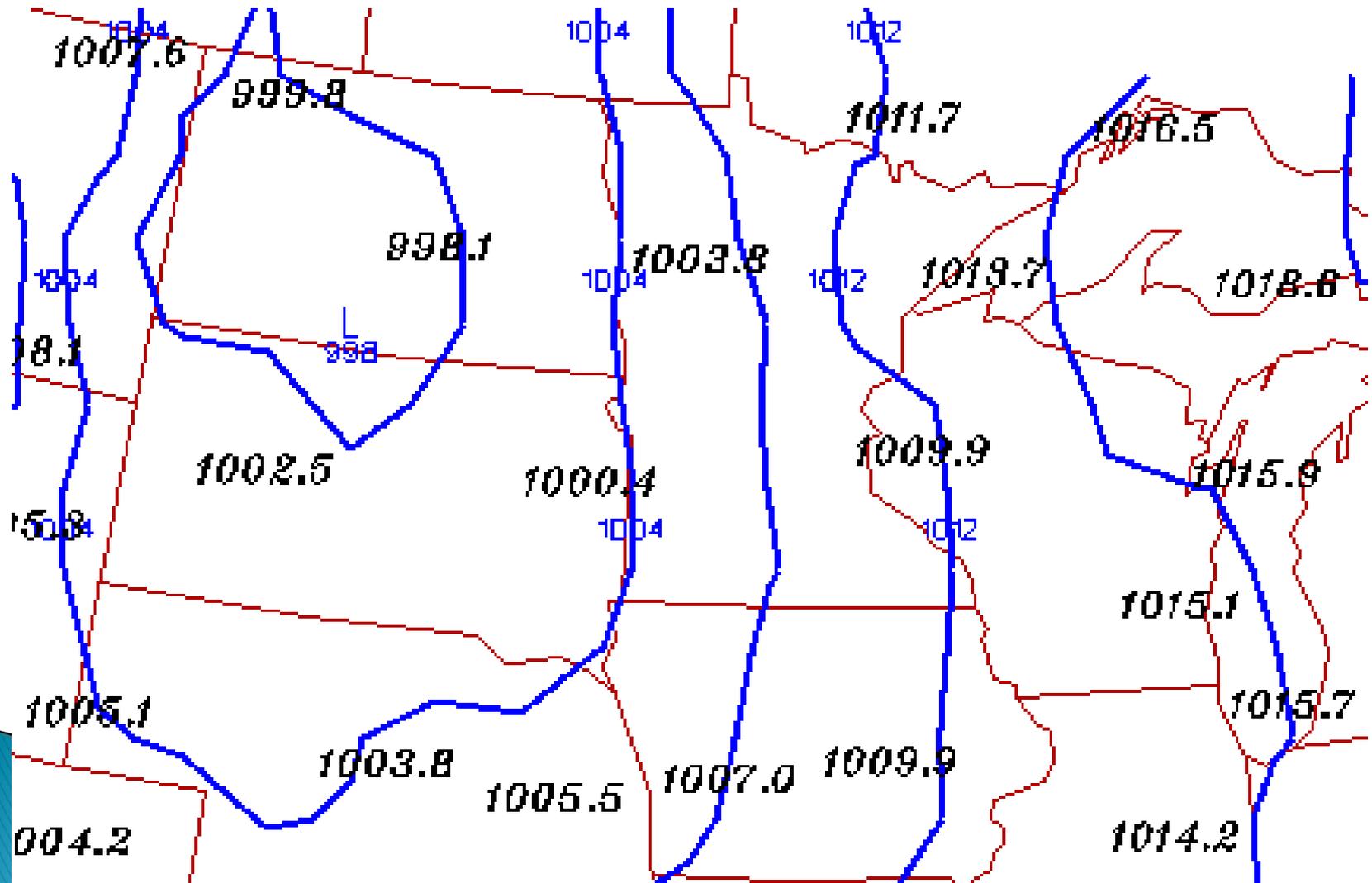
Sudden rise of pressure: (if P => average and fair weather): approach of a low pressure cell, and the barometer will soon start to come down.

Rapid rise when the pressure is low: announces a period of fair weather.

If pressure rise is large and prolonged: many days of good weather ahead.

Isobars : same pressure lines based on

plotted fixed station pressure observations



Common Pressure Patterns

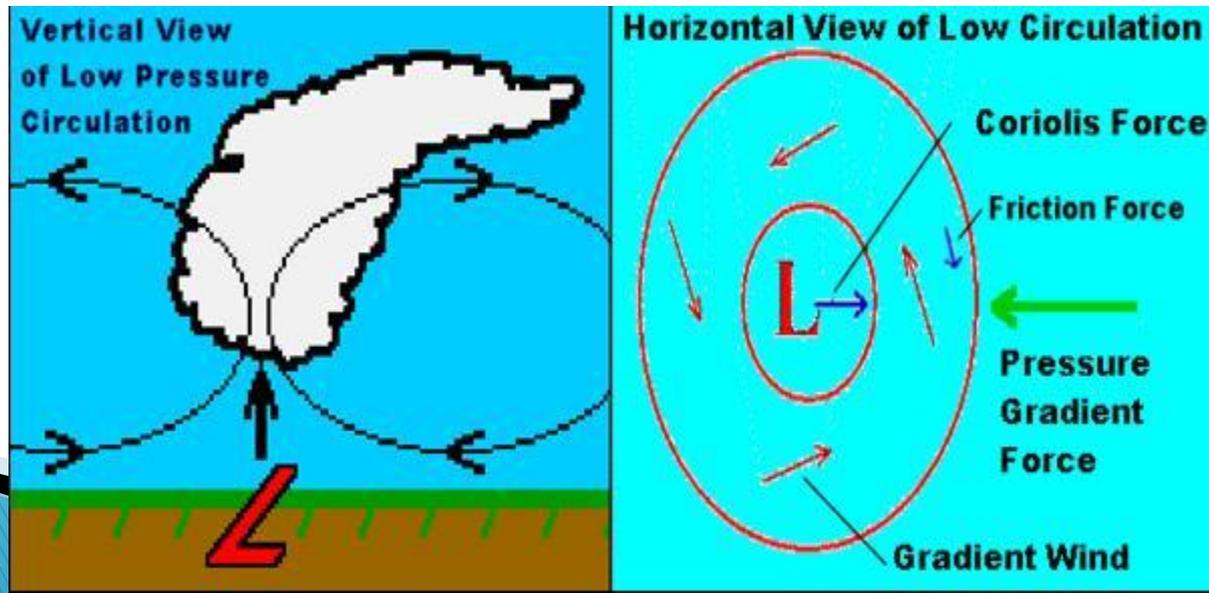
Depression / Cyclone / Area of low pressure (StL, PL, ThL)

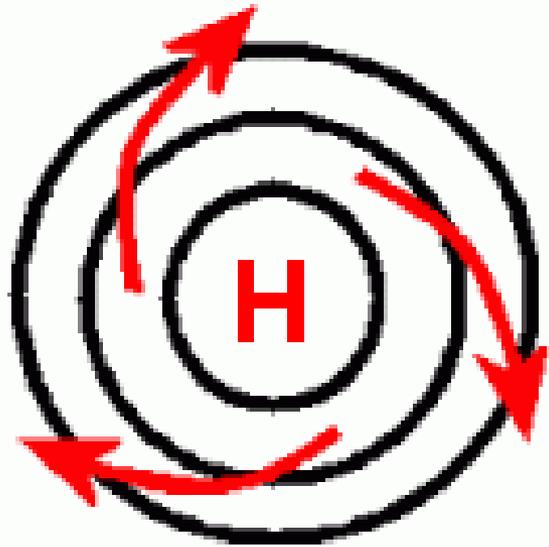
When the **air pressure in a region is lower than its surrounding**

In the northern hemisphere, the air around a depression moves in a **counterclockwise direction**.

Near the Earth's surface, however, friction tends to cause the air to move **slightly inward across the isobars**.

Hence, a low pressure area is usually associated with **unstable weather** (e.g. clouds, rain or showers).





Anticyclone / Area of high pressure

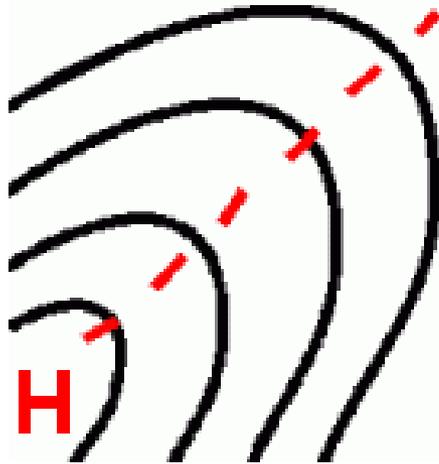
When the air pressure in a region is **higher than its surrounding**,

In the northern hemisphere, the air around an anticyclone moves in a **clockwise direction**.

