

EGS 312 : Atmospheric processes

Hurricane [Jeanne](#)

Weather stations

[http://ww2010.atmos.uiuc.edu/\(Gh\)/guides/maps/sfcobs/home.rxml](http://ww2010.atmos.uiuc.edu/(Gh)/guides/maps/sfcobs/home.rxml)

<http://www.hpc.ncep.noaa.gov/html/stationplot.shtml>

For wind speed:

1knot = 1.9km/h (so essentially double to get to km/h)

For temperature (Tf to Tc):

$T_c = (5/9) * (T_f - 32)$

eg. 98.6 degrees F --> degrees Celsius: $(98.6 - 32) * 5/9 = 37$ degrees Celsius.



Mount Everest has been shown to be 29,028 feet high. The summit of Mount Everest has an average pressure around 300 mb. This picture shows Hillary's camp set at about 20 000 feet looking up to the summit.

What to look at when making a forecast

A. Synoptic chart

1. Pressure systems and their related weather conditions (synoptic types)
2. Isobars (wind speed and direction)
3. Station data
4. Check the upper air situation to gauge the intensity of the systems
5. When forecasting on a station scale you need to know topography and what effect this may have on the local weather eg. the influence of a water mass, temperature drop with altitude (especially if wind is blowing), modified wind flow and speed.
6. The characteristics of a system will be different in different seasons.

B. Satellite photo

1. Clouds and temperature

C. Radar

1. For short time scale forecast (0.5 – 1.5 hours); precipitation
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Practical Forecasting - some examples to work through

