Weather charts
I. Surface Analysis (more details)

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METAR

- METAR is the international standard code for hourly and special surface weather observations.
- It roughly translates from French as Aviation Routine Weather Report (MEssage of Temp de l'Aviation Routinaire)
- This is the typical form of a METAR:

LIMF 311156Z 12015G22KT 10SM SCT350 OVC420 08/M02 A2999 RMK A02 SLP136 T00781018 P0012=

- All lines after the first are indented.
- Each METAR report ends with an = sign

Station Identifier

LIMF 231420Z 09004G22KT 5000 FEW090 SCT350 OVC420 08/M02 A2999 Q1034 (NOSIG) RMK A02 SLP136 T00781018 P0012=

- **LIMF** is the station identifier.
  - All Italian station identifiers begin with LI
  - This identifier stands for Torino Caselle

Other METAR

- **Bergamo Orio al Serio** LIME 161450Z 28006KT 4000 -RA BR SCT020 OVC045 18/13 Q1017
- **Venezia Tessera** LIPZ 161450Z 15010KT 9999 SCT020 SCT080 22/15 Q1017
- **Alghero** LIEA 161450Z 33007KT 9999 FEW025 SCT080 BKN200 24/09 Q1016
- **Roma Fiumicino** LIRF 161450Z 18004KT 9999 FEW025 SCT090 21/15 Q1017 NOSIG
- **Palermo Punta Raisi** LICJ 161520Z VRB02KT CAVOK 25/15 Q1017 WS ALL RWY
- **Ronchi dei Legionari** LIPQ 161520Z 20008KT 9999 SCT030 BKN080 21/15 Q1017

Date & Time

LIMF 231420Z 09004G22KT 5000 FEW090 SCT350 OVC420 08/M02 A2999 Q1034 (NOSIG) RMK A02 SLP136 T00781018 P0012=

- 23 indicates it is the 23st day of the month
- 1420Z tells us it's 1420 Zulu (Greenwich time).
- All observations are taken at the same time around the world

Coordinated Universal Time (UTC)

- Coordinated Universal Time (UTC) can be considered equivalent to Greenwich Mean Time (GMT) (when fractions of a second are not important)
- UTC is the system used to indicate time in meteorology and is recommended for all general timekeeping applications
- Time on most weather maps is given given in Coordinated Universal Time

Winds

LIMF 231420Z 09004G22KT 5000 FEW090 SCT350 OVC420 08/M02 A2999 Q1034 (NOSIG) RMK A02 SLP136 T00781018 P0012=

- 090 means the wind is *FROM* 90º. Here, we have an E wind.
- 04 is the wind speed (in knots)
- G22 means the wind is gusting to 22 kts
- KT just gives you the units (knots)

Visibility

LIMF 231420Z 09004G22KT 5000 FEW090 SCT350 OVC420 08/M02 A2999 Q1034 (NOSIG) RMK A02 SLP136 T00781018 P0012=

- **5000** means the visibility is at least 5 kilometers; in USA still statute miles (SM) are used
- Visibility may decrease if the air is hazy, foggy, dusty, or precipitation is falling.

Cloud Abundance & Height

LIMF 231420Z 09004G22KT 5000 FEW090 SCT350 OVC420 08/M02 A2999 Q1034 (NOSIG) RMK A02 SLP136 T00781018 P0012=

- **FEW090** means there are few clouds at 9,000 feet. Just add 2 zeros to the end
- **SCT350** means there are scattered clouds at 35,000 feet. Just add 2 zeros to the end
- **OVC420** means it's overcast at 42,000 ft (idem).
- You can have also BKN(broken) or FEW(few)
- In terms of clouds, FEW < SCT < BKN < OVC

Temperature & Dew Point

LIMF 231420Z 09004G22KT 5000 FEW090 SCT350 OVC420 08/M02 A2999 Q1034 (NOSIG) RMK A02 SLP136 T00781018 P0012=

- The number before the slash, **08**, gives you the temperature in °C
- **M02** gives you the dew point temperature in °C (2°C)
- The **M** means the dew point is minus 2°C (-2°C)

Altimeter Setting

LIMF 231420Z 09004G22KT 5000 FEW090 SCT350 OVC420 08/M02 A2999 Q1034 (NOSIG) RMK A02 SLP136 T00781018 P0012=

- **A2999** stands for an Altimeter setting of 29.99 inches of mercury (in Hg)
- **Q1034** Altimeter setting of 1034 hPa (integer value)
- Used by pilots and skydivers to help them figure out how high above the ground they are.

Remarks & Precipitation Discriminator

LIMF 231420Z 09004G22KT 5000 FEW090 SCT350 OVC420 08/M02 A2999 Q1034 (NOSIG) RMK A02 SLP136 T00781018 P0012=

- **NOSIG** means that there are not other significant information
- **RMK** stands for ‘remarks’. It is in every METAR report and separates the standard data from extra data
- **A02** means this site has a precipitation discriminator. A01 would mean it didn’t.

Sea Level Pressure

LIMF 231420Z 09004G22KT 5000 FEW090 SCT350 OVC420 08/M02 A2999 Q1034 (NOSIG) RMK A02 SLP136 T00781018 P0012=

- **SLP =** Sea Level Pressure. This is the pressure the barometer would read if it were at sea level.
- We use this instead of the actual measured station pressure so we can compare the pressure at 2 stations with different elevations.
- This datum is available only for stations ower than 500 m

More Fun with Sea Level Pressure

LIMF 231420Z 09004G22KT 5000 FEW090 SCT350 OVC420 08/M02 A2999 Q1034 (NOSIG) RMK A02 SLP136 T00781018 P0012=

- Add either 10 or 9 in front of **136** to get the sea level pressure. Add a decimal before the last digit; I.e. 913.6 or 1013.6
- You have to decide whether you add 9 or 10. This station is at 1013.6 hPa, because typical values range from 970 hPa to 1030 hPa

Temperature & Dew Point

LIMF 231420Z 09004G22KT 5000 FEW090 SCT350 OVC420 08/M02 A2999 Q1034 (NOSIG) RMK A02 SLP136 T00781018 P0012=

- **T** indicates temperature & dew point group.
- Gives temperature and dew point to a tenth of a degree (more precise)