Near the **Earth's surface**, however, **friction tends to cause the air to move slightly outward** across the isobars.

In an area of high pressure the air is generally **stable and is usually associated with fine weather**.

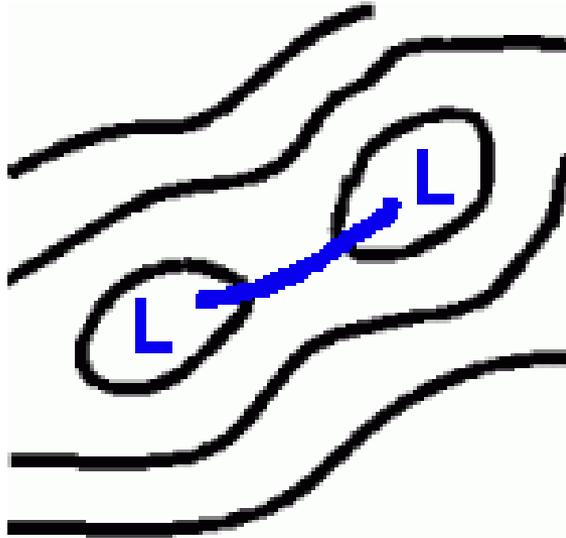
Ridge of high pressure



A ridge of high pressure is an **elongated area of high pressure**.

On the weather chart, it sometimes has associated with it a ridge line.

The pressure there is **higher than that at neighbouring points** on either side of the ridge line.



Trough of low pressure

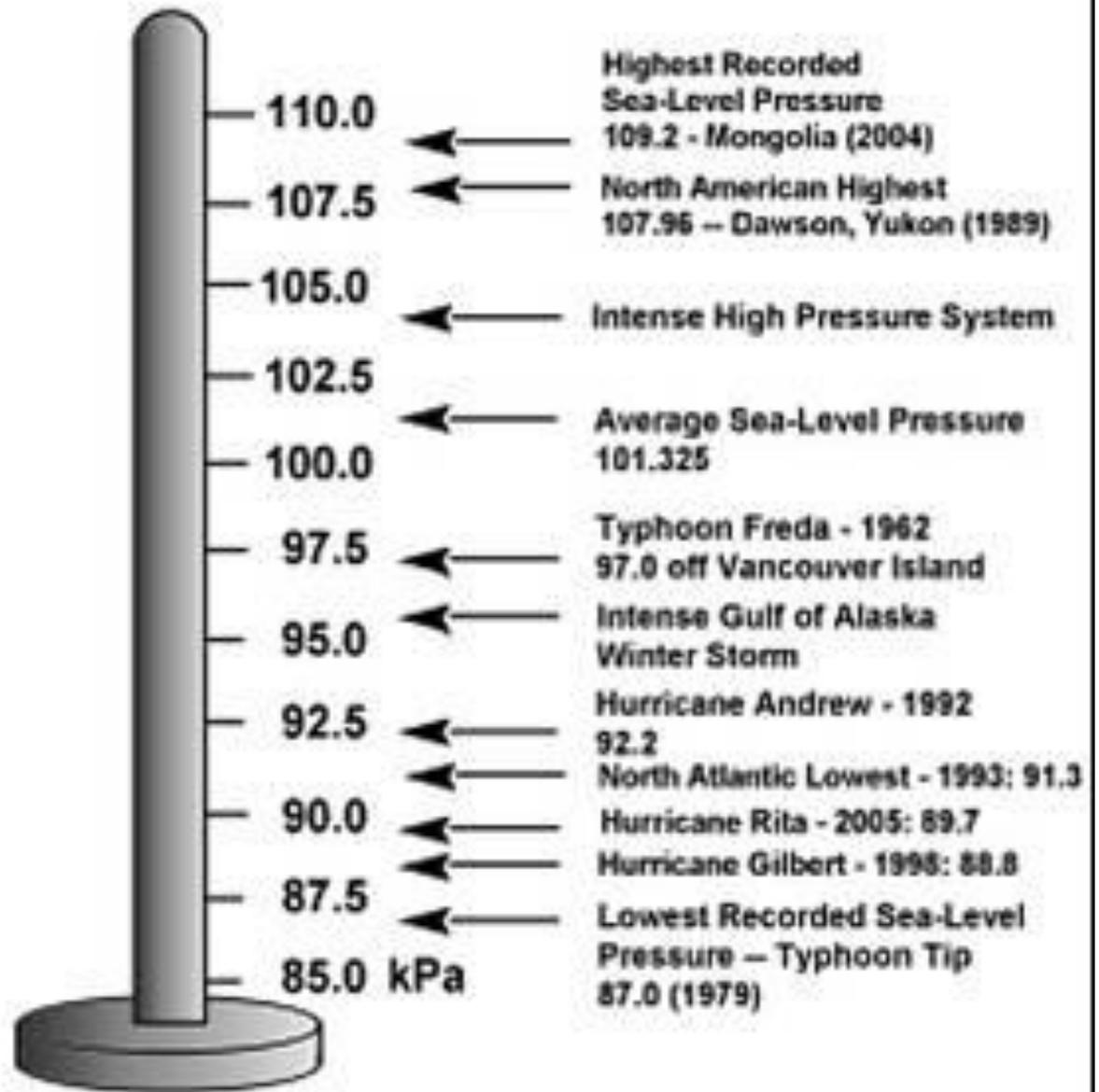
A trough of low pressure is an **extended area of low pressure**.

On the weather chart, it has associated with it a **trough line**.

The pressure there is **lower than that at neighbouring points** on either side of the trough line.

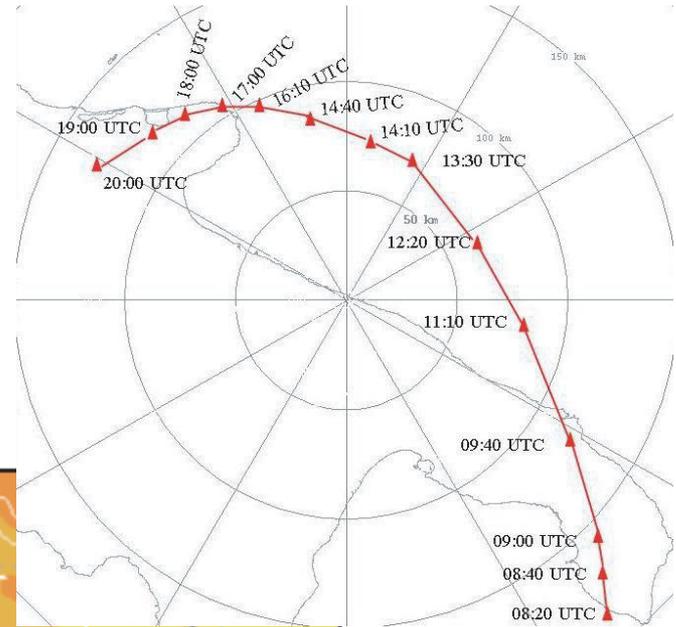
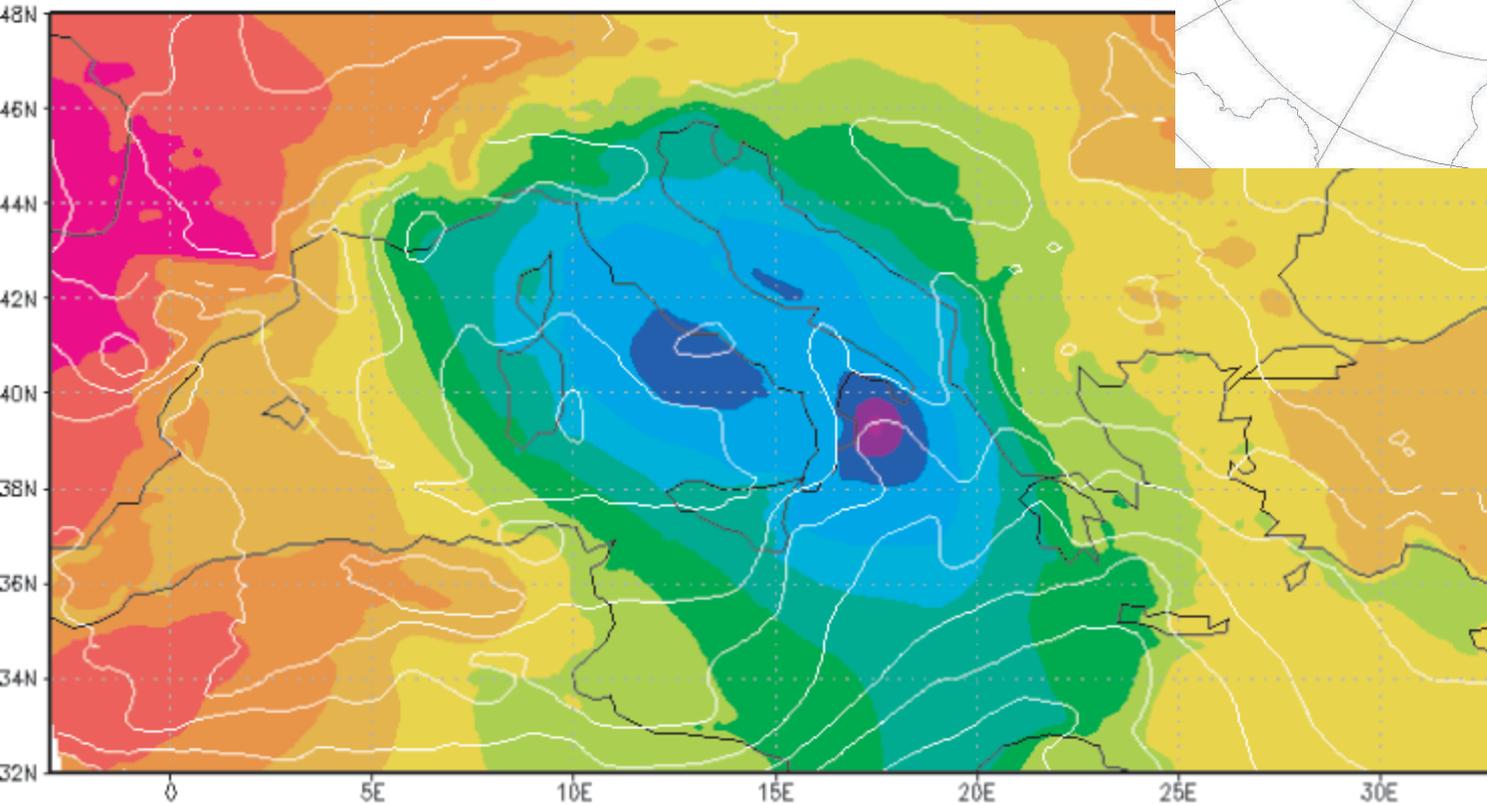
Reference point