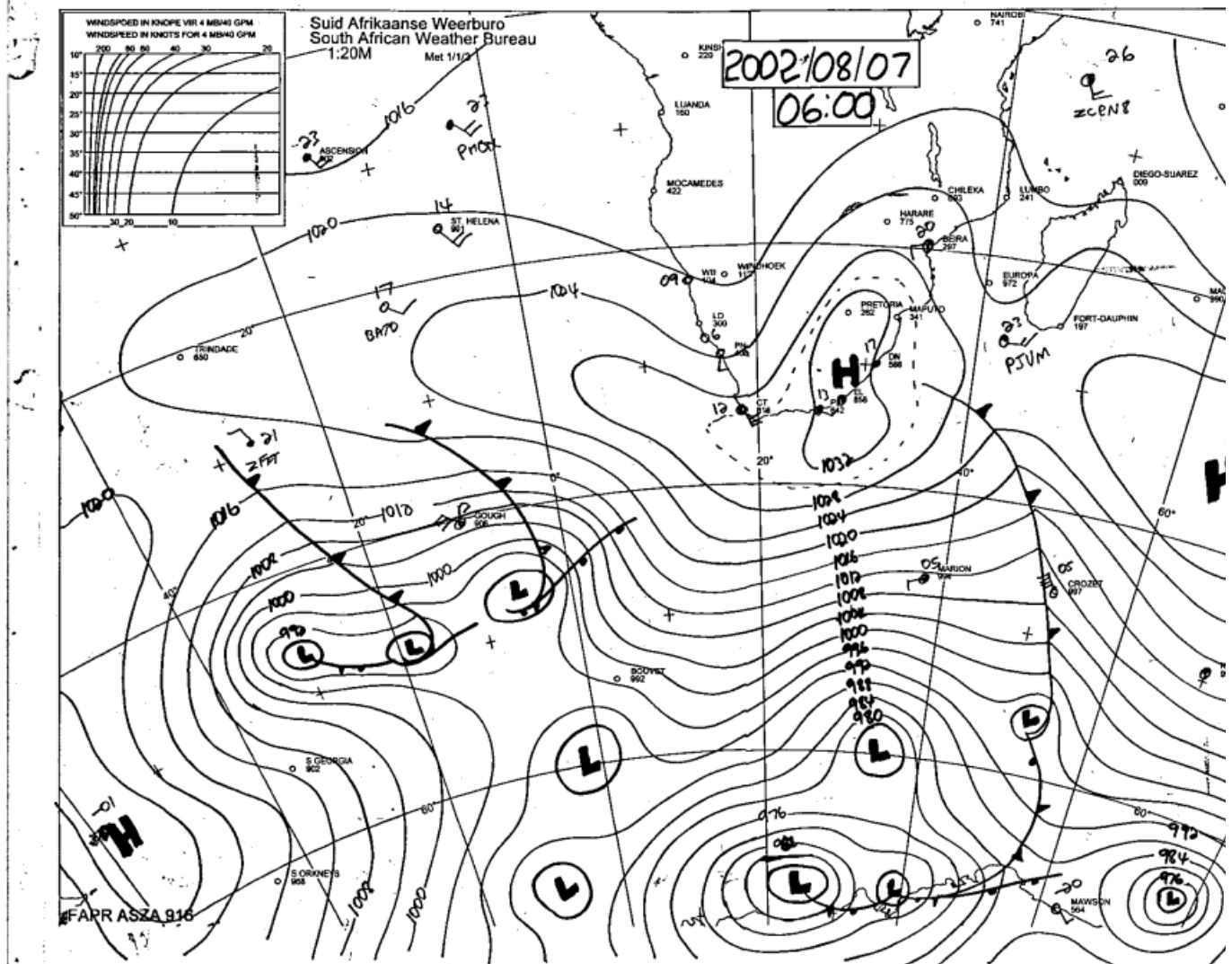
Example 1: Reading the synoptic map

What sort of weather would you expect in the following places on this day based on the 06Z (08:00 am SAST) synoptic map? Please give estimates of

- 1. wind direction and speed*
- 2. maximum temperature*
- 3. relative humidity*
- 4. cloud cover*

This is low-tech using blunt tools, so don't panic, just try and give a rough estimate of the weather.....

- 1. Cape Town*
- 2. Bloemfontein*
- 3. Durban*



What was observed (lets use the METAR code)?

METAR is a METErological Aerodrome Report, required for landing and taking off of all commercial airlines

The latest METARS are posted at: <http://weather.noaa.gov/mgetmetar.php>

Useful interpretation site: <http://weather.gladstonefamily.net/site/FACT>

The code is: SSSS DDHHMM *Z* DDVVV*KT* cloud TT/TD *Q* PPPP, where

- SSSS = the four letter station identity
- DD = day of month
- HH = 24-hour
- MM = minute
- DD = wind bearing (tens of degrees)
- VVV = wind speed (in knots)
- TT = air temperature

- **TD = dew point**
- **PPPP = air pressure in hPa or mb**
- **CAVOK = clouds and visibility OK (for aviation)**

The METARs for the above synoptic state were:

1. **Cape Town: FACT 071230Z 18004KT CAVOK 20/11 Q1023**
2. **Bloemfontein: FABL 071200Z 27006KT 250V310 CAVOK 24/M02 Q1029**
Variable wind direction betw 250 and 310 deg; M=minus
3. **Durban: FADN 071230Z 13006KT 9999 FEW015 21/13 Q1029**

9999 - visibility >er 9999 meters; FEW015 - Few clouds at 1500 feet.

Other examples of METARs:

METAR FADN 130430Z 29003KT 9000 SKC 11/08 Q1024 NOSIG=

Explanation:

Location Durban(FADN), 13th at 04:30 utc, wind direction 290 degrees at 3 knots, visibly 9000m, clear skies(SK), temperature 11 degrees / dewpoint temperature 8 degrees, QNH 1024 Hpa(mb), no significant change expected(NOSIG), end of bulletin(=).

**METAR FAJS 170530Z 35007KT 0500 R/21R0150 R/03L0300V0700 FG
OVC000 FEW///CB T07/07 Q1025 FM0535 TL0615 0100 RMK
THUNDER=**

Explanation:

Location Johannesburg Int. Airport(FAJS), 17th at 05:30 utc, wind 350 degrees at 7 knots, visibility 500m, designator on runway 21 right - visibility 150m, at designator 03 left visibility 300m with a tendency to increase to 700m, fog, overcast cloud at 0ft, few Cumulonimbus cloud of which the observer is unable to determine the cloud base(///), temperature 7 degrees / dewpoint temperature 7 degrees, QNH 1025 Hpa. Here the observation ends and the trend forecast begins, from 05:35 until 06:15 the visibility is expected to be 100m. RMK signifies the end of the trend forecast and the observer remarks that thunder was heard at the time of observation.

What is significant about the remark in this case is, if the observer had heard no thunder during the time of observation, the term FEW///CB would not have been included in the METAR.

