

Surface Pressure Charts and Meteorology Codes

Meteorology & Climatology

Environmental Science Degree

December 17, 2018

Date Performed: _____
Partners: _____

Instructor: _____ Prof. F. Pérez-Bernal

Abstract

This lab session aim is that students understand isobars and their relationship with wind speed, identify various pressure systems and fronts on a weather chart, and interpret and produce plotted weather symbols. For the latter case meteorology report codes, in particular the SYNOP code, is presented. Students should learn to encode a general weather situation to this code as well as to interpret the code both graphically and as a short weather report.

1 Introduction

Surface pressure charts show the surface pressure pattern using *isobars* (a particular kind of *isopleths*, solid lines joining points of equal sea level pressure) and indicate areas of high (*H*) and low pressure (*L*) along with their central pressure value. High pressure is usually associated with settled weather while low pressure is normally associated with unsettled weather.

In these charts fronts and other information of meteorological interest can be also displayed. In particular, in the so called *synoptic charts* an extensive information about the state of the atmosphere, usually reported with a graphical transcription of the SYNOP code, is graphically encoded and represented.

SYNOPSIS stands for *surface SYNOPSIS observation* and it is a numerical code (called FM-12 by the World Meteorological Office WMO[4, 3]) that has been used for decades as the main way of reporting and transmitting weather information. The observations could be made by manned and automated weather stations.

The international SYNOPSIS format has been used for real time transmission of synoptic weather observations for about 50 years and SYNOPSIS reports are typically sent every six hours by Deutscher Wetterdienst on shortwave and low frequency using RTTY. The introduction of Internet made this redundant.

A report consists of groups of five numbers (and slashes where data are not available) describing general weather information, such as the temperature, atmospheric pressure, precipitation, and visibility at a weather station.

In most countries, SYNOPSIS observations are made and transmitted each 3 hours at 0000, 0300, 0600, 0900, 1200, 1500, 1800, and 2100 Universal Time (UTC). There are two basic forms of land station surface synoptic reports, one of which is the complete form and the other is the shortened form. The complete form is referred to as the primary (or main) synoptic, the 6-hourly report, or SYNOPSIS. The primary synoptic is reported at the standard hours of observation which are: 0000, 0600, 1200, and 1800 UTC. The shortened form is referred to as the intermediate synoptic or the 3-hourly report.

The SYNOPSIS code is very similar to another code called the METAR. METAR is an abbreviation of *MÉTéorologique Aviation Régulière* and is a report designed for aviation that could be issued from an Automatic Weather Station (AWS) or a manned station. The METAR code is also managed by the WMO. METARs usually carry less information about the weather than SYNOPSISs and are issued more frequently. In particular, if conditions change significantly since the

last METAR, a SPECI, or special weather report is produced. SPECIs are sent to report heavy rain, sudden increase or direction change of wind, strong gusts, or sudden temperature or visibility variations.

2 Objectives

The objectives of this lab session are the following:

- a. Understand surface pressure maps and their relationship with wind speed.
- b. Identify pressure systems and fronts on a synoptic weather chart.
- c. Get acquainted with the SYNOP code to interpret and produce plotted weather symbols.

3 Isobars, pressure and winds

Isobar lines join points of equal pressure, in a similar way to height contours, on weather charts. Charts showing isobars help to identify anticyclones (high atmospheric pressure areas) and depressions or cyclones (low pressure areas). Pressure is measured in millibars¹ and isobars are normally drawn at intervals of $\Delta p = 4$ mb. Pressure values are corrected to Mean Sea Level Pressure (MSLP) before being plotted on a map, this ensures that altitude does not affect the mapping.

Drawing isobars in a map it is important to take into account the following considerations.

- Each map point can only be associated with one isobar, thus isobar lines never cross.
- Isobar lines are continuous, forming loops or terminating in the map edges, but never branch or terminate in a certain point.
- A particular sense can be given to an isobar considering that the pressure should grow to the right of the given sense.

Isobars are also helpful because their distribution helps us to understand the direction and strength of wind in a particular location. Where isobars are *close together*, for example near a low pressure area, they indicate *strong* winds. Where the isobars are more *widely spaced*, e.g. near an anticyclone, they indicate *light* winds.

Wind blows almost parallel to the isobars. Around a high pressure area (an anticyclone) winds blow clockwise and slightly across the isobars, away from the center of the anticyclone. In low pressure zones, wind blows anticlockwise slightly across the isobars towards the centre of the low pressure.

Buys Ballot's law states that if you stand with your back to the wind in the northern Hemisphere, low pressure will be on your left. With the help of this law that you can work out the wind direction at different locations on a weather chart.

There are several features of weather chart that can be easily identified.

An *anticyclone*, also known as a 'high' can be identified on a weather chart as an (often large) area of widely spaced isobars, where pressure is higher than in the surrounding area and the highest pressure occurs at the center which is known as the 'high pressure center'. Anticyclones can bring warm and sunny weather in summer, but cold and foggy weather in winter. In association with anticyclones, *ridges* are elongated extensions of areas of high pressure. They bring similar weather to that associated with anticyclones.