(kPa *10 = hPa)



Significant lows in the Mediterranean

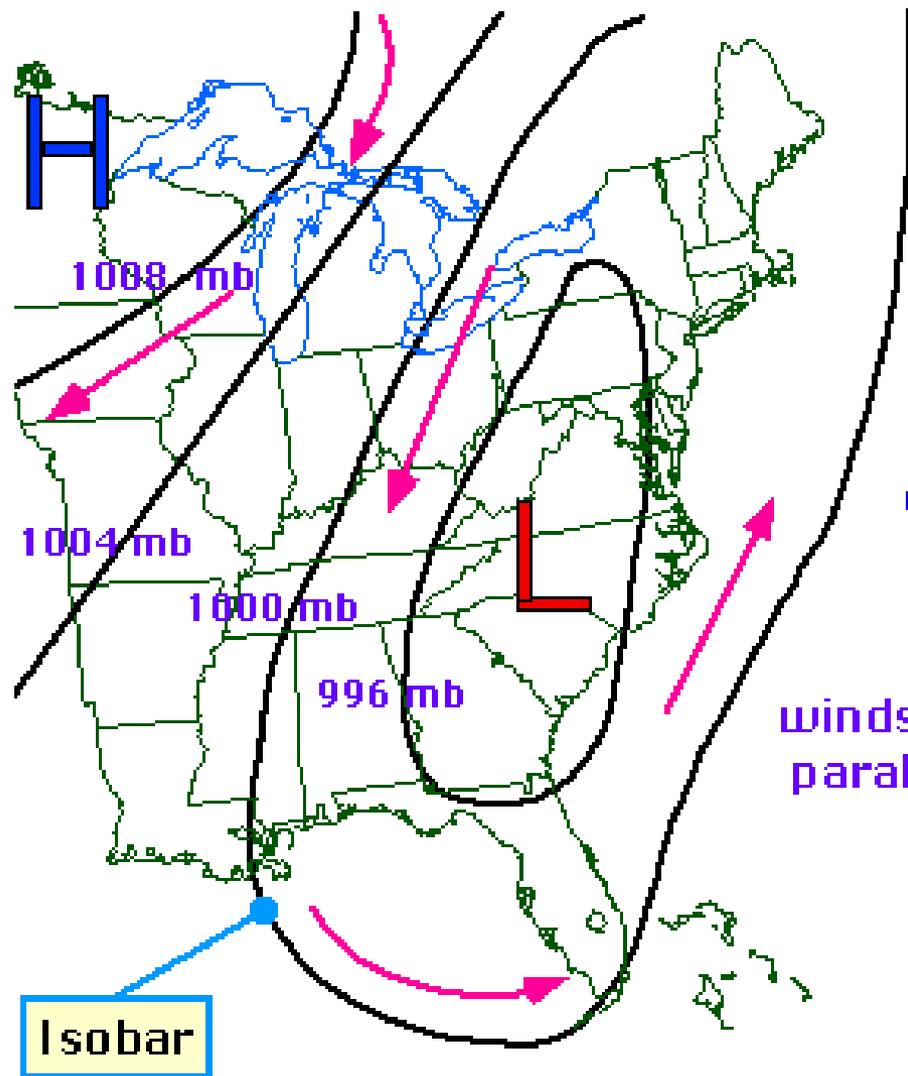
ECMWF analysis at 0600 UTC, 26 September 2006



The **1995 Mediterranean Sea Hurricane** was a possible tropical cyclone that formed on January 14 and moved west-southwest before making landfall in northern Libya on January 17 and dissipating the next day.



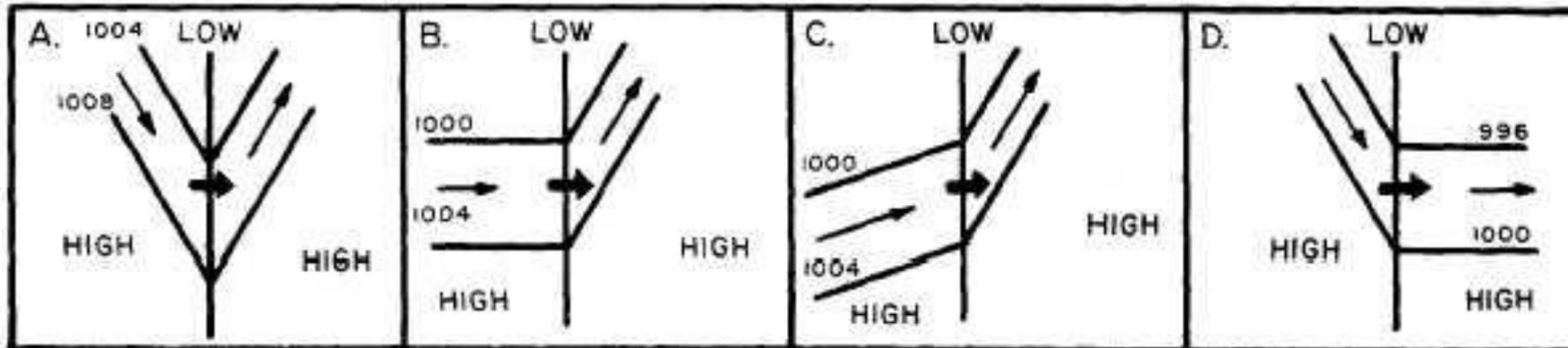
... back to Pressure Systems



winds flow counterclockwise around lows

winds flow clockwise around highs

winds flow roughly parallel to isobars



210.87

Take control over your weather chart!

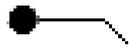
Wind Symbol

Winds are described by the direction *from* which they are blowing - Wind speed is indicated by the feathers on the arrow.

Full feathers represent 10 knot increments; half feathers represent five knots.



Wind blowing from the southwest (225 degrees) at 25 knots.



Wind blowing from the east (90 degrees) at 10 knots.

Cloud Cover

Weather charts depict information about cloud cover.

On surface weather maps, the following symbols are combined with the heads of the wind arrows to depict the amount of cloud cover.