Click [here](#) (SAWS) if you want more on METARS.... and TAFs (Terminal Aerodrome Forecasts)

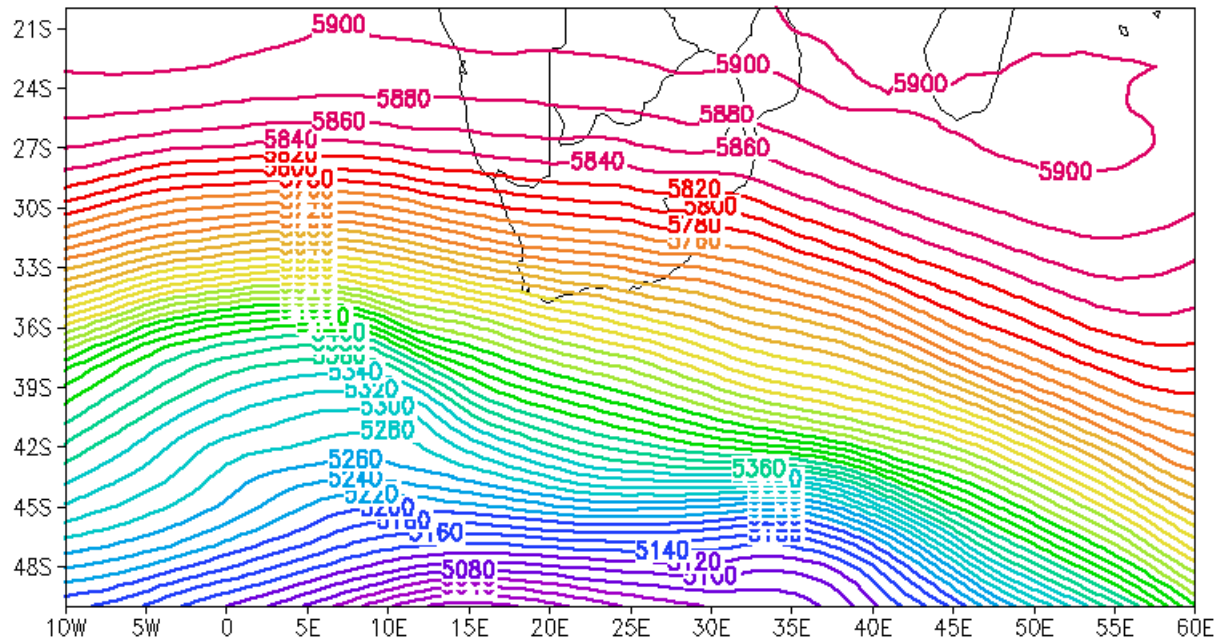
Example 2: Using GCM forecast maps

Discuss the sort of weather expected in the following regions based on these maps...