A *cyclone*, also known as a depression or a 'low' can be recognized on a weather chart by an area of closely spaced isobars, often in a roughly circular shape, where pressure is lower than surrounding areas. They are often accompanied by fronts. The lowest pressure occurs at the 'low pressure center', in the middle of a depression. Cyclones are often associated with strong winds and heavy rain and are nearly always accompanied by fronts. Associated with cyclones, *troughs* are elongated extensions of areas of low pressure and bring similar weather to that associated with depressions.

¹Remember: 1 mb = 1 hPa

Cold fronts can be identified on weather charts as bold lines with triangles. These are blue when displayed on color charts. The points of the triangle indicate the direction in which the front is moving. A cold front indicates a change in air mass, where warmer air is being replaced by colder air. They often bring short spells of heavy rainfall in the form of showers and squally winds, and are accompanied by a decrease in temperature, a veer in wind direction and a change to brighter showery conditions.

Warm fronts can be identified on weather charts as bold lines with semi-circles or humps. These are colored red when displayed on color charts. The direction of the humps indicates the direction in which the front is moving. A warm front indicates a change from a colder to a warmer air mass. They often bring spells of prolonged and sometimes heavy rainfall, with strong winds.

The warm sector of a depression is located behind the warm front and ahead of the cold front. It often brings mild temperatures but the weather can be overcast with drizzle.

Occluded fronts can be identified on weather charts as bold lines with sets of triangles and semi-circles. These are colored purple on colored weather charts. The direction in which the symbols face indicates the direction in which the front is traveling. Occlusions are formed when the cold front overtakes the warm front, therefore they have similar characteristics to a cold front, but less intense.

Other features of interest are *troughs* and *cols*. *Troughs* are lines of low pressure and high vorticity, with clouds, and possible precipitation, wind shift and confluence. They often do not possess the strong horizontal gradients of temperature and moisture that characterize fronts. *Cols* can be identified as an area of slack pressure between two anticyclones and two depressions.

4 Synop Code Description

The SYNOP code data are divided in four main groups:

000 Group Data Identifier

111 Group Land Observations

222 Group Sea Surface Observations

333 Group Climatological Data

Most reports do not make use all of the groups. For example, only at a coastal station would the section 222 (wave information) be included, and even that station might not include all of the groups in the 222 section. Also, individual groups may be left out of an observation for a number of reasons. Different regions may have requirements which will include groups or exclude groups, principally in section 333.

We will deal with land synoptic reports in the first group, which are often stated as *AAXX* and are compliant with the WMO Code FM 12 XI SYNOP. The general syntax of the SYNOP code for such reports is as follows

YYGGi_w IIII or *IIII 99LLL QLLLL*

i_Ri_XhVV Nddf f 00f ff 1sTTT 2sTTT 3PPPP 4PPPP 5appp 6RRRt 7wwW₁W₂ 8NC_LC_MC_H 9GGgg

222Dv 0sTTT 1PPHH 2PPHH 3ddd 4PPHH 5PPHH 6IEER 70HHH 8aTTT

333 0.... 1sTTT 2sTTT 3Ejjj 4Esss 5jjjjj jjjjj 6RRRt 7RRRR 8Nchh 9SSss

4.1 000 Group: Identification and Location

<i>YY</i>	The day of the month
<i>GG</i>	The hour of the observation (UTC)
<i>i_w</i>	Wind type indicator
<i>YYGGi_w</i>	0 m/s (estimated)
	1 m/s (from anemometer)
	3 knots (estimated)
	4 knots (from anemometer)

IIiii The WMO number of the station².

IIIII Ship or Buoy Observations. The ship or buoy identifier. (Not reported in land observations)

	<i>LLL</i>	Latitude of observation to 0.1 degrees
	<i>Q</i>	Quadrant of observation
	1	North east
99LLL QLLLL	3	South east
	5	South west
	7	North west
	<i>LLLL</i>	Longitude of observation to 0.1 degrees

4.2 111 Group: Land Observations

	0	Precipitation in groups 1 and 3
	1	Precipitation reported in group 1 only
<i>i_Ri_XhVV</i>	<i>i_R</i>	– Precipitation indicator
	2	Precipitation reported in group 3 only
	3	Precipitation omitted, no precipitation
	4	Precipitation omitted, no observation

	Value	Station	Weather group
	1	manned	included
	2	manned	omitted, no significant weather
<i>i_X</i>	3	manned	omitted, no weather observation
– Station type and present/past weather indicator	4	automated	included (see automated codes 4677 and 4561)
	5	automated	omitted, no significant weather
	6	automated	omitted, no weather observation
	7	automated	included (see automated codes 4680 and 4531)