Clear 

Scattered 

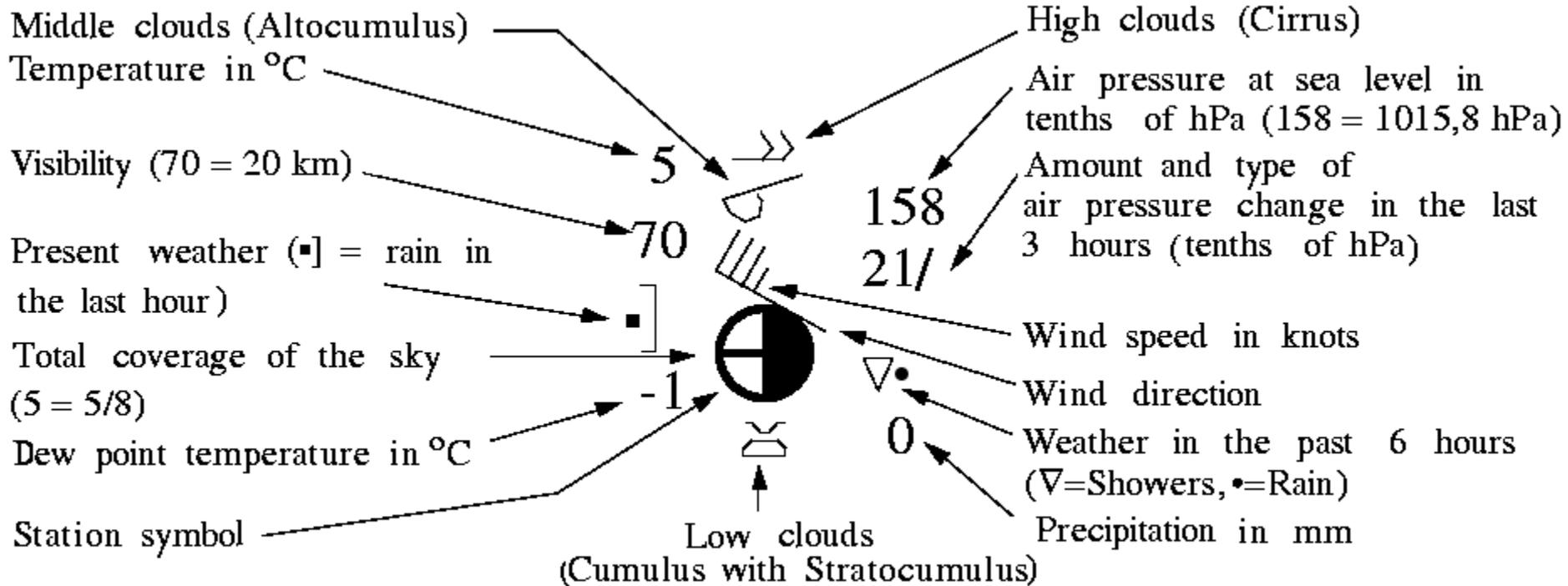
Broken 

Overcast with Breaks 

Overcast 



Full weather station codes



Exercise

In the following exercise, interpret the information in order to match the weather descriptions with the stations shown on the map.

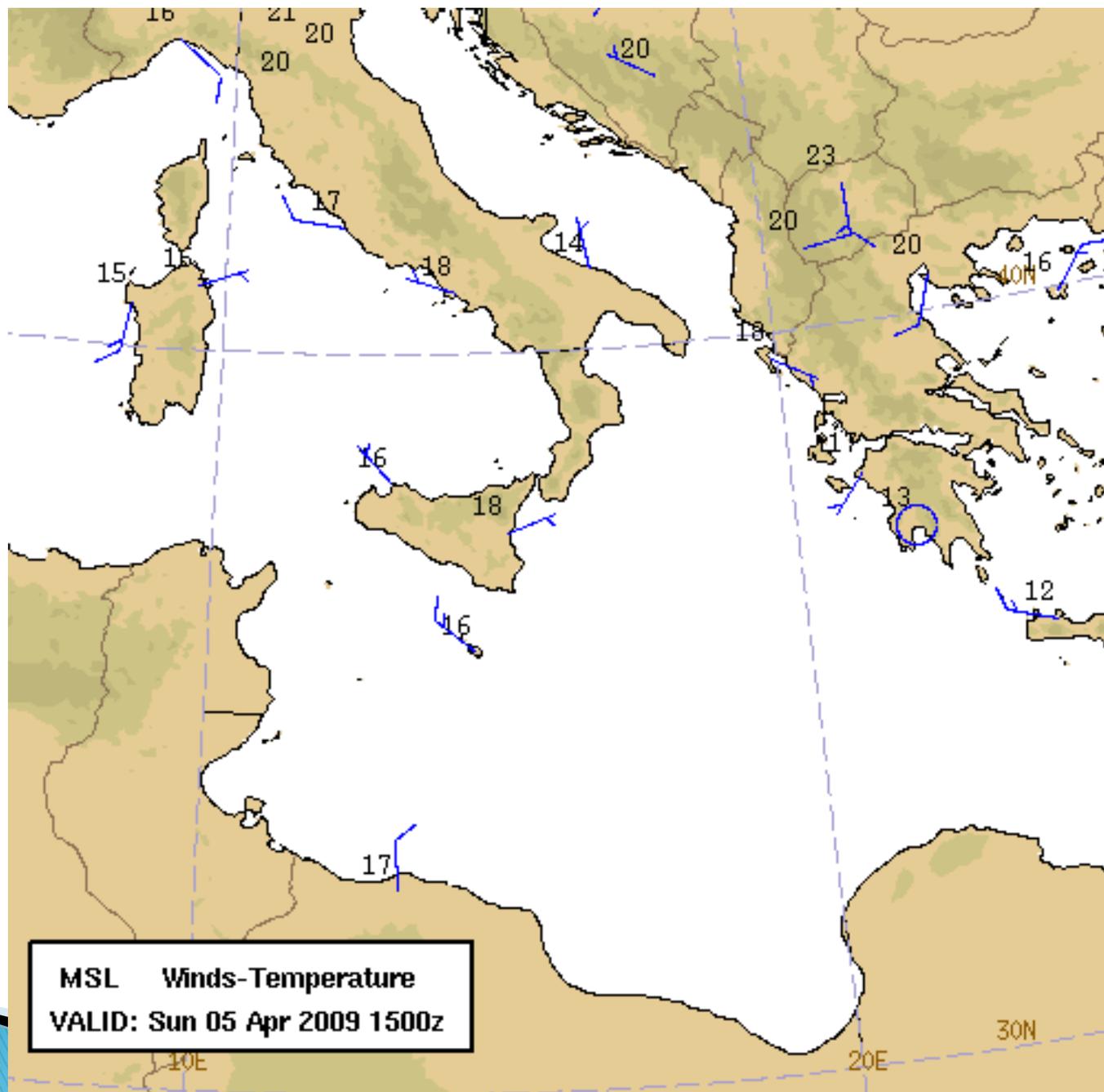


Wind SW at 15 knots. Pressure 995.7 Scattered (4/8)

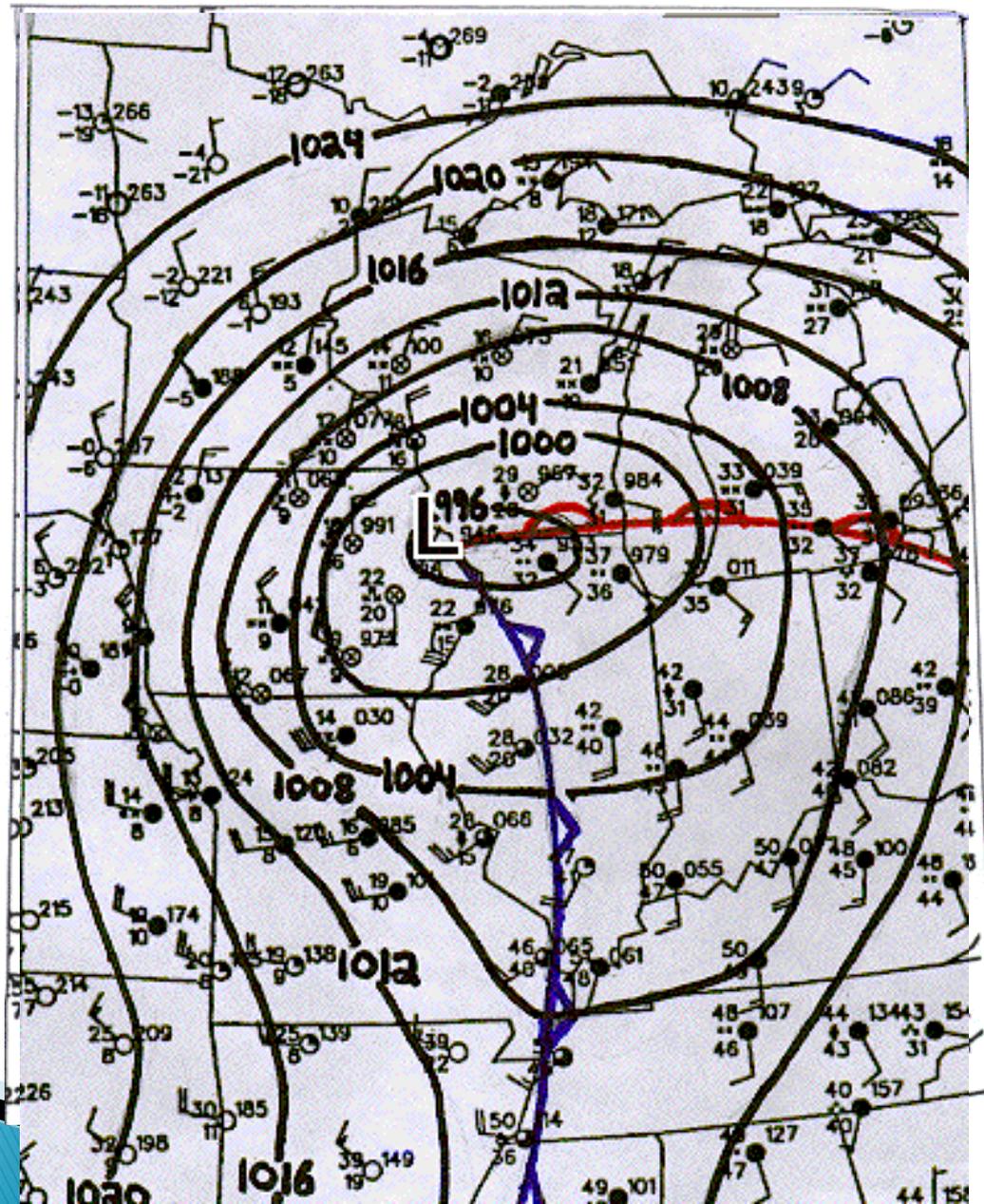
Wind SE at 20 knots. Pressure 1000.3 Few (2/8)