More Fun With Temperature & Dew Point

LIMF 231420Z 09004G22KT 5000 FEW090 SCT350 OVC420 08/M02 A2999 Q1034 (NOSIG) RMK A02 SLP136 T00781018 P0012=

- A **zero** in the 1st or 5th number means it is positive. A **one** means it's negative.
- **0078** indicates the temperature is 7.8 °C.
- **1018** means the dew point is –1.8 °C

Amount of Precipitation

LIMF 231420Z 09004G22KT 5000 FEW090 SCT350 OVC420 08/M02 A2999 Q1034 (NOSIG) RMK A02 SLP136 T00781018 P0012=

- **P** indicates precipitation
- It gives you the precipitation: since the last hourly report; precision is at least .01
- **P0012** means 0.12” of precipitation fell in the last hour

TAF

- TAF are forecasts available in some airports; duration of forecast is normally 9 hours since time of emission of forecast

- **LIMF 231400Z 231524 VRB03KT 5000 BR SCT030 BKN070**

- Symbol meaning is similar to that of metar

Format of a SYNOP message

AAXX 30124

07149 11475 72316 10122 20096 39933 40040 58011 69921 70165 875// 333 10045 20024=

AAXX 30124

07149 11475 72316 10122 20096 39933 40040 58011 69921 70165 875// 333 10045 20024=

AAXX

Symbolic format: **MjMjMjMj**

MjMjMjMj Message identifier: AAXX means terrestrial station, BBXX means maritime station

SYNOP message

AAXX **30124**

07149 11475 72316 10122 20096 39933 40040 58011 69921
70165 875// 333 10045 20024=

30124

symbolic format : **YYGGiw**

YY Day: here 30

GG Observation time (UTC): here 12:00 UTC

iw Wind measurement index: in this case, 4 means wind speed, in knots, measured with an anemometer

0	Estimated wind speed (m/s)
1	Wind speed measured with anemometer (m/s)
3	Estimated wind speed (knots)
4	Wind speed measured with anemometer (knots)

SYNOP message

AAXX 30124

07149 11475 72316 10122 20096 39933 40040 58011 69921 70165 875// 333 10045 20024=

07149

symbolic format: **II**iii

II Country index: here 07 France (16=Italy)

iii international station code: here 149=Paris ORLY (080=Milano Linate, 059=Torino Caselle)

SYNOP message

AAXX 30124

07149 **11475** 72316 10122 20096 39933 40040 58011
69921 70165 875// 333 10045 20024=

11475

Symbolic format: **iRixhVV**

iR code for inclusion or exclusion of group 6RRRtR: here 1=incluse

ix code for inclusion or exclusion of group groupe 7wawaWa1Wa2: here 1=incluse

h Cloudiness bottom code, here between 300 and 399 m

VV Horizontal visibility code, here 15 nautical miles

0	0 à 49
1	50 à 99
2	100 à 199
3	200 à 299
4	300 à 399
5	400 à 599
6	600 à 999
7	1 000 à 1 999
8	2 000 à 2 499
9	2 500 ou pas de nuages
/	Ciel obscurci par du brouillard, de la neige ou des nuages

00	0	62	8
02	1/8	64	9
04	1/4	66	10
06	3/8	67	11
08	1/2	69	12
10	5/8	70	13
12	3/4	72	14
16	1	74	15
20	1. 1/4	80	19
24	1. 1/2	81	22
28	1. 3/4	82	25
32	2	83	28
36	2. 1/4	84	32
40	2. 1/2	85	35
48	3	86	38
56	4	87	41
58	5	88	44
59	6	89	> 44
61	7		

SYNOP message

AAXX 30124

07149 11475 **72316** 10122 20096
39933 40040 58011 69921 70165
875// 333 10045 20024=

72316

Symbolic format: **Nddff**

N Cloud cover code, here 7/8

dd Wind direction du vent, here SW, 225° to 234°

ff Wind speed in knots, here 16 knots

00	Calme (Pas de vent)	19	185 - 194
01	5 - 14	20	195 - 204
02	15 - 24	21	205 - 214
03	25 - 34	22	215 - 224
04	35 - 44	23	225 - 234
05	45 - 54	24	235 - 244
06	55 - 64	25	245 - 254
07	65 - 74	26	255 - 264
08	75 - 84	27	265 - 274
09	85 - 94	28	275 - 284
10	95 - 104	29	285 - 294
11	105 - 114	30	295 - 304
12	115 - 124	31	305 - 314
13	125 - 134	32	315 - 324
14	135 - 144	33	325 - 334
15	145 - 154	34	335 - 344
16	155 - 164	35	345 - 354
17	165 - 174	36	355 - 4
18	175 - 184	99	Vent variable
19	185 - 194		

SYNOP message

AAXX 30124

07149 11475 72316 **10122** 20096 39933 40040 58011 69921
70165 875// 333 10045 20024=

10122

Symbolic format: **1snTTT**

1 Group code (air temperature)

Sn Sign of air temperature (1=negative 0=positive), here >0

TTT Air temperature (in 1/10th of C°), here 12.2°C

SYNOP message

AAXX 30124

07149 11475 72316 10122 **20096** 39933 40040 58011 69921 70165 875// 333 10045 20024=

20096

Symbolic format: **2snTdTdTd**

2 Group code (dew point temperature)

Sn Sign of dew point temperature (1=negative 0=positive), here >0

TdTdTd Dew point temperature (in 1/10th of C°), here 9.6°C

SYNOP message

AAXX 30124

07149 11475 72316 10122 20096 **39933** 40040 58011 69921 70165 875// 333 10045 20024=

39933

Symbolic format: **3PoPoPoPoPo**

3 Group code (atmospheric pressure)

PoPoPoPoPo atmospheric pressure at station QFE (1/10 hPa), here 993.3 hPa

SYNOP message

AAXX 30124

07149 11475 72316 10122 20096 39933 **40040** 58011 69921 70165 875// 333 10045 20024=

40040

Symbolic format: **4PPPP**

4 Group code (sea level atmospheric pressure)

PPPP sea level atmospheric pressure QFH (1/10 hPa), here 1004.0 hPa

SYNOP message

AAXX 30124

07149 11475 72316 10122 20096 39933 40040 **58011** 69921 70165 875// 333 10045 20024=