	0	0 to 50 m
	1	50 to 100 m
	2	100 to 200 m
	3	200 to 300 m
	4	300 to 600 m
<i>h</i>	5	600 to 1000 m
– Cloud base of lowest cloud seen (meters above ground)	6	1000 to 1500 m
	7	1500 to 2000 m
	8	2000 to 2500 m
	9	above 2500 m
	/	unknown

	00 < 0.1 km	01 – 0.1 km	02 – 0.2 km	...	50 – 5.0 km
	56 – 6 km	57 – 7 km	58 – 8 km	...	80 – 30 km
	81 – 35 km	82 – 40 km	83 – 45 km	84 – 50 km	85 – 55 km
<i>VV</i>	86 – 60 km	87 – 65 km	88 – 70 km	89 – > 70 km	
– Visibility	90 – < 0.05 km	91 – 0.05 km	92 – 0.2 km	93 – 0.5 km	94 – 1 km
	95 – 2 km	96 – 4 km	97 – 10 km	98 – 20 km	99 – > 50 km
	//	– missing			

<i>Nddf f</i>	<i>N</i>	– Total cloud cover	0 – clear	1 – 1/8th	2 – 2/8ths	3 – 3/8ths	4 – 4/8ths	5 – 5/8ths
			6 – 6/8ths	7 – 7/8ths	8 – overcast	9 – sky obscured		/ – no observation

dd – wind direction in 10s of degrees

²In order to check station codes visit the url <http://weather.rap.ucar.edu/surface/stations.txt> or make a query at NOAA website <http://www.nws.noaa.gov/tg/siteloc.php>.

ff – wind speed in units determined by wind type indicator (see above)

00fff (optional) *fff* – wind speed if value greater than 100

1sTTT – Temperature

s – sign of temperature (0=positive, 1=negative)

TTT – Temperature in 0.1 °C

2sTTT – Dew point

s – sign of temperature (0=positive, 1=negative, 9 = RH)

TTT – Dew point temperature in 0.1 °C (if *s* is 9, *TTT* is relative humidity)

3PPPP – Station pressure in 0.1 hPa (thousandths digit omitted, last digit can be slash, then pressure in full hPa)

4PPPP – Sea level pressure in 0.1 hPa (thousandths digit omitted, last digit can be slash, then pressure in full hPa)

4a₃hhh – Geopotential of nearest mandatory pressure level (use for high altitude stations where sea level pressure reduction is not accurate)

<i>a₃</i> – mandatory pressure level	1 – 1000 mb	2 – 925 m	5 – 500 mb
	7 – 700 mb	8 – 850 mb	hhh – geopotential height omitting thousandths digit

5a_{ppp} – Pressure tendency over 3 hours

<i>a</i> – characteristics of pressure tendency	0 – Increasing, then decreasing – resultant pressure same or higher
	1 – Increasing, then steady – resultant pressure higher
	2 – Increasing steadily – resultant pressure higher
	3 – Decreasing or steady, then increasing – resultant pressure higher
	4 – Steady – resultant pressure same
	5 – Decreasing, then increasing – resultant pressure lower
	6 – Decreasing, then steady – resultant pressure lower
	7 – Decreasing steadily – resultant pressure lower
8 – Increasing or steady, then decreasing – resultant pressure lower	

ppp – 3 hour pressure change in 0.1 mb

6RRRt – Liquid precipitation

RRR – Precipitation amount in mm

001 – 1 mm	002 – 2 mm	...	988 – 988 mm	989 – 989 or more mm
990 – Trace	991 – 0.1 mm	992 – 0.2 mm	...	999 – 0.9 mm

t – Duration over which precipitation amount measured

1 – 6 hours	2 – 12 hours	3 – 18 hours
4 – 24 hours	5 – 1 hour	6 – 2 hours
7 – 3 hours	8 – 9 hours	9 – 15 hours
/ – 24 hours		

7wwW₁W₂ – Present and past weather

ww The present weather codes can be found in the next page.

W_1W_2 – Past weather (type 1 and 2)

- 0 – cloud covering less than half of sky
- 1 – cloud covering more than half of sky during part of period and more than half during part of period
- 2 – cloud covering more than half of sky
- 3 – sandstorm, dust storm or blowing snow
- 4 – fog, or thick haze
- 5 – drizzle
- 6 – rain
- 7 – snow or mixed rain and snow
- 8 – showers
- 9 – thunderstorms

8NC_LC_MC_H – Cloud type information

N – Amount of low clouds covering sky, if no low clouds, the amount of the middle clouds

C_L – Low cloud type

- 0 – no low clouds
- 1 – cumulus humilis or fractus (no vertical development)
- 2 – cumulus mediocris or congestus (moderate vertical development)
- 3 – cumulonimbus calvus (no outlines nor anvil)
- 4 – stratocumulus cumulogenitus (formed by spreading of cumulus)
- 5 – stratocumulus
- 6 – stratus nebulosus (continuous sheet)
- 7 – stratus or cumulus fractus (bad weather)
- 8 – cumulus and stratocumulus (multilevel)
- 9 – cumulonimbus with anvil
- / – low clouds unobserved due to darkness or obscuration