Wind SE at 5 knots. Pressure 1011.1 Broken. (6/8)

Wind NW at 20 knots. Pressure 987.1 Overcast (8/8)



Let's draw some isobars and delineate air masses



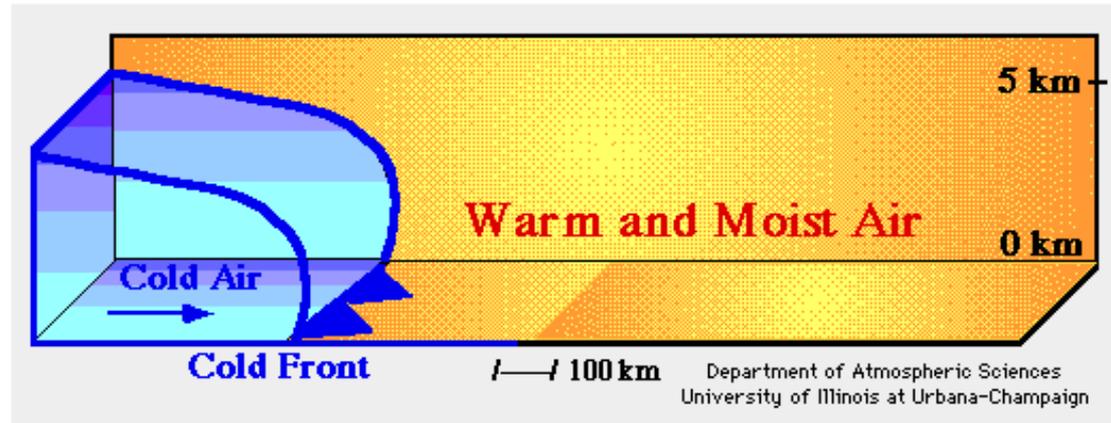
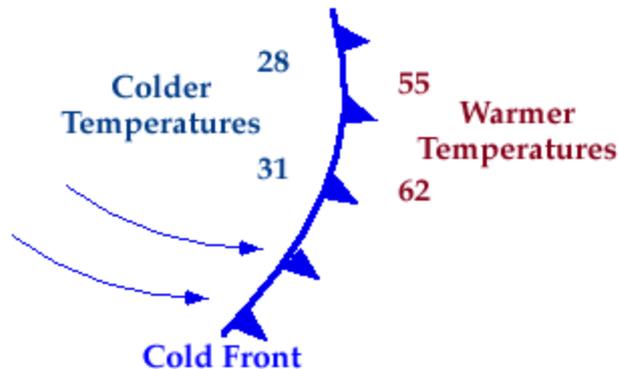
Typical Winds in the Mediterranean



Fronts and clouds

Cold Front

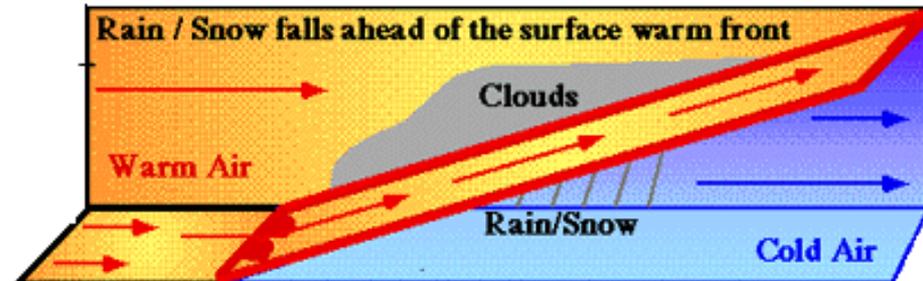
Defined as the transition zone where a cold air mass is replacing a warmer air mass. The air behind a cold front is noticeably colder and drier than the air ahead of it. When a cold front passes through, temperatures can drop more than 15 degrees within the first hour.



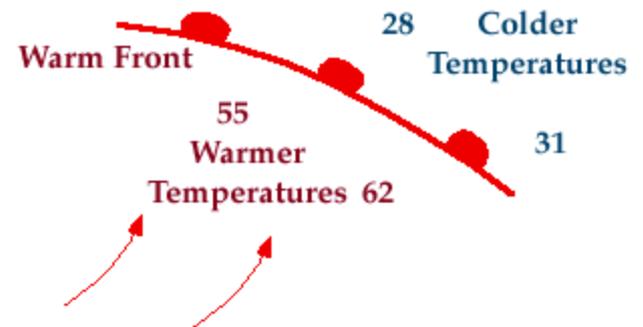
Represented by a solid line with triangles along the front pointing towards the warmer air and in the direction of movement. .

Warm front

Transition zone where a warm air mass is replacing a cold air mass. The air behind a warm front is **warmer and more moist** than the air ahead of it. When a warm front passes through, the air becomes noticeably warmer and more humid than it was before.



Represented by a solid line with semicircles pointing towards the colder air and in the direction of movement.



Excellent

Improves

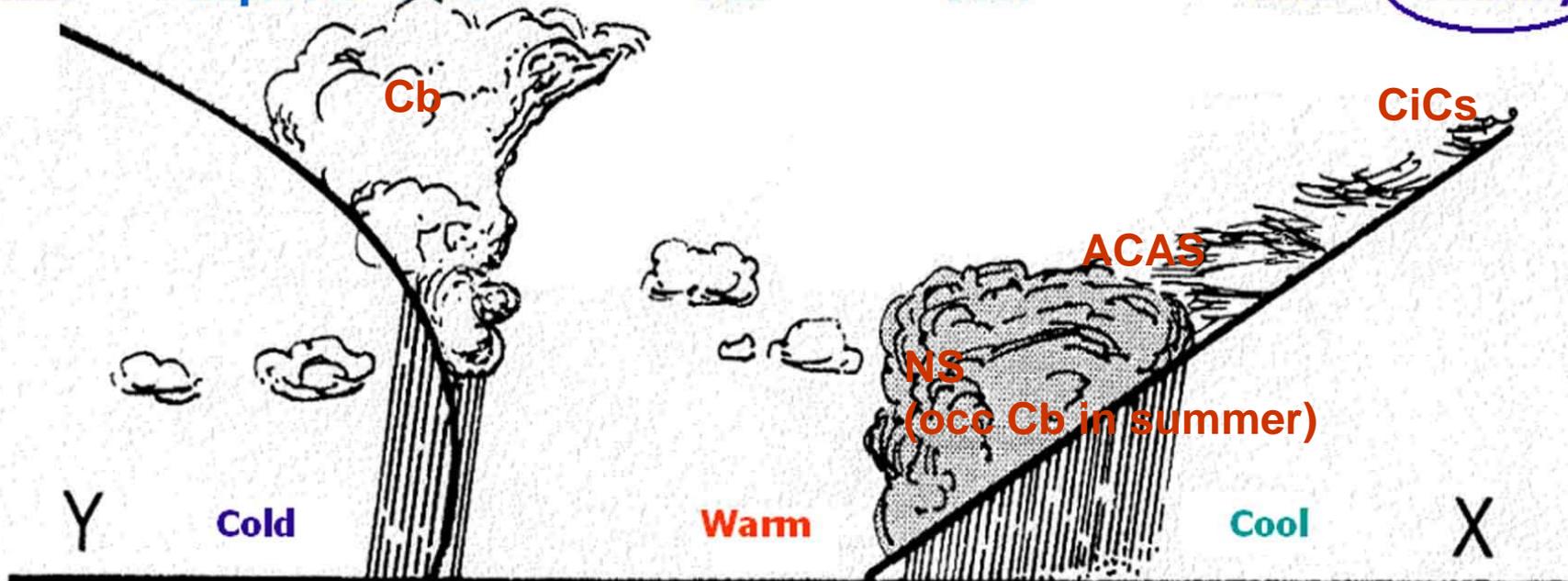
Poor

Fair

Poor

Good

Visibility



Y

Cold

Warm

Cool

X

Clearing

Heavy Shwrs
Tstorms

Clear to mostly
cloudy possible
drizzle/shwrs

Steady
Shwrs

Light
Shwrs

Precipitation
<18 hrs



Pressure



Cirrus clouds fly high and are made of ice.