58011

Symbolic format: **5appp**

5 Group code (atmospheric pressure tendency)

a Atmospheric pressure tendency code, here stationary and then decreasing

ppp Atmospheric pressure tendency amplitude (1/10 hPa), here 1.1 hPa

code	meaning
0	INCREASING, THEN DECREASING: ATMOSPHERIC PRESSURE THE SAME OR HIGHER THAN 3 HOURS AGO (OR 24 AGO)
1	INCREASING, THEN STEADY; OR INCREASING; THEN MORE SLOWLY
2	INCREASING (STEADILY OR UNSTEADILY)
3	DECREASING OR STEADY, THEN INCREASING; RAPIDLY
4	STEADY; ATMOSPHERIC PRESSURE THE SAME AS 3 HOURS AGO (OR 24 HOURS)
5	DECREASING; THEN INCREASING; ATMOSPHERIC PRESSURE THE SAME OR LOWER THAN 3 HOURS AGO
6	DECREASING, THEN STEADY; OR DECREASING, DECREASING MORE SLOWLY
7	DECREASING (STEADILY OR UNSTEADELY)
8	STEADY OR INCREASING, THEN DECREASING; OR DECREASING, THEN DECREASING MORE RAPIDLY
15	MISSING VALUE

SYNOP message

AAXX 30124

07149 11475 72316 10122 20096 39933 40040 58011
69921 70165 875// 333 10045 20024=

69921

Symbolic format: **6**RRR**t**r

This part of message is transmitted only if Ir of group iRixhVV is =1)

6 Group code (precipitation heigth)

RRR 6 hours precipitation heigth in mm, here 0.2 mm

tr Measuring period of RRR, here 6 hours

1	Total precipitations in the last 6 hours
2	Total precipitations in the last 12 hours
3	Total precipitations in the last 18 hours
4	Total precipitations in the last 24 hours
5	Total precipitations in the last hour
6	Total precipitations in the last 2 hours
7	Total precipitations in the last 3 hours
8	Total precipitations in the last 9 hours
9	Total precipitations in the last 15 hours

001	1
002	2
...	
989	989 ou plus
990	traces
991	0.1
992	0.2
993	0.3
994	0.4
995	0.5
996	0.6
997	0.7
998	0.8
999	0.9

SYNOP message

AAXX 30124

07149 11475 72316 10122 20096 39933 40040 58011 69921
70165 875// 333 10045 20024=

70165

Symbolic format: **7wwW1W2**

This part of message is transmitted only if Ix of group iRixhVV is =1)

7 Group code (weather code)

ww Actual weather code, here nothing special

W1W2 Past weather (in last 6 hours) code, here freezing rain and frost

Here all weather codes:
http://badc.nerc.ac.uk/data/surface/code.html

SYNOP message

AAXX 30124

07149 11475 72316 10122 20096 39933 40040 58011 69921
70165 **875//** 333 10045 20024=

875//

Symbolic format: **8NhClCmCh**

8 Group code (cloudiness)

Nh Cloudiness code, here 7/8

Cl Low cloud type code, here Strato-cumulus

Cm Middle cloud type code, here clouds are invisible

Ch High cloud type code, here clouds are invisible

Low cloud code

0 No Stratocumulus, Stratus, Cumulus or Cumulonimbus

1 Cumulus with little vertical extent and seemingly flattened,or ragged Cumulus other than of bad weather*, or both

2 Cumulus of moderate or strong vertical extent, generally with protuberances in the form of domes or towers, either accompanied or not by other Cumulus or by Stratocumulus, all having their bases at the same level.

3 Cumulonimbus the summits of which, at least partially, lack sharp outlines but are neither clearly fibrous (cirriform) nor in the form of an anvil; Cumulus, Stratocumulus or Stratus may also be present

4 Stratocumulus formed from the spreading out of Cumulus; Cumulus may also be present

5 Stratocumulus not formed from the spreading out of Cumulus

6 Stratus in a more or less continuous sheet or layer, or in ragged shreds, or both, but no Stratus fractus of bad weather*

7 Stratus fractus of bad weather* or Cumulus fractus of bad weather or both (pannus), usually below Altostratus or Nimbostratus

8 Cumulus and Stratocumulus other than that formed from the spreading out of Cumulus; the base of the Cumulus is at a different level from that of the Stratocumulus

9 Cumulonimbus, the upper part of which is clearly fibrous (cirriform), often in the form of an anvil; either accompanied by Cumulonimbus without anvil or fibrous upper part, by Cumulus, Stratocumulus,Stratus

* ‘Bad weather’ denotes the conditions which generally exists during precipitation and a short time before and after.

Middle cloud code

0 No Altocumulus, Altostratus or Nimbostratus

1 Altostratus, the greater part of which is semi-transparent; through this part the sun or moon may be weakly visible - as through ground glass

2 Altostratus, the greater part of which is sufficiently dense to hide the sun or moon, or Nimbostratus

3 Altocumulus, the greater part of which is semi-transparent; the various elements of the cloud change only slowly and are all at a single level

4 Patches (often in the form of almonds or fishes) of Altocumulus, the greater part of which is semi-transparent; the clouds ocurr at one or more levels and the elements are continually changing in appearance

5 Semi-transparent Altocumulus in bands, or Altocumulus in one or more fairly continuous layers (semitransparent or opaque), progressively invading the sky; these Altocumulus clouds generally thicken as a whole

6 Altocumulus resulting from the spreading out of Cumulus (or Cumulonimbus)

7 Altocumulus in two or more layers, usually opaque in places, and not progressively invading the sky; or opaque layer of Altocumulus, not progressively invading the sky; or Altocumulus together with Altostratus or Nimbostratus

8 Altocumulus with sproutings in the form of small towers or battlements, or Altocumulus having the appearance of cumuliform tufts

9 Altocumulus of a chaotic sky, generally at several levels

/ Altocumulus, Altostratus and Nimbostratus invisible owing to darkness, fog,blowing snow, dust or sand, or other similar phenomena, or more often because of the presence of a continuous layer of lower clouds

High cloud code

0 No Cirrus, Cirrocumulus or Cirrostratus

1 Cirrus in the form of filaments, strands or hooks, not progressively invading the sky

2 Dense Cirrus, in patches or entangled sheaves, which usually do not increase and sometimes seem to be the remains of the upper part of a Cumulonimbus; or Cirrus with sproutings in the form of small turrets or battlements, or Cirrus having the appearance of cumuliform tufts