C_M – Middle cloud type

- 0 – no middle clouds
- 1 – altostratus translucidus (mostly transparent)
- 2 – altostratus opacus or nimbostratus
- 3 – altocumulus translucidus (mostly transparent)
- 4 – patches of altocumulus (irregular, lenticular)
- 5 – bands of altocumulus
- 6 – altocumulus cumulogenitus (formed by spreading of cumulus)
- 7 – altocumulus (multilayers)
- 8 – altocumulus castellanus (having cumuliform tufts)
- 9 – altocumulus of a chaotic sky
- / – middle clouds unobserved due to darkness or obscuration

C_H – High cloud type

- 0 – no high clouds
- 1 – cirrus fibratus (wispy)
- 2 – cirrus spissatus (dense in patches)
- 3 – cirrus spissatus cumulogenitus (formed out of anvil)
- 4 – cirrus unicus or fibratus (progressively invading sky)
- 5 – bands of cirrus or cirrostratus invading sky (less than 45° above horizon)
- 6 – bands of cirrus or cirrostratus invading sky (more than 45° above horizon)
- 7 – cirrostratus covering whole sky
- 8 – cirrostratus not covering sky but not invading
- 9 – cirrocumulus
- / – high clouds unobserved due to darkness or obscuration

9GGgg – Time of observation in hours and minutes (Optional)

ww – Present weather

00 – clear skies	01 – clouds dissolving	02 – state of sky unchanged	03 – clouds developing
Haze, smoke, dust or sand			
04 – visibility reduced by smoke	05 – haze	06 – widespread dust in suspension not raised by wind	
07 – dust or sand raised by wind	08 – well developed dust or sand whirls	09 – dust or sand storm within sight but not at station	
Non-precipitation events			
10 – mist	11 – patches of shallow fog	12 – continuous shallow fog	13 – lightning visible, no thunder heard
14 – precipitation within sight but not hitting ground			
16 – nearby precipitation but not falling at station			
18 – squalls within sight but no precipitation falling at station			
Precipitation within past hour but not at observation time			
20 – drizzle	21 – rain	22 – snow	23 – rain and snow
24 – freezing rain	25 – rain showers	26 – snow showers	27 – hail showers
28 – fog	29 – thunderstorms		
Dust storm, sandstorm, drifting or blowing snow			
30 – slight to moderate dust storm, decreasing in intensity			
32 – slight to moderate dust storm, increasing in intensity			
34 – severe dust storm, no change			
36 – slight to moderate drifting snow, below eye level			
38 – slight to moderate drifting snow, above eye level			
Fog or ice fog			
40 – Fog at a distance	41 – patches of fog	42 – fog, sky visible, thinning	43 – fog, sky not visible, thinning
44 – fog, sky visible, no change	45 – fog, sky not visible, no change	46 – fog, sky visible, becoming thicker	47 – fog, sky not visible, becoming thicker
48 – fog, depositing rime, sky visible	49 – fog, depositing rime, sky not visible		
Drizzle			
50 – intermittent light drizzle	51 – continuous light drizzle	52 – intermittent moderate drizzle	53 – continuous moderate drizzle
54 – intermittent heavy drizzle	55 – continuous heavy drizzle	56 – light freezing drizzle	57 – moderate to heavy freezing drizzle
58 – light drizzle and rain	59 – moderate to heavy drizzle and rain		
Rain			
60 – intermittent light rain	61 – continuous light rain	62 – intermittent moderate rain	63 – continuous moderate rain
64 – intermittent heavy rain	65 – continuous heavy rain	66 – light freezing rain	67 – moderate to heavy freezing rain
68 – light rain and snow	69 – moderate to heavy rain and snow		
Snow			
70 – intermittent light snow	71 – continuous light snow	72 – intermittent moderate snow	73 – continuous moderate snow
74 – intermittent heavy snow	75 – continuous heavy snow	76 – diamond dust	77 – snow grains
78 – snow crystals	79 – ice pellets		
Showers			
80 – light rain showers	81 – moderate to heavy rain showers	82 – violent rain showers	83 – light rain and snow showers
84 – moderate to heavy rain and snow showers	85 – light snow showers	86 – moderate to heavy snow showers	87 – light snow/ice pellet showers
88 – moderate to heavy snow/ice pellet showers	89 – light hail showers	90 – moderate to heavy hail showers	
Thunderstorms			
91 – thunderstorm in past hour, currently only light rain		92 – thunderstorm in past hour, currently only moderate to heavy rain	
93 – thunderstorm in past hour, currently only light snow or rain/snow mix		94 – thunderstorm in past hour, currently only moderate to heavy snow or rain/snow mix	
95 – light to moderate thunderstorm	96 – light to moderate thunderstorm with hail	97 – heavy thunderstorm	98 – heavy thunderstorm with dust storm
99 – heavy thunderstorm with hail			

4.3 222 Group: Sea Surface Observations

This is a more specialized field that will not be covered in the present lab session.