Thin and wispy. **Predict fair weather until they begin to thicken due to a drop in barometric pressure.**



Cirrostratus are ice at high altitude.

May cover the entire sky and are sometimes so thin that you can see the sun or even the moon through them. Producing a halo effect.

The **thicker the clouds**, the greater is the chance of **experiencing rain** within 24 hours.



Altostratus clouds (middle layer clouds) 6500 and 23,000 feet.

As they **build** they **sometimes predict afternoon thunderstorms**



Altostratus clouds are gray with a blue tinge.

These fly at a middle layer and **predict storms.**



Stratus clouds (low layer clouds).

If they are at ground level, it's **called fog**.

More likely to **produce a drizzle** than heavy rain.

They can sometimes cover the entire sky.



Stratocumulus clouds are **low, gray, and lumpy**.

They may not cover the entire sky and simply gather in patches or rows.

They **seldom produce rain**



Nimbostratus clouds are dark gray and are a harbinger of rain.



Cumulus clouds

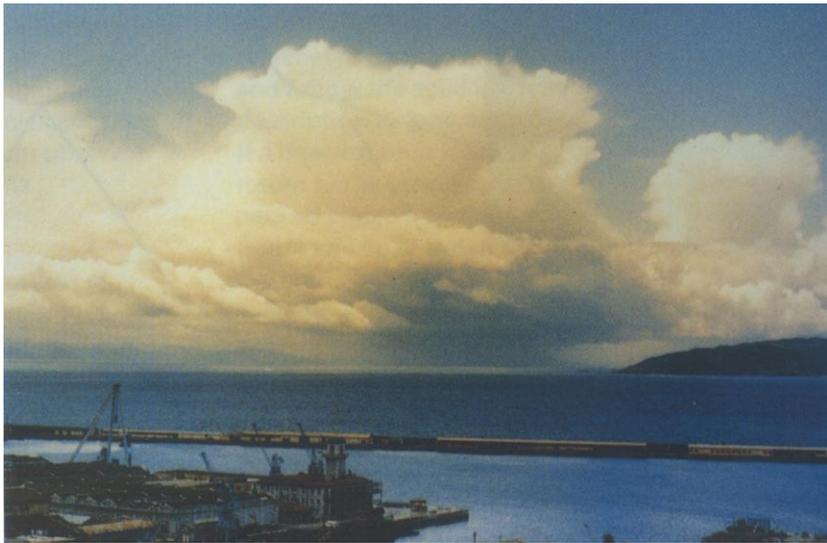
They look like fluffy cotton balls and begin at about 4000 feet.

These clouds usually indicate fair weather.



Towering Cumulus clouds grow when the air is unstable, producing strong convection currents.

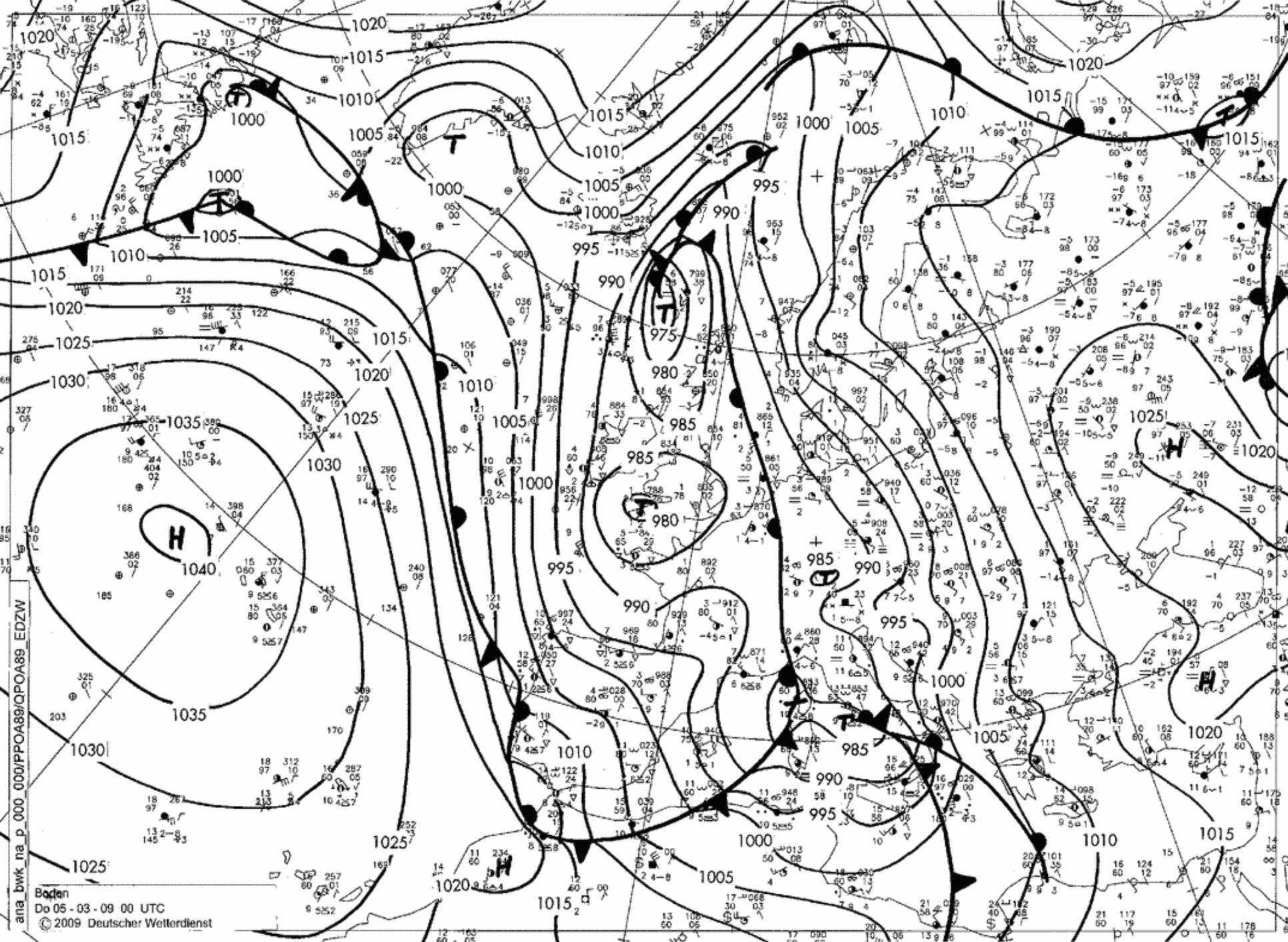
As these clouds go upward into the middle altitudes they **predict showers and thunderstorms.**



Cumulonimbus clouds are the classic thunderheads, with a **flat base and anvil top.**

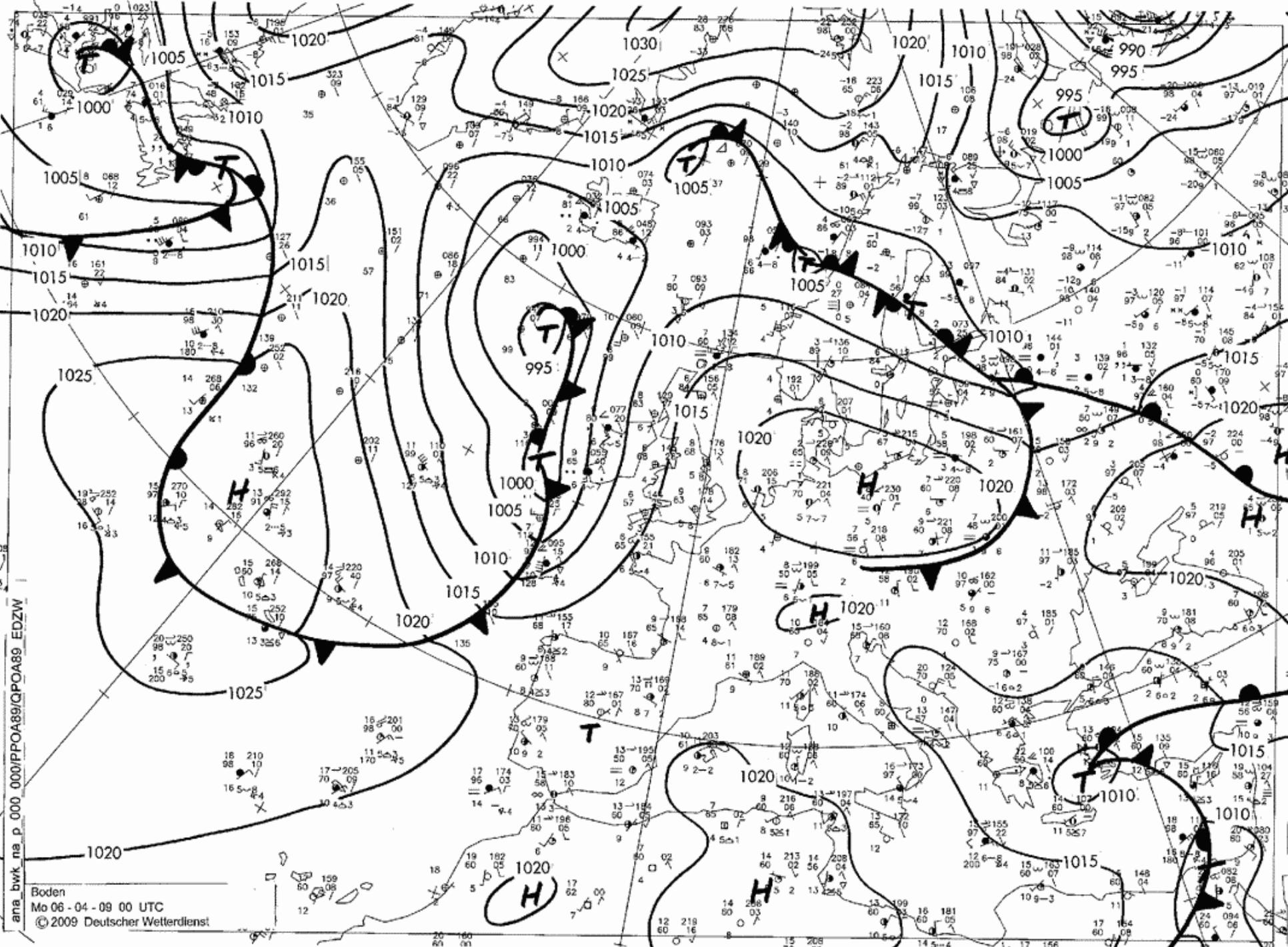
They can extend up to 60,000 feet especially over deserts.