3 Dense Cirrus, often in the form of an anvil, being the remains of the upper parts of Cumulonimbus

4 Cirrus in the form of hooks or filaments, or both, progressively invading the sky; they generally become denser as a whole

5 Cirrus (often in bands converging towards one point or two opposite points of the horizon) and Cirrostratus, or Cirrostratus alone; in either case they are progressively invading the sky, and generally growing denser as a whole, but the continuous veil does not reach 45 degrees above the horizon

6 Cirrus (often in bands converging towards one point or two opposite points of the horizon) and Cirrostratus, or Cirrostratus alone; in either case they are progressively invading the sky, and generally growing denser as a whole, the continuous veil extends more than 45 degrees above the horizon, without the sky being totally covered

7 Veil of Cirrostratus covering the celestial dome

8 Cirrostratus not progressively invading the sky and not completely covering the celestial dome

9 Cirrocumulus alone, or Cirrocumulus accompanied by Cirrus or Cirrostratus, or both, but Cirrocumulus is predominant

/ Cirrus, Cirrocumulus or Cirrostratus invisible owing to darkness, fog,blowing snow, dust or sand, or other similar phenomena, or more often because of the presence of a continuous layer of lower clouds

SYNOP message

AAXX 30124

07149 11475 72316 10122 20096 39933 40040 58011 69921
70165 875// **333 10045** 20024=

333

Code for Section 3

10045

Symbolic format: **1SnTxTxTx**

1 Group code (maximum temperature)

Sn Sign of temperature (1=negative, 0=positive), here positive

TxTxTx Maximum temperature in 1/10 °C, here 4.5 °C

SYNOP message

AAXX 30124

07149 11475 72316 10122 20096 39933 40040 58011 69921
70165 875// 333 10045 **20024**=

20024

Symbolic format: **2SnTnTnTn**

2 Group code (minimum temperature)

Sn Sign of temperature (1=negative, 0=positive), here positive

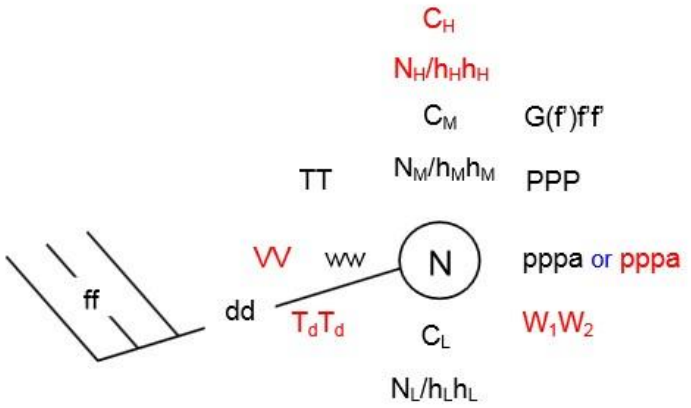
TnTnTn Minimum temperature in 1/10 °C, here 2.4 °C

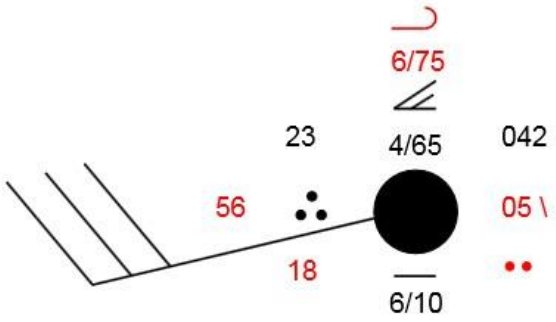
=

End of message

For more informations, consult
http://f1agw.free.fr/Synop/Synop.htm

Example of symbol in a map





Decode of elements plotted on a land station circle (note the colour coding)

Identifier	Description
N	Total amount of cloud (in oktas)
C_L	Type of low cloud
N_L	Amount of low cloud (in oktas)
h_Lh_L	Height of low cloud (in feet)
C_M	Type of medium cloud
N_M	Amount of medium cloud (in oktas)
h_Mh_M	Height of medium cloud (in feet)
C_H	Type of high cloud
N_H	Amount of high cloud (in oktas)
h_Hh_H	Height of high cloud (in feet)
TT	Dry-bulb air temperature (in degrees Celsius)
ww	Present weather
dd	Wind direction (in degrees)
ff	Wind speed (in knots)
VV	Visibility (in metres or kilometres)
T_dT_d	Dew point temperature (in degrees Celsius)
W_1W_2	Past weather
pppa or pppa	Pressure tendency and trend (black: rising, red: falling) (in millibars)
PPP	Atmospheric pressure (in millibars)
G(f')f'f'	Wind gust (in knots)

The decode of the above station plot is as follows:

Weather as observed	Code group	Description
8 oktas	N	Total amount of cloud (in oktas)
23 ºC	TT	Dry-bulb air temperature (in degrees Celsius)
Continuous moderate rain	ww	Present weather
260 º	dd	Wind direction (in degrees)
30 knots	ff	Wind speed (in knots)
6 km	VV	Visibility (in metres or kilometres)
18 ºC	T_dT_d	Dew-point temperature (in degrees Celsius)
Stratus (6 oktas at 1000 feet)	C_L or C	Type of low cloud
Rain	W_1W_2	Past weather
Falling 0.5mb in last 3 hours	pppa or pppa	Pressure tendency and trend (black: rising, red: falling) (in millibars)
1004.2mb	PPP	Atmospheric pressure (in millibars)
Dense altostratus (4 oktas at 15000 feet)	C_m or C	Type of medium cloud
Cirrus (6 oktas at 25000 feet)	C_H or C	Type of high cloud

Wind, weather and cloudiness symbols

Weather symbols used on early synoptic charts and early daily weather summaries (ww)

Symbol	Definition
●	Rain
✳	Snow
✶	Sleet
▲	Hail
☰	Fog
≡°	Mist
⊤	Thunder
⊤↘	Thunderstorm
~~	Sea disturbance - rough
≈≈≈	Sea disturbance - high

Table 45. Present weather symbols used on early synoptic charts.