4.4 333 Group: Special/Climatological Data

This is a more specialized field that will not be covered in the present lab session.

4.5 Example of a SYNOP code interpretation

This example starting point is the following SYNOP code:

AAXX 08383 08181 12580 21212 10248 20093 49175 55006 60002 81201

The interpretation of the given report is as follows:

AAXX: FM12-XI Ext. SYNOP. Land Station

IIii = 08383: Location of the station, 08 means Spain and 383 means Huelva. You can check this online at [2].

YYGGi_w = 08181: Data taken on the 8-th day of the month at 18.00 with wind given in m s^{-1} units from anemometer.

i_Ri_XhVV = 12580: i_R = 1 means that precipitation is reported in group 1, i_X = 2 means that the station is manned and that no present/past weather is reported because of no significant changes. h = 5 means that lowest clouds appear at heights 600 to 1000 m. Finally VV = 80 means that minimum visibility extends to 30 km.

Nddf f = 21212: N = 2 means that two eighths of the sky is covered by clouds, dd = 12 means that wind is from south east (SE, 120°), and ff = 12 means that wind speed is $v = 12 \text{ m s}^{-1} = 12 * 1.94 = 23$ knots.

1sTTT = 10248: s = 0, positive temperature; TTT = 248, temperature $T = 24.8^\circ\text{C}$.

2sTTT = 20093: s = 0, positive dew point temperature; TTT = 093, temperature $\tau = 9.3^\circ\text{C}$.

4PPPP = 49175: PPPP = 9175, station pressure $p = 917.5 \text{ hPa}$.

5appp = 55006: a = 5, pressure tendency since last report is decreasing, then increasing with a lower resultant pressure; ppp = 006 stands for a $\Delta p = 0.6 \text{ hPa}$ in last three hours.

6RRRt = 60002: RRR = 0 stands for no precipitation and t = 2 during last 12 hours.

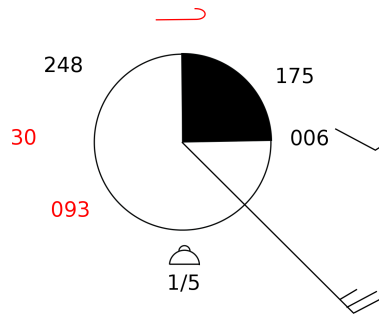
8NC_LC_MC_H = 81201: N = 1 means than 1 eighth of the sky is covered with low altitude clouds and C_LC_MC_H = 201 means that low clouds are *towering cumulus*, that there are no middle clouds, and that high clouds are *cirrus*.

5 Graphical Representation

Synoptic maps use a simple graphical representation to easily convey the information in a condensed way. The way the information is arranged can be found in figure 1. The center of the plot is a circle for manned stations or a triangle for automatic stations.

The conventional symbols used for cloud cover, pressure trend, past weather, and cloud types in this representation can be found in figure 2. The wind speed and present weather graphical codification are included in figures 1 and 3.

The graphical encoding of the example given in the previous subsection is the following:



6 Exercises

Exercise 1 Given the sea level pressure field values draw the associated isobar lines.