1. ***Western Cape***
2. ***Eastern Cape***
3. ***Limpopo Province***

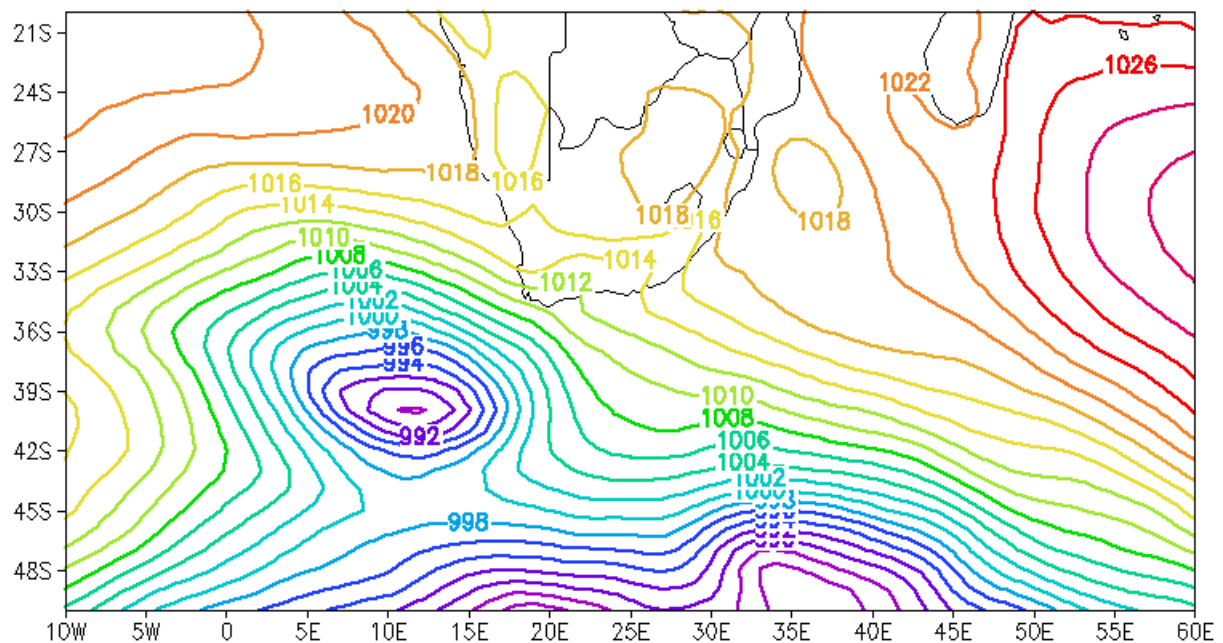
500 hPa Heights

12Z 28 July 2002



Sea-level Pressure

12Z 28 July 2002



What can we expect? (Subjective is good - remember man-machine mix)

First what are the main features on these maps:

1. **The season is winter** (see table below for temperature definitions)
2. **Well-developed mid-latitude cyclone at the surface (40S 10E), close enough to Cape Town for impact! Pressure gradients are tight so wind should be strong**

3. **The 500hPa heights are not showing a strong trough, the system is driven largely at the surface. This may limit the amount of snow on the mountains**
4. **Winds are off-shore along the east coast, but backward trajectories indicate that this is not a true berg-wind situation. The air may be dry but not hot.**
5. **Further north the pressure gradients are slack in the anticyclone belt, not much happening there.**

1) Western Cape: Cloudy and cold with rain, wind strong northwesterly (possibly gale-force).

2) Eastern Cape: Partly cloudy and mild with showers later in the west as front moves in. Wind strong north-westerly to westerly

3) Limpopo: Fine and mild

Note: temperature forecasts are just a guess at this point, we obviously need observations and 24-hour changes to do a good job of it, but returning to climatology and the basic elements of the synoptic situation we can give a reasonable estimate. Temperature categories as used operationally by the SA Weather Service are given in the table below:

Maximum temperature	Summer	Winter
Very Cold		< 7
Cold	< 15	7 - 12
Cool	15 - 20	12 - 17
Mild	20 - 25	17 - 22
Warm	25 - 30	22 - 27
Hot	30 - 35	> 27
Very Hot	> 35	

Some more [charts](#)

Your weekend weather according to EGS_312!!

For Saturday, Sunday and Monday give a forecast for the following regions for 6am and 2pm.

	Temp	Pressure	Wind speed	Wind dir.	Cloud cover	Precip
Durban						
Cape Town						
Johannesburg						
PE						
UCT						

Weather Forecasting - Summary

Need to know 2 things:

- 1. The state of the atmosphere**
- 2. The laws that govern that state**

A. Forecast methods:

- 1. Objective method – computers do the work numerically**
- 2. Subjective method – Synoptic archetypes, extrapolation/interpolation, analogue systems, climatology, local weather knowledge**

B. Observations

- 1. Measurements**

Class 1 - *in situ* measurements, thermometer, barometer, anemometer etc

Class 2 - remote using EM, eg radar, aircraft and satellite

Class 3 – wind velocities (balloon tracking, satellite cloud tracking and scatterometer)

- 2. Error**

Natural error – instrument error and error of representativeness

Gross error – calibration, telecommunication, coding

- 3. Data observation**

Surface -land synop, marine and satellite

Radiosondes – vertical profile; wind speed and dir., temperature and dew point temperature, humidity

Aircraft – wind and temperature

Satellites – wind, temperature

C. Check data quality

Objectively – filtering rules written to check data

Subjectively – Eyeballing the data

D. Dissemination of data to organizations using it

World Meteorological Organization

World Weather Watch

E. Analysis

Subjective – synoptic charts, weather stations, etc...

Objective –

|-----Initialization-----|

Previous forecast --> + checked observed data --> analysis increment --> new forecast --> + obs data --> analysis increment --> new forecast etc...

Observations at 00Z and 12Z for initialization

F. Forecast clients

Aviation, shipping, agriculture, government, commercial, public

Finally:

Forecasting combines objective numerical forecasts with subjective human experience to get a best forecast.