Past weather symbols used on synoptic charts (W_1W_2)

Symbol	Code Figure	Definition
	0	Cloud cover ½ or less of the sky throughout the appropriate period
	1	Cloud cover ½ or less for part of the appropriate period and more than ½ sky for part of the period
	2	Cloud cover more than ½ of the sky throughout the appropriate period
S / ⇢	3	Duststorm, sand storm or blowing snow – Visibility less than 1000 metres
☰	4	Fog or thick haze – Visibility less than 1000 metres
,	5	Drizzle
●	6	Rain
✳	7	Snow or rain and snow mixed
▽	8	Shower(s)
⊤↘	9	Thunder, with or without precipitation

Symbol	Description	Symbol	Description
○	Sky clear (0 oktas)	◕	6 oktas of sky covered
◐	1 okta or less of sky covered, but not zero	●	7 oktas of sky covered
◔	2 oktas of sky covered	●	8 oktas of sky covered
◔	3 oktas of sky covered	⊗	Sky obscured by fog or other meteorological phenomena
◑	4 oktas of sky covered	⊖	Cloud cover obscured for other reasons or not observed
◕	5 oktas of sky covered		

Symbol	Description	Symbol	Description
◎	Calm	◣	53 – 57 knots
—	1 - 2 knots	◣	58 - 62 knots
⊢	3 - 7 knots	◣	63 - 67 knots
⊢	8 - 12 knots	◣	68 - 72 knots
⊢	13 - 17 knots	◣	73 - 77 knots
⊢	18 - 22 knots	◣	78 - 82 knots
⊢	23 - 27 knots	◣	83 - 87 knots
⊢	28 - 32 knots	◣	88 - 92 knots
⊢	33 - 37 knots	◣	93 – 97 knots
⊢	38 - 42 knots	◣	98 – 102 knots
⊢	43 - 47 knots	✳	Wind direction variable
◣	48 – 52 knots	←	Wind direction given but wind speed missing

Low and middle cloud codes

Symbol	Code Figure	Definition
	0	No stratocumulus, stratus, cumulus or cumulonimbus.
	1	Cumulus with little vertical extent and seemingly flattened, or ragged cumulus other than of bad weather*, or both.
	2	Cumulus of moderate or strong vertical extent, generally with protuberances in the form of domes or towers, either accompanied or not by other cumulus or by stratocumulus, all having their bases at the same level.
	3	Cumulonimbus the summits of which, at least partially, lack sharp outlines, but are neither clearly fibrous (cirriform) nor in the form of an anvil; cumulus, stratocumulus or stratus may also be present.
	4	Stratocumulus formed by the spreading out of cumulus; cumulus may also be present.
	5	Stratocumulus not resulting from the spreading out of cumulus.
	6	Stratus in a more or less continuous sheet or layer, or in ragged shreds, or both, but no stratus fractus of bad weather.
	7	Stratus fractus of bad weather* or cumulus fractus of bad weather*, or both (pannus), usually below altostratus or nimbostratus.
	8	Cumulus and stratocumulus other than that formed from the spreading out of cumulus; the base of the cumulus is at a different level from that of the stratocumulus.
	9	Cumulonimbus, the upper part of which is clearly fibrous (cirroform), often in the form of an anvil; either accompanied or not by cumulonimbus without anvil or fibrous upper part, by cumulus, stratocumulus, stratus or pannus.
	/	Stratocumulus, stratus, cumulus or cumulonimbus are invisible owing to fog, darkness or other surface phenomena.

Symbol	Code Figure	Definition
	0	No altocumulus, altostratus or nimbostratus.
	1	Altostratus, the greater part of which is semi-transparent; through this part the sun or moon may be weakly visible, as through ground glass.
	2	Altostratus, the greater part of which is sufficiently dense to hide the sun or moon, or nimbostratus.
	3	Altocumulus, the greater part of which is semi-transparent; the various elements of the cloud change only slowly and are all at a single level.
	4	Patches (often in the form of almonds or fishes) of altocumulus, the greater part of which is semi-transparent; the clouds occur at one or more levels and the elements are continually changing in appearance.
	5	Semi-transparent altocumulus in bands, or altocumulus in one or more fairly continuous layers (semi-transparent or opaque), progressively invading the sky; these altocumulus clouds generally thicken as a whole.
	6	Altocumulus resulting from the spreading out of cumulus (or cumulonimbus).
	7	Altocumulus in two or more layers, usually opaque in places and not progressively invading the sky; or opaque layer of altocumulus, not progressively invading the sky; or altocumulus together with altostratus or nimbostratus.
	8	Altocumulus with sproutings in the form of small towers or battlements, or altocumulus having the appearance of cumuliform tufts.
	9	Altocumulus of a chaotic sky, generally at several levels.
	/	Altocumulus, altostratus or nimbostratus are invisible owing to fog, darkness or other surface phenomena, or because of the presence of a continuous layer of lower cloud.

High cloud codes and visibility

Symbol	Code Figure	Definition
	0	No Cirrus, cirrocumulus or cirrostratus.
	1	Cirrus in the form of filaments, strands or hooks, not progressively invading the sky.
	2	Dense cirrus, in patches or entangled sheaves, which usually do not increase and sometimes seem to be the remains of the upper part of cumulonimbus; or cirrus with sproutings in the form of small turrets or battlements, or cirrus having the appearance of cumuliform tufts.
	3	Dense cirrus, often in the form of an anvil; being the remains of the upper parts of cumulonimbus.
	4	Cirrus in the form of hooks or of filaments, or both, progressively invading the sky; they generally become denser as a whole.
	5	Cirrus (often in bands converging towards one point or two opposite points of the horizon) and cirrostratus, or cirrostratus alone; in either case, they are progressively invading the sky, and generally growing denser as a whole, but the continuous veil does not reach 45° above the horizon.
	6	Cirrus (often in bands converging towards one point or two opposite points of the horizon) and cirrostratus, or cirrostratus alone; in either case, they are progressively invading the sky, and generally growing denser as a whole, the continuous veil exceeds mare that 45° above the horizon, without the sky being totally covered.
	7	Veil of cirrostratus covering the celestial dome.
	8	Cirrostratus not progressively invading the sky and not completely covering the celestial dome.
	9	Cirrocumulus alone, or cirrocumulus accompanied by cirrus or cirrostratus or both, but cirrocumulus is predominant.
	/	Cirrus, cirrocumulus or cirrostratus are invisible owing to fog, darkness or other surface phenomena, or because of the presence of a continuous layer of lower cloud.