They **predict thunderstorms, lighting, rain, possible hail, flash floods and tornadoes.**



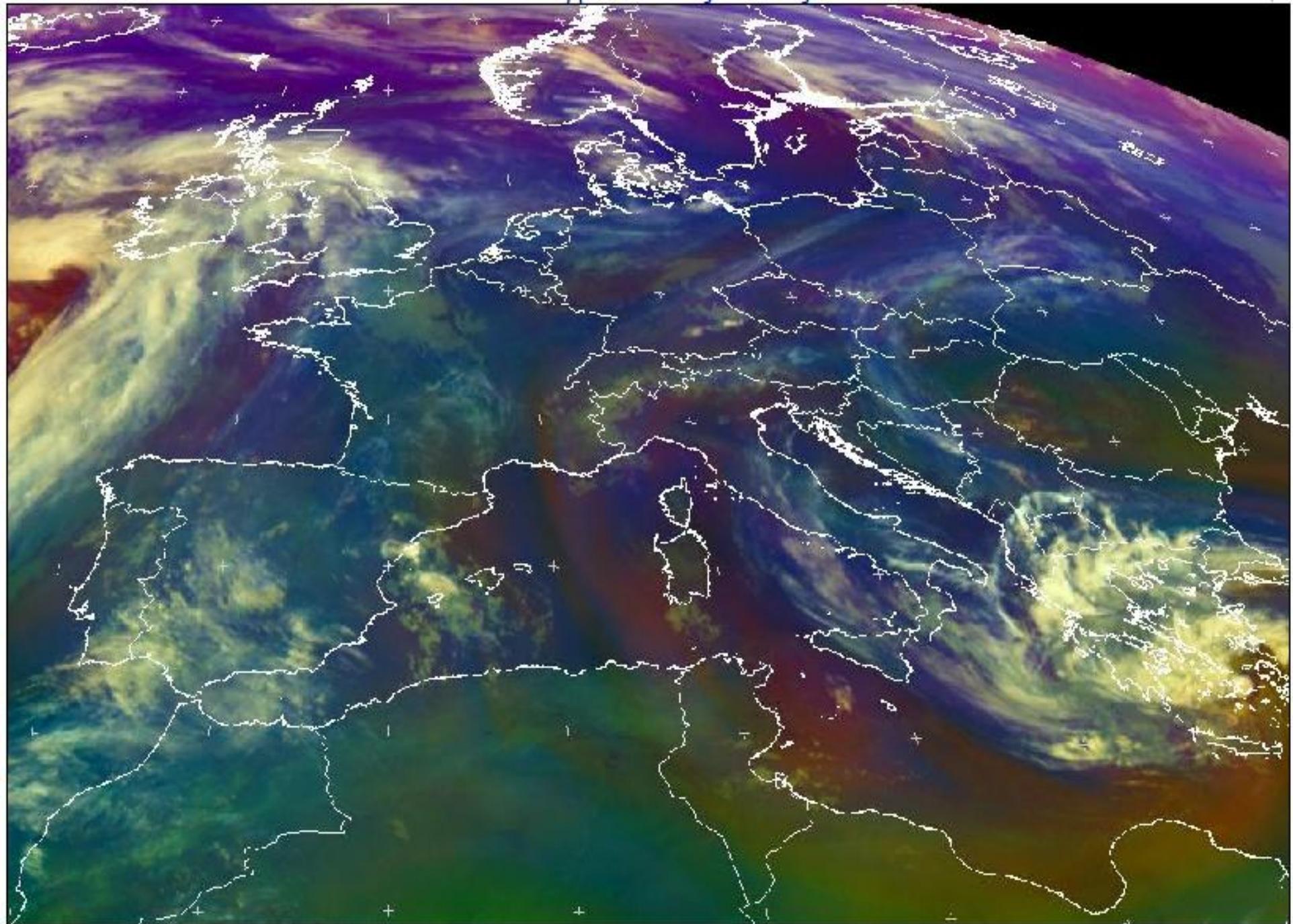
ana_bwk_na_p_000_000/PPOA89/QPOA89_EDZW

Boden
Do 05 - 03 - 09 00 UTC
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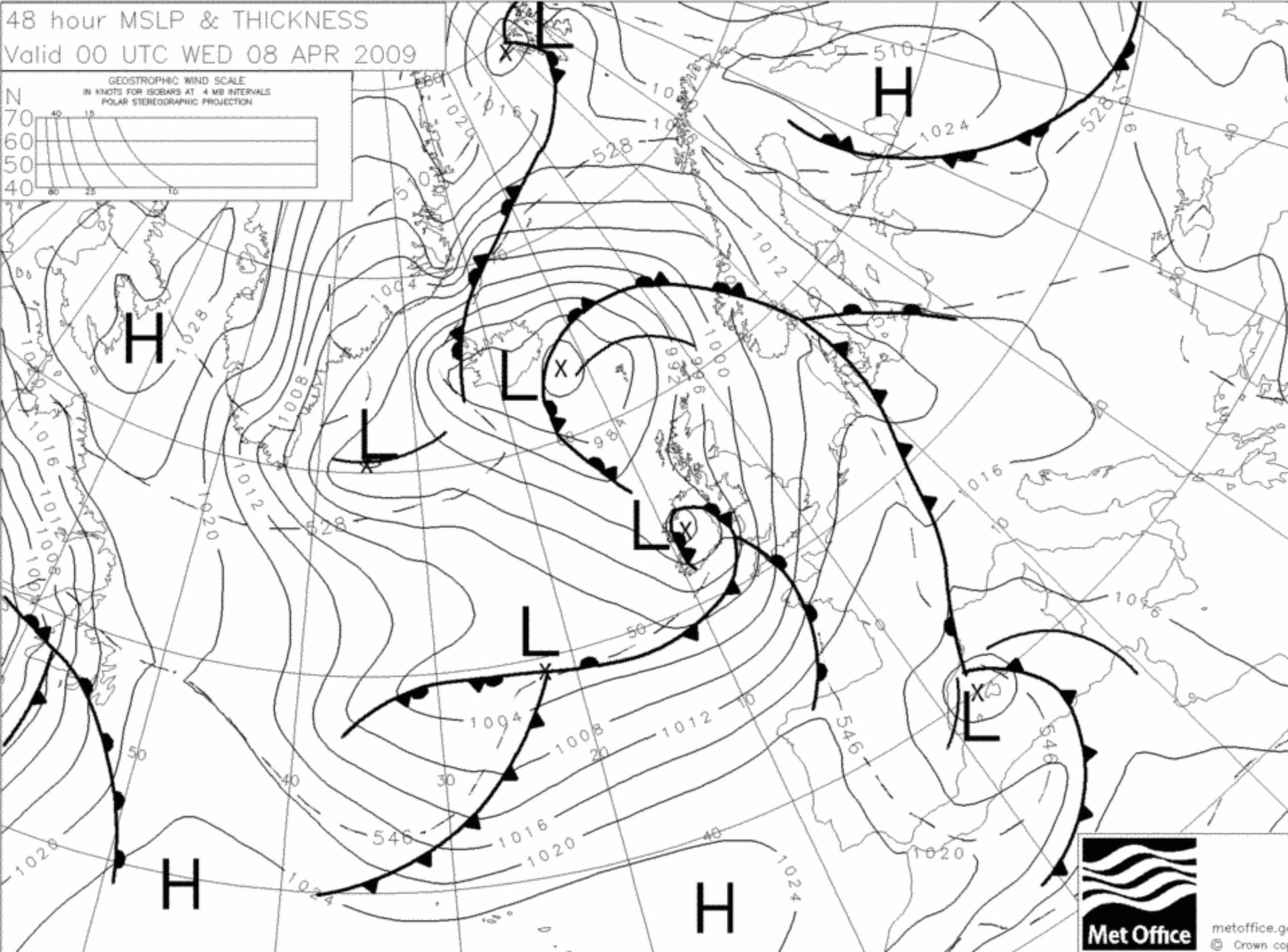
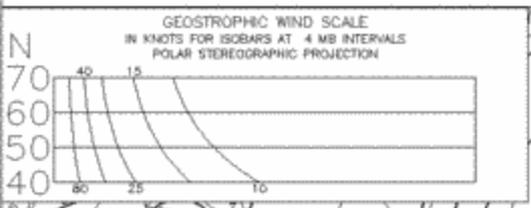
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Mo 06 - 04 - 09 00 UTC
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MET9 RGB-airmass 2009-04-06 00:00 UTC