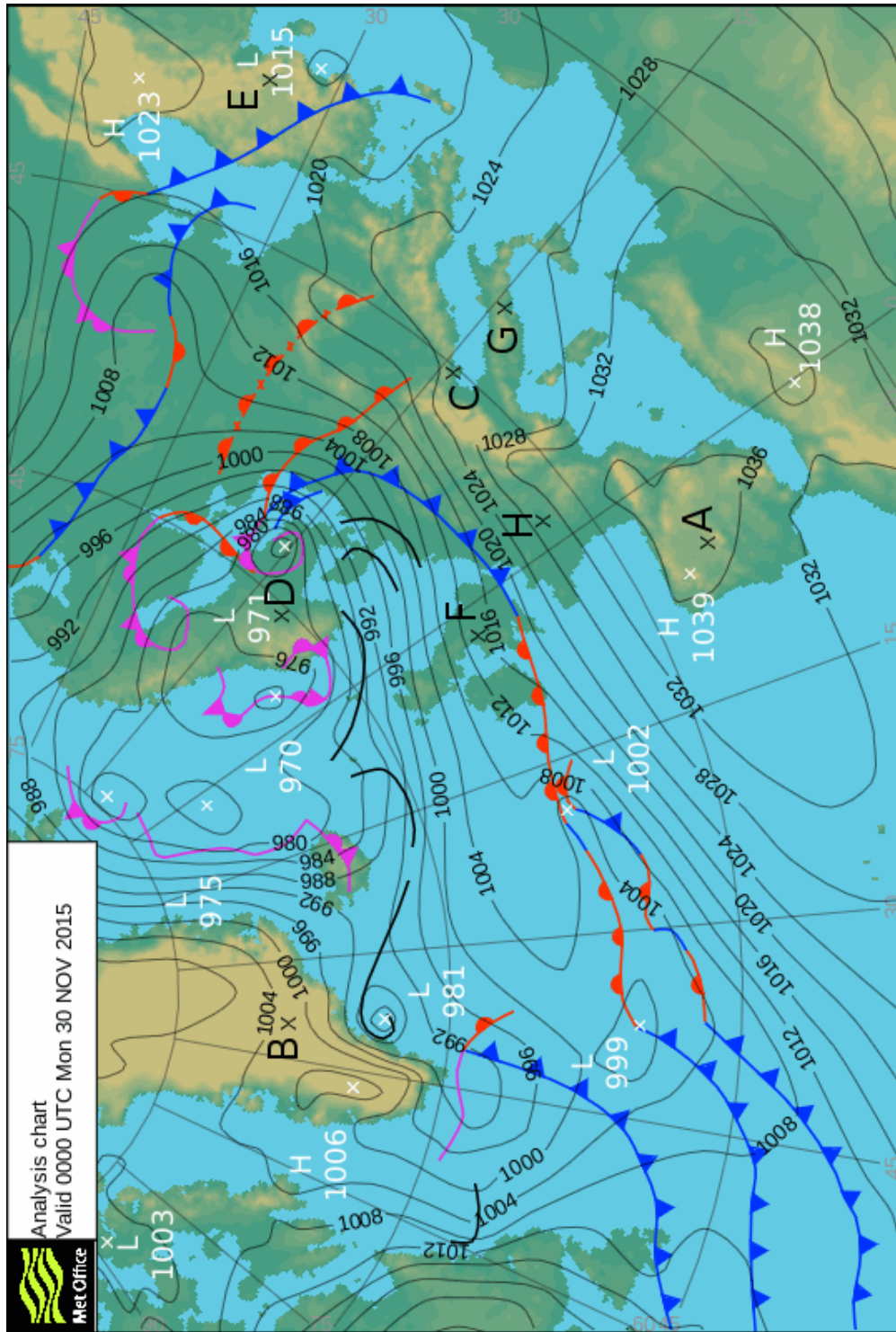
Exercise 2 Given the surface pressure chart represented in the figure fill the given table and find and label the following items:

Cold front	Col	Warm front
Trough	Occlusion	High pressure center
Low pressure trough	Low pressure center	High pressure ridge
Warm sector		

Location	Pressure in mb	Location	Pressure in mb
A		E	
B		F	
C		G	
D		H	

Exercise 3 Given the following SYNOP codes decipher them and encode them graphically.

08001	11430	82001	10108	20075		40310	51004	69901	75022	8562X
47606	11650	80516	10176	20141	39844	40104	52020	60092	71022	8552X
08180	32980	43216	10154	21019		40154	50003			83031
03535	41470	82312	10077	20064		40007	58012		72165	8682X
08001	11430	82001	10108	20075		40310	51004	69901	75022	8562X
47662	12970	20203	10203	20151	30150	40193	56005	60001		80002



Exercise 2. Met Office SYNOP Map.

References

- [1] Royal Meteorological Society metlink. <http://www.metlink.org/secondary/a-level/>

weather-charts/.

- [2] Telecommunication Operations Center noaa - us. <http://www.nws.noaa.gov/tg/siteloc.php>.
- [3] J. A. Almazan et al. Surface Synoptic Codes – Federal Meteorological Handbook No. 2. Technical report, OFCM – NOAA, 1988.
- [4] S. of the World Meteorological Organization. Manual on codes, part a — alphanumeric codes. Technical Report WMO-N.306, World Meteorological Organization, 1995.
- [5] R. Stull. *Practical Meteorology*. UBC, 2015.

A Appendix: SYNOP code graphical transcription

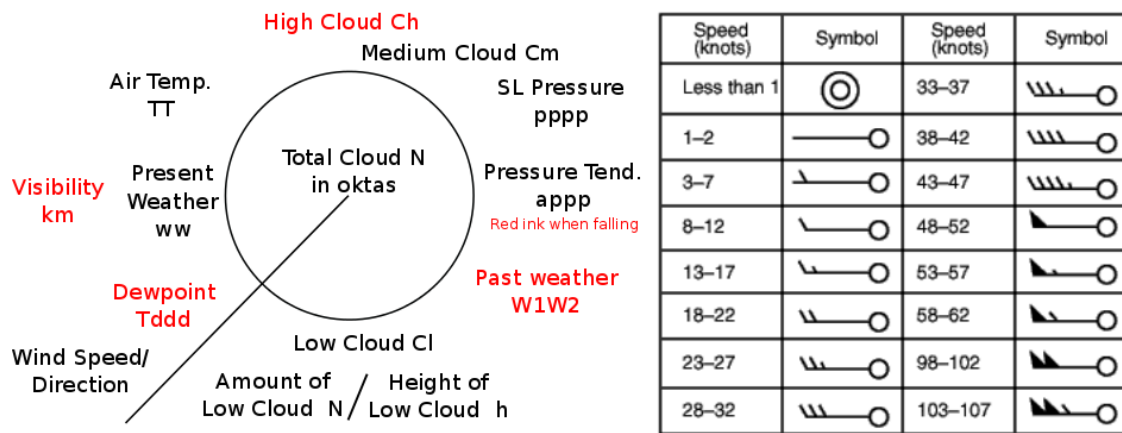





























































































































































Figure 1: Left: Example of graphical codification of a SYNOP report. Black ink should be used unless otherwise stated. Right: Conventional codification for wind speed in a SYNOP report. Source: RMetS, The Royal Meteorological Society.