Actual Cloud Height (feet)	Plotted Cloud Height	Actual Cloud Height (feet)	Plotted Cloud Height	Actual Cloud Height (feet)	Plotted Cloud Height	Actual Cloud Height (feet)	Plotted Cloud Height
<100	00	1700	17	3200	32	4900	49
100	01	1800	18	3300	33	5000	50
200	02	1900	19	3400	34	6000	56
300	03	2000	20	3500	35	7000	57
400	04	2100	21	3600	36	8000	58
500	05	2200	22	3700	37	9000	59
600	06	2300	23	3800	38	10000	60
700	07	2400	24	3900	39	11000	61
800	08	2500	25	4000	40	12000	62
900	09	2600	26	4100	41		
1000	10	2700	27	4200	42		
1100	11	2800	28	4300	43		
1200	12	2900	29	4400	44		
1300	13	1700	17	4500	45		
1400	14	1800	18	4600	46		
1500	15	3000	30	4700	47		
1600	16	3100	31	4800	48	25000	75

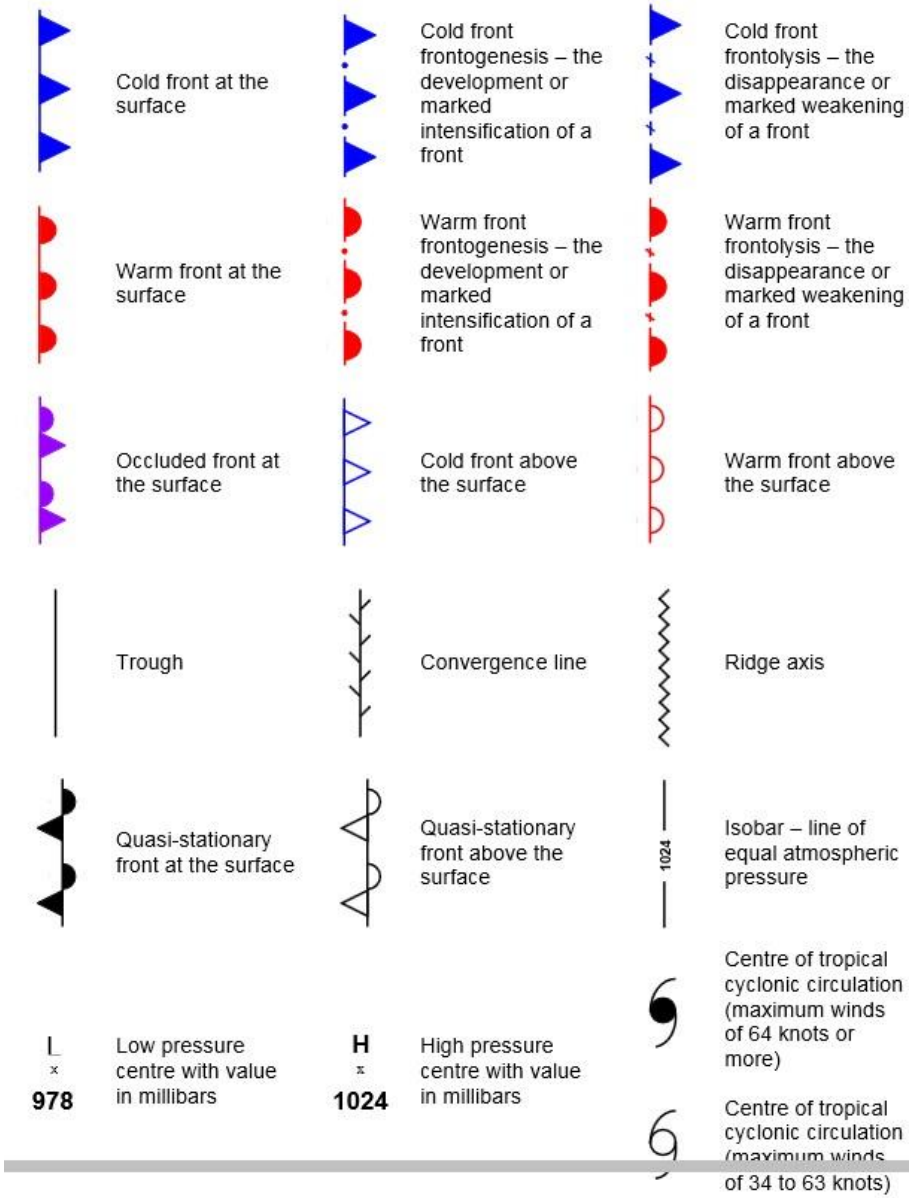
Present Weather Symbols

00  Cloud development NOT observed during past hour (not plotted)	01  Clouds generally becoming less developed (not plotted)	02  State of sky on the whole unchanged during past hour (not plotted)	03  Clouds generally forming or developing during past hour (not plotted)	04  Visibility reduced by smoke	05  Haze	06  Widespread dust in the air, not raised by wind at or near station	07  Dust or sand due to wind at or near the station but no dust whirl/sandstorm	08  Well developed dust whirl and/or sand whirl but no dust storm/sandstorm	09  Dust storm or sandstorm within sight or at the station during past hour
10  Mist	11  Patches of shallow fog at station, NOT deeper than 6 feet on land	12  More or less continuous shallow fog at station, NOT deeper than 6 feet	13  Lighting visible, no thunder heard	14  Precipitation within sight, but NOT reaching the ground	15  Precipitation within sight, reaching the surface, but more than 3 miles away	16  Precipitation within sight, reaching the surface within 3 miles	17  Thunder heard, but no precipitation at the station	18  Squall(s) within sight during past hour	19  Funnel cloud(s) and/or Tornado(es) during the preceding hour
20  Drizzle (not freezing) or snow grains, not as shower(s), has ended	21  Rain (not freezing) not falling as shower(s) , ended in the past hour	22  Snow not falling as shower(s) ended in the past hour	23  Rain and snow or ice pellets, not as shower(s) ended in the past hour	24  Freezing drizzle or freezing rain, not as shower(s) ended in the past hour	25  Shower(s) of rain ended in the past hour	26  Shower(s) of snow, or of rain and snow ended in the past hour	27  Shower(s) of hail, or of rain and hail ended in the past hour	28  Fog or ice fog ended in the past hour	29  Thunderstorm (with or without precipitation) ended in the past hour
30  Slight or moderate dust storm or sandstorm (has decreased in past hour)	31  Slight or moderate dust storm/sandstorm (no change during past hour)	32  Slight or moderate dust storm or sandstorm (has begun or increased)	33  Severe dust storm or sandstorm, decreased during the past hour	34  Severe dust storm or sandstorm, has no change during past hour	35  Severe dust storm or sandstorm has begun or increased	36  Slight or moderate drifting snow (generally below eye level)	37  Heavy drifting snow (generally below eye level)	38  Slight or moderate blowing snow (generally above eye level)	39  Heavy blowing snow (generally above eye level)