EUMETSAT

48 hour MSLP & THICKNESS
Valid 00 UTC WED 08 APR 2009



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CURRENT OBSERVATIONS



RADAR IMAGES



ISOBAR CHART



SATELLITE IMAGES



WIND + TEMPERATURE

CURRENT CONDITIONS AT LUQA	5-DAY FORECAST				
Updated on 6 April 2009 at 14:15	Tue	Wed	Thu	Fri	Sat
 PARTLY CLOUDY					
Temp: 17°C	HIGH 20°C	HIGH 20°C	HIGH 17°C	HIGH 17°C	HIGH 19°C
Humidity: 67%	LOW 12°C	LOW 14°C	LOW 13°C	LOW 11°C	LOW 12°C
Atmospheric Pressure: 1017hPa	WNW F3 to 4 bec SSE	SSE F3 to 4 bec ESE F4 to 5	ESE F4 to 5 bec F5 to 6	ESE F4 to 5 bec F5	ENE F4 to 5 bec WSW F3 to 4
Wind: WNW 18 Knots	UV INDEX 6	UV INDEX 7	UV INDEX 6	UV INDEX 7	UV INDEX 6
Sunrise: 06:43	HEAT STRESS INDEX (more info)				
Sunset: 19:29	--	--	--	--	--
© Malta International Airport plc. MET OFFICE					

DETAILED FORECAST

RAINFALL
From Noon to Noon

TEMPERATURE IN OTHER CITIES

WEATHER OBSERVATIONS AT LUQA (6/4/2009)

DETAILED 3-DAY FORECAST FOR MARINERS

Detailed Forecast issued on Monday, April 06, 2009 at 10:00 (Forecast valid noon till midnight)

Verżjoni Bil-Malti

WIND • TEMPERATURE

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DETAILED FORECAST	RAINFALL From Noon to Noon	TEMPERATURE IN OTHER CITIES	WEATHER OBSERVATIONS AT LUQA (6/4/2009)	DETAILED 3-DAY FORECAST FOR MARINERS
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Detailed Forecast issued on Monday, April 06, 2009 at 10:00 (Forecast valid noon till midnight) Verzjoni Bil-Malti

WARNINGS:	Nil
GENERAL SITUATION :	A centre of high pressure over Tunisia and the Gulf of Gabes is moving towards Northern Libya, as a trough of low pressure extending from the Aegean Sea towards Sicily is moving eastwards.
WEATHER:	Partly cloudy becoming partly to rather cloudy at times
VISIBILITY:	Good
WIND:	Moderate to rather strong West Northwest, becoming rather strong at times during the day.
SEA:	Rough becoming moderate
SWELL:	Negligible
SEA TEMPERATURE :	15°C

HIGHEST TEMPERATURE: 18 °C
LOWEST TEMPERATURE: 12 °C

UV Index: (more info) UV INDEX 6
Heat Stress Index: (more info) --

OUTLOOK UNTIL NOON TOMORROW:
Partly to rather cloudy becoming partly cloudy, and with a moderate West Northwest wind becoming light Southwest.

Please ensure that you are accessing current Meteorological information and not cached pages that may be out of date.

[Printer Version](#)

Detailed 3 Day forecast for Mariners issued on 6/4/2009 at 10:30 (valid for a 50 nautical mile radius) Verżjoni Bi-Malti

Monday, 6 April 2009 Tuesday, 7 April 2009 Wednesday, 8 April 2009

<p>WARNINGS: Nil</p> <p>GENERAL SITUATION : A centre of high pressure over Tunisia and the Gulf of Gabes is moving towards Northern Libya, as a trough of low pressure extending from the Aegean Sea towards Sicily is moving eastwards.</p> <p>WEATHER: Partly to rather cloudy</p> <p>VISIBILITY: Good</p> <p>WIND: Rather strong West Northwest (force 5) locally rather strong to strong (force 5 to 6), becoming moderate to rather strong (force 4 to 5) later in the evening.</p> <p>SEA: Rough becoming moderate to rough</p> <p>SWELL: Negligible becoming low North Northwest in South of area overnight</p> <p>SEA TEMPERATURE: 15°C</p>	<p>WEATHER: Partly to rather cloudy at first, becoming partly cloudy.</p> <p>VISIBILITY: Good</p> <p>WIND: Moderate West Northwest (force 4), becoming light to moderate Southwest (force 3 to 4) in the morning, and backing Southerly by evening.</p> <p>SEA: Moderate becoming slight to moderate</p> <p>SWELL: Negligible, locally low North Northwest at first in South of area.</p>	<p>WEATHER: Partly cloudy becoming partly to rather cloudy at times</p> <p>VISIBILITY: Good</p> <p>WIND: Light to moderate South to Southeast (force 3 to 4), becoming moderate to rather strong (force 4 to 5) and backing East Southeast during the day, and becoming locally rather strong (force 5) in Southwest of area overnight</p> <p>SEA: Slight to moderate becoming moderate to rough locally rough</p> <p>SWELL: Negligible</p>
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Malta Meteorological Office

Newsletter

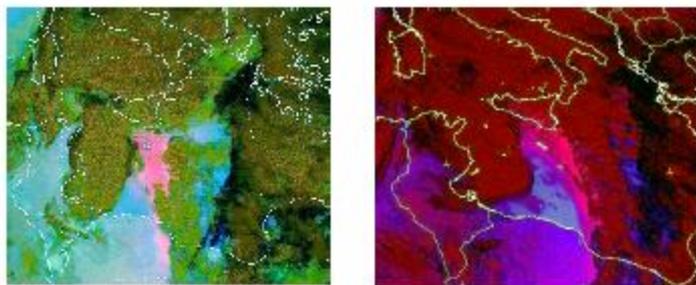
- Weather forecast
- Current observations
- Weather chart
- Forecast for mariners
- Weather satellite



News · Images · Photos · Climate · Resource

ISSN 2072-6147 Issue 7 : February 2009 maltairport.com/weather

Image of the month



Fine drizzle, dust and poor visibility led to an unusual January day

The containment and deposition of dust from the upper atmosphere (magenta colour in left image) as seen by the weather satellite on January 13th at 08:00 UTC, combined with low level clouds (magenta colour in right image) on the same day and time led to orange opaque skies and low horizontal visibility at Luqa airport. This low visibility of not more than 1000m lasted for 30 minutes, impacting on local flights.

Source: EUMETSAT

SUBMIT YOUR PHOTOS

The public is invited to contribute to our newsletter by submitting their favourite photos featuring the weather.

All photographs will be considered and due credit will be given.

Kindly send your material to:
leslie.bonello@maltairport.com

Should you have any questions please email us at:
Metoffice.newsletter@maltairport.com

SERVICES FOR YOU

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or talk directly to our forecaster on:



5004 3858

or 99638

FOR FREE ONLINE WEATHER INFORMATION

WWW.

MALTAIRPORT.COM/WEATHER

LOCAL WEATHER → 5-day forecasts. DETAILED WEATHER FORECASTS → 4x daily updates. MARINE → 3 day 50nm forecasts updated 4x daily. CURRENT OBSERVATIONS → updated every 30 minutes. WEATHER STATION NETWORK → Valletta, Luqa, B'Kara, B'Buġija, Mellieħa, Dingli, Xagħra, Xewkija. SATELLITE → updated every hour. MEDIA CHART → updated daily. WEATHER RADAR → rain updates every 20mins. RAINFALL → from noon-to-noon. TEMPERATURE IN OTHER CITIES → updated daily.

Thank you