MISCELLANEOUS SYMBOLS					
The numbers pertain to code representations used in transmitted reports, and the pictograms are used as part of a station plot.					
N Total sky cover	a Pressure trend	W Past weather	C _L Low cloud	C _M Middle cloud	C _H High cloud
0  No clouds.	0  Rising then falling.	0  Cloud covering half or less of sky throughout period.	0  No low clouds.	0  No middle clouds.	0  No high clouds.
1  1/8, or 1 tenth cloud cover.	1  Rising, then steady, or rising, then rising more slowly.	1  Cloud covering both more than half and less than half of sky during period.	L1  CUMULUS, with little vertical development and seemingly flattened.	M1  ALTOSTRATUS, semitransparent, thin enough to see sun/moon.	H1  CIRRUS, in the form of filaments or hooks, not invading the sky.
2  2/8, or 2 to 3 tenths cloud cover.	2  Rising, steadily or unsteadily.	2  Cloud covering more than half of sky throughout period.	L2  CUMULUS, of considerable size. Towering cumulus.	M2  ALTOSTRATUS or NIMBOSTRATUS. The sun/moon can't be seen.	H2  CIRRUS, dense, and in patches/twisted sheaves, not invading sky.
3  3/8, or 4 tenths cloud cover.	3  Falling or steady, then rising; or rising then rising more rapidly.	3  Sandstorm, or duststorm, or drifting or blowing snow.	L3  CUMULONIMBUS, tops are not fibrous, cirriform, or anvil-shaped.	M3  ALTOCUMULUS, at single level, and semitransparent.	H3  CIRRUS, often anvil-shaped and associated with cumulonimbus.
4  4/8, or 5 tenths cloud cover.	4  Steady.	4  Fog or thick haze.	L4  STRATOCUMULUS, formed by the spreading out of cumulus.	M4  ALTOCUMULUS, in patches, continuously changing.	H4  CIRRUS, in the form of hooks or filaments, invading the sky.
5  5/8, or 6 tenths cloud cover.	5  Falling, then rising.	5  Drizzle.	L5  STRATOCUMULUS, not formed by the spreading out of cumulus.	M5  ALTOCUMULUS, invading sky and usually thickening.	H5  CIRRUS or CIRROSTRATUS, invading sky, bulk not 45° above horizon.
6  6/8, or 7 to 8 tenths cloud cover.	6  Falling, then steady, or falling, then falling more slowly.	6  Rain.	L6  STRATUS, in continuous layer or shreds. No stratus of bad weather.	M6  ALTOCUMULUS, formed by spreading out of cumulus.	H6  CIRRUS or CIRROSTRATUS, invading sky, bulk 45° or more above horizon.
7  7/8, or 9 tenths cloud cover.	7  Falling, steadily or unsteadily.	7  Snow.	L7  STRATUS, of bad weather (scud), and often with nimbostratus.	M7  ALTOCUMULUS, not invading sky, usually double-layered/opaque.	H7  CIRROSTRATUS, completely covering the sky.
8  Sky completely covered with clouds.	8  Steady or rising, then falling, or falling, then falling more rapidly.	8  Showers.	L8  STRATOCUMULUS and CUMULUS with bases at different levels and not formed by spreading Cu.	M8  ALTOCUMULUS, in the form of cumuliform tufts (castellanus).	H8  CIRROSTRATUS, not invading the sky and not completely covering sky.
9  Sky obscured (clouds not visible due to rain, snow, fog, or other obscuration).	9  NOT USED	9  Thunderstorm, with or without precipitation.	L9  CUMULONIMBUS, whose tops are clearly fibrous or anvil-shaped.	M9  ALTOCUMULUS, at many layers (a chaotic sky).	H9  CIRROCUMULUS predominating all other cirriform clouds.

©1998 Weather Graphics Technologies

Figure 2: Example of standard graphical codification for cloud cover, pressure trend, past weather, and cloud types in a SYNOP report. Source: Weather Graphics Technologies.