40 Fog at a distance, but not at the station during the preceding hour	41 Fog in patches	42 Fog, sky visible (has become thinner during preceding hour)	43 Fog, sky obscured (has become thinner during preceding hour)	44 Fog, sky visible (no appreciable change during the past hour)	45 Fog, sky obscured (no appreciable change during the past hour)	46 Fog, sky visible (has begun or has become thicker during past hour)	47 Fog, sky obscured (has begun or has become thicker during past hour)	48 Fog, depositing rime ice, sky visible	49 Fog, depositing rime ice, or ice fog, sky obscured
50 Drizzle, not freezing, intermittent (slight at time of observation)	51 Drizzle, not freezing, continuous (slight at time of observation)	52 Drizzle, not freezing, intermittent (moderate at time of observation)	53 Drizzle, not freezing, continuous (moderate at time of observation)	54 Drizzle, not freezing, intermittent (heavy at time of observation)	55 Drizzle, not freezing, continuous (heavy at time of observation)	56 Drizzle, freezing, slight	57 Drizzle, freezing, moderate or heavy	58 Drizzle and rain, slight	59 Drizzle and rain, moderate or heavy
60 Rain, not freezing, intermittent (slight at time of observation)	61 Rain, not freezing, continuous (slight at time of observation)	62 Rain, not freezing, intermittent (moderate at time of observation)	63 Rain, not freezing, continuous (moderate at time of observation)	64 Rain, not freezing, intermittent (heavy at time of observation)	65 Rain, not freezing, continuous (heavy at time of observation)	66 Rain, freezing, slight	67 Rain, freezing, moderate or heavy	68 Rain or drizzle and snow, slight	69 Rain or drizzle and snow, moderate or heavy
70 Intermittent fall of snowflakes (slight at time of observation)	71 Continuous fall of snowflakes (slight at time of observation)	72 Intermittent fall of snowflakes (moderate at time of observation)	73 Continuous fall of snowflakes (moderate at time of observation)	74 Intermittent fall of snowflakes (heavy at time of observation)	75 Continuous fall of snowflakes (heavy at time of observation)	76 Ice needles (with or without fog)	77 Snow grains (with or without fog)	78 Isolated star-like snow crystals (with or without fog)	79 Ice pellets (sleet)
80 Rain shower(s), slight	81 Rain shower(s), moderate or heavy	82 Rain shower(s), violent	83 Shower(s) of rain and snow mixed, slight	84 Shower(s) of rain and snow mixed, moderate or heavy	85 Snow shower(s), slight	86 Snow shower(s), moderate or heavy	87 Shower(s) of snow pellets or small hail, slight with or without rain or rain/snow	88 Shower(s) of snow pellets or small hail, moderate or heavy w/ or w/o rain/snow	89 Shower(s) of hail, slight, w/ or w/o rain or rain/ snow mixed, no thunder
90 Shower(s) of hail, w/ or w/o rain or rain/snow, no thunder, mod. or heavy	91 Thunderstorm during past hour w/ slight rain at time of observation	92 Thunderstorm during past hour w/ current moderate/ heavy rain	93 Thunderstorm ended w/ current slight snow, rain/ snow mixed, or hail	94 Thunderstorm ended w/ current moderate/heavy snow, rain/snow, or hail	95 Thunderstorm, slight or moderate, w/o hail but w/ rain and/or snow	96 Thunderstorm, slight or moderate, with hail at time of observation	97 Thunderstorm, heavy, w/o hail but with rain and/or snow	98 Thunderstorm combined with dust storm or sandstorm	99 Thunderstorm, heavy, with hail at time of observation

JetStream - An Online School for Weather
http://www.srh.noaa.gov/srh/jetstream/synoptic/wxmaps.htm

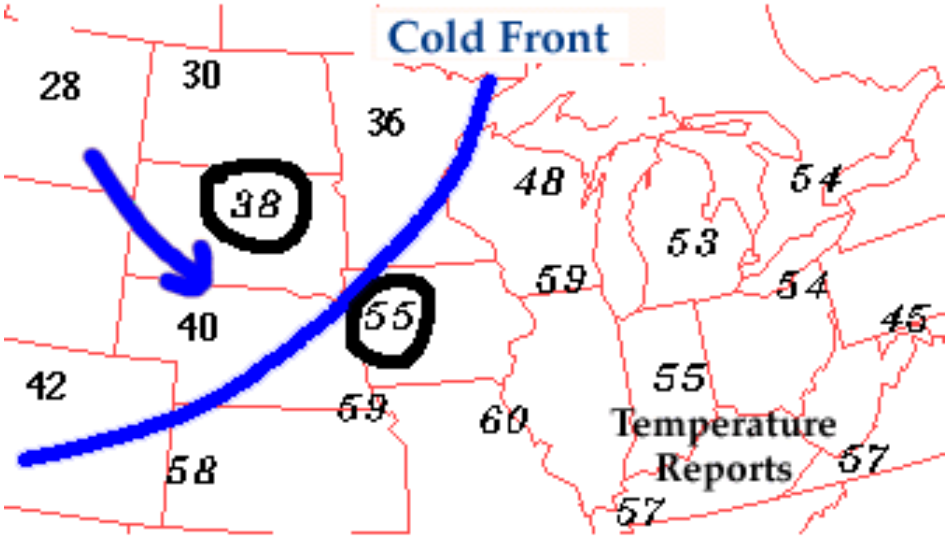
What is a front?

- At a frontal boundary, some or all of the following changes occur:
  - Temperature change
  - Change in dewpoint
  - Wind Shift
  - Pressure trough

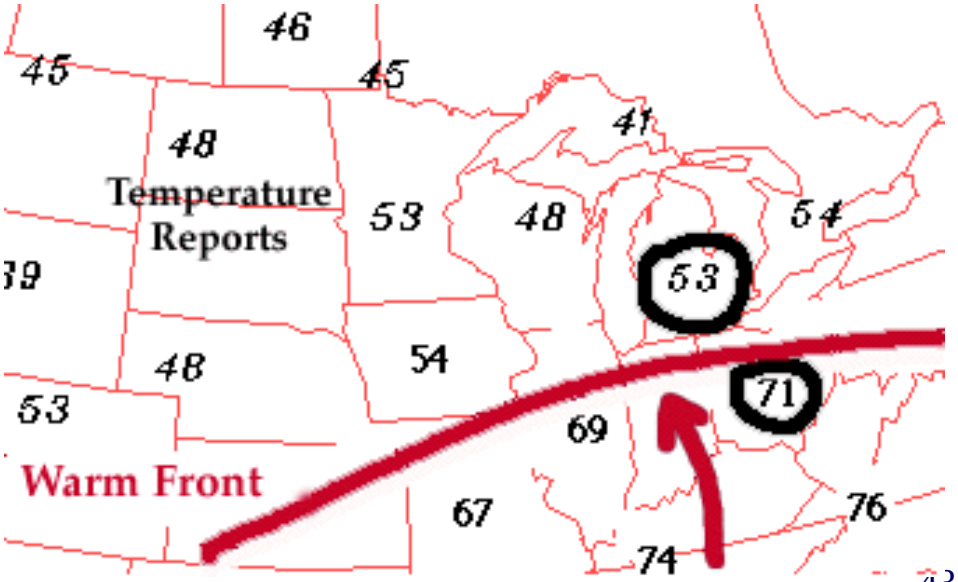


Cold and warm fronts

- A cold front is a boundary where cold, dry air is sliding under warm, moist air.
- A typical temperature change with a cold front is about 10°C but can vary greatly



- A warm front is a boundary where warm, moist air is advancing against cooler, drier air.
- Temperature change averages 7-8 °C but varies.

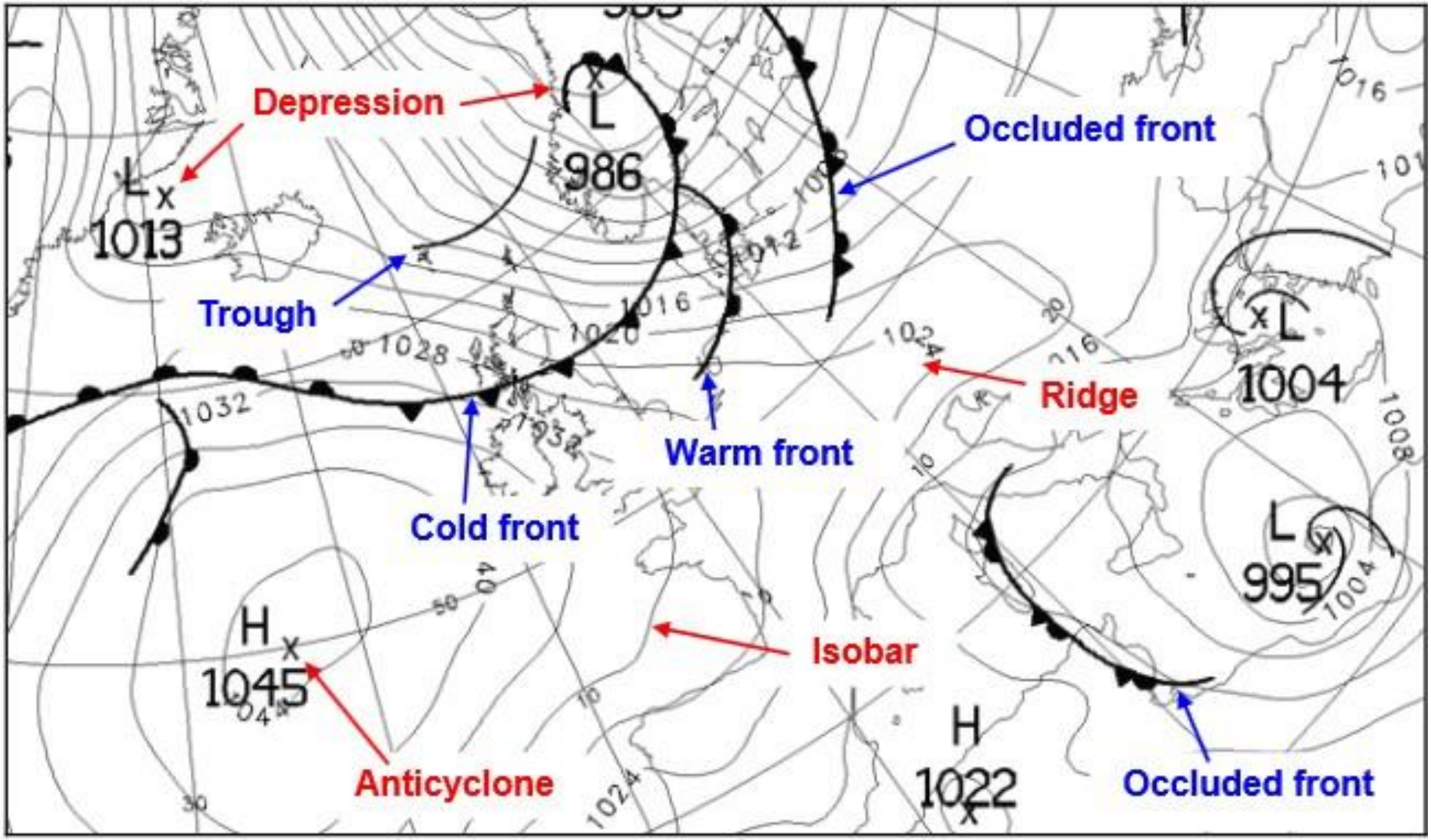


Stationary Front

- Boundary between warm, moist air and cold dry air in which neither air mass is advancing.
- Indicated by alternating blue triangles and red half circles.
- Often happens when front loses it's "punch" or is blocked by high pressure.

- A occluded front, or occlusion, occurs when a warm air mass and a cool air mass come in contact with each other, making boundaries at both the ground as well as aloft.
- Often associated with showers or snow (in winter) and is the beginning of the end to a storm.
- Indicated by triangles and half circles on the same side

Elements on a surface map



Correspondance between map and satellite