WEATHER SYMBOLS										Numbers indicate the weather code as used in synoptic weather reports (ww, present weather reported from a manned weather station, as defined in WMO Pub. No. 306-A).									
00  Cloud development not observed/observable during past hour.	01  Clouds generally dissolving during past hour.	02  State of sky unchanged during past hour.	03  Clouds generally forming or developing during past hour.	04  Visibility reduced by smoke.	05  Haze.	06  Dust suspended in the air, but not raised by wind.	07  Dust or sand raised by wind.	08  Dust devils now or within past hour.	09  Duststorm or sandstorm not at station but within sight.	10  Mist.	11  Patches of shallow fog at station, not deeper than 2 m (10 m at sea).	12  Continuous shallow fog at station, not deeper than 2 m (10 m at sea).	13  Lightning visible, but no thunder heard.	14  Precipitation visible but not reaching ground at station.	15  Precipitation reaching the ground not at or near the station but at a distance.	16  Precipitation reaching the ground not at the station but nearby.	17  Thunder heard but no precipitation at the station.	18  Wind squall now or during the past hour.	19 Tornado, waterspout, or funnel cloud observed now or during past hour.
20  Recent drizzle (not freezing, not showers) during past hour.	21  Recent rain (not freezing, not showers) during past hour.	22  Recent snow (not showers) during past hour.	23  Recent rain and snow (not showers) during past hour.	24  Freezing drizzle or rain (not showers), not now but during past hour.	25  Rain showers, not now but during past hour.	26  Snow showers, not now but during past hour.	27  Hail or hail and rain, not now but during past hour.	28  Fog, not now but during past hour.	29  Thunderstorm, with or without precipitation, not now but during past hour.	30  Slight/moderate duststorm or sandstorm, decreased during hour.	31  Slight/moderate duststorm or sandstorm, no change during hour.	32  Slight/moderate duststorm or sandstorm, increased during hour.	33  Severe duststorm or sandstorm, which has decreased during hour.	34  Severe duststorm or sandstorm, no change during past hour.	35  Duststorm or sandstorm, severe, has increased during past hour.	36  Drifting snow, slight or moderate.	37  Drifting snow, heavy.	38  Blowing snow, slight or moderate.	39 Blowing snow, heavy.
40  Fog at a distance but not at station during past hour.	41  Patchy fog.	42  Fog, sky discernible and has become thinner during past hour.	43  Fog, sky not discernible, and has become thinner during past hour.	44  Fog, sky discernible, no change during past hour.	45  Fog, sky not visible, no change during past hour.	46  Fog, sky visible, has begun or become thicker during past hour.	47  Fog, sky not visible, has begun or become thicker during past hour.	48  Freezing fog, sky visible.	49  Freezing fog, sky not visible.	50  Drizzle, light, intermittent, not freezing.	51  Drizzle, light, continuous, not freezing.	52  Drizzle, moderate, intermittent, not freezing.	53  Drizzle, moderate, continuous, not freezing.	54  Drizzle, heavy, intermittent, not freezing.	55  Drizzle, heavy, continuous, not freezing.	56  Freezing drizzle, light.	57  Freezing drizzle, moderate or heavy.	58  Drizzle and rain mixed, light.	59 Drizzle and rain mixed, moderate or heavy.
60  Rain, light, intermittent, not freezing.	61  Rain, light, continuous, not freezing.	62  Rain, moderate, intermittent, not freezing.	63  Rain, moderate, continuous, not freezing.	64  Rain, heavy, intermittent, not freezing.	65  Rain, heavy, continuous, not freezing.	66  Freezing rain, light.	67  Freezing rain, moderate or heavy.	68  Rain and snow mixed, light.	69  Rain and snow mixed, moderate or heavy.	70  Snow, light, intermittent.	71  Snow, light, continuous.	72  Snow, moderate, intermittent.	73  Snow, moderate, continuous.	74  Snow, heavy, intermittent.	75  Snow, heavy, continuous.	76  Ice needles, with or without fog.	77  Snow grains, with or without fog.	78  Snow crystals, with or without fog.	79 Ice pellets (sleet).
80  Rain showers, light.	81  Rain showers, moderate or heavy.	82  Rain showers, torrential.	83  Rain/snow showers mixed, light.	84  Rain/snow showers mixed, moderate or heavy.	85  Snow showers, light.	86  Snow showers, moderate or heavy.	87  Ice pellet showers, light.	88  Ice pellet showers, moderate or heavy.	89  Hail, light, not associated with thunder.	90  Hail, moderate or heavy, not associated with thunder.	91  Rain, light. Thunder heard during past hour but not now.	92  Rain, moderate or heavy. Thunder heard during past hour but not now.	93  Light snow or rain/snow mixed with hail. Thunder heard during past hour.	94  Moderate or heavy snow or rain/snow with hail. Thunder in past hour.	95  Thunderstorm, light or moderate. Rain or snow, but no hail.	96  Thunderstorm, light or moderate, with hail.	97  Thunderstorm, severe. Rain or snow, but no hail.	98  Thunderstorm, with duststorm or sandstorm.	99 Thunderstorm, severe, with hail.

Copyright ©1998 WEATHER GRAPHICS TECHNOLOGIES, P.O. Box 450211, Garland TX 75045 www.weathergraphics.com

Figure 3: Example of standard graphical codification for present weather in a SYNOP report. Source: Weather Graphics Technologies.