Monana

THE OFFICIAL PUBLICATION OF THE AUSTRALIAN METEOROLOGICAL ASSOCIATION INC
June 2020

From the President's Pen

by Mark Little

When a duck glides across a pond, it usually looks like the duck isn't doing much, but under the water its feet are paddling like crazy. The same can currently be said about the AMetA Committee.

The Committee is having to deal with the potentially conflicting objectives of getting the membership back together while making sure that it does nothing that could reasonably be expected to put the members' health at risk.

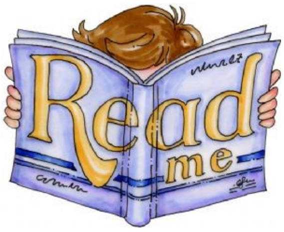
Based on the current information, the first physical meeting since the pandemic struck (the AGM) is planned for the third Tuesday of August (18th August). Unfortunately, it is unlikely that the BOM meeting room will be available to us. It is understandable their COVID-19 safety plan does not account for strangers potentially contaminating their meeting room and kitchen.

As a result, the Committee is looking for an alternate meeting location in the Adelaide CBD (Central Business District). Unlike the BOM meeting room, these locations do not come free of charge. It is expected that each meeting will cost at least $75 per meeting. This is an extra few hundred dollars a year that the AMetA will need to find. This will be a bit complicated as the Committee has decided to defer raising the membership fee for the 2020-2021 membership .

Just to complicate matters, there is also a possibility that by August, the state of the COVID-19 pandemic may be such that the risk to members is not yet at an acceptable level. This means that the Committee is planning for an alternative August meeting – an on-line AGM. Like the change of meeting room location, but additional costs will be involved.

Through all this activity, the Committee is still carrying out its "ordinary" tasks such as managing the administrative duties required by the law, and organising support for Citizen Science projects that digitise historical information that is of significance to Meteorology and the history of Meteorology in Australia.

The Committee is attempting to provide a wider range of articles to members in the *Monana* magazine and encouraging members to share their projects and weather-related anecdotes in the Monana by running a competition for magazine articles. As was expected, there hasn't been a rush of articles, but it is hoped that members will eventually realise that the odds of winning a prize for themselves (or a give-away) are incredibly high and "That could have been me!!"



Although many members are not interested in Personal Weather Stations, the articles in the PWS edition of the *Monana* may include some interesting information about basic Meteorology before launching into technical discussions about gathering observations, electronics, and computer programming.

Hopefully, the effort that the Committee members are putting into our Association is keeping members interested. If you have any suggestions on how to improve our Association during these COVID-19 times, please let us know.

Keep Happy, Keep Safe.

Article Competition - Great Prizes - See Back Page (Click to Follow Link)

Members are also encouraged to submit weather related photos to monana@ameta.org.au for publication in *Monana.*

The Wind in The Willows

by Mark Little

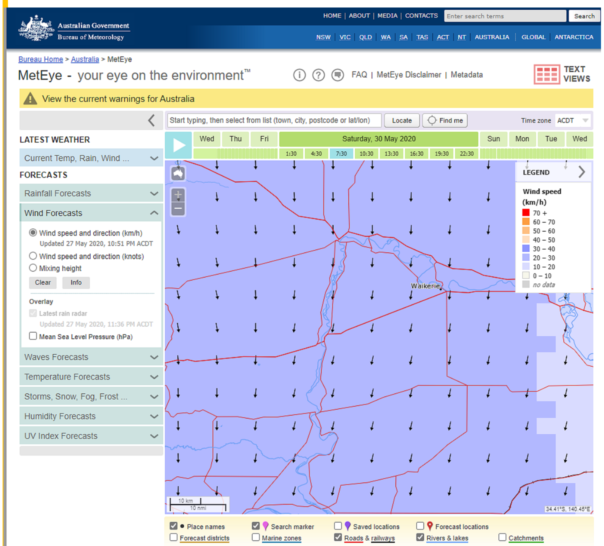
"Believe me, my young friend, there is nothing - absolutely nothing - half so much worth doing as simply messing about in boats"

- Kenneth Grahame "The Wind in the Willows"

#Ratty (the Water Rat) never said a truer statement than the one above, but while this article is about the wind in the willows, it has nothing to do with that famous 1905 book and more to do with the Bureau Of Meteorology (BOM). It is about the actual wind in the actual willows along the Murray River.

But let's not get ahead of ourselves. It is perhaps best to go back to the Article "2019 Wild Weather on the Murray" in the February 2020 edition of the Monana magazine which deals with a houseboat trip along the lower Murray River and how it was impacted by heavy winds. Well, nearly 12 months later, it is almost time to go out on the river again and brave the winter weather, while keeping the COVID-19 social isolation intact. That is, the crew will be myself, my wife Alexa and our dog Marduk.

This time, however, we will be using a tool from the BOM to help us plan our voyage. As the previous article indicated, the wind can be dangerous for houseboats, especially those that are slab-sided and a couple of stories tall. The wind can catch the superstructure and make it difficult to steer the boat. At times on that trip, the wind slowed the boat by about 4kph, which does not seem like much until you realise that the houseboat normally only travels at about 7.5kph. At that slower rate, the houseboat will use more than twice the amount of fuel than normal and it is forever crashing into the waves on the river, causing the plates and glasses to go tumbling if you are not careful. Of course, running with the wind can reduce your fuel consumption, but the boat can become a bit more difficult to steer.

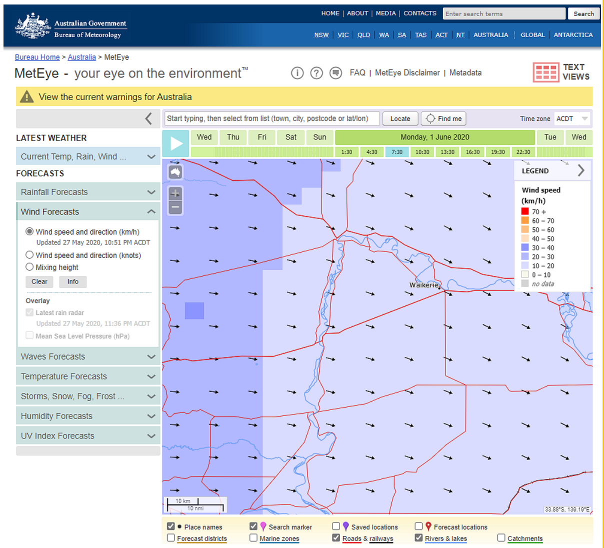


So, what can the BOM do for us when we are looking at moving along the river? Well, this is where the BOM's MetEye webpages comes in. It can provide high (er) resolution maps of the forecast wind and direction that can be used to plan when and where we should go. As an example, to the left is a wind forecast (from 27th May) for 07:30 on the 30th May along the Murray River. If you click on a spot on the map on the BOM site, a 7-day forecast is displayed as well. If you are viewing a pdf of the magazine, you can zoom in to see the map more clearly.

What it shows is that a Northerly wind between 20 to 30 kph can be expected and if the boat was going to travel north from Blanchetown to Morgan which is where the river turns east, it will be headwind all the way, and it can be expected the travelling time and the fuel consumption will be higher than normal.

If we assume that we are going to stay in Morgan until the 1st May, looking at the wind forecast for the 30th and the 31st will give an idea of where we should moor when we get to the Morgan area. It may seem odd that we would be concerned about the wind when we are moored, but as the previous article showed, strong winds hitting the broadside of the houseboat can make for an uncomfortable and/or dangerous night. It is also easier to cast off if the houseboat is facing into the wind as the outboards don't generate as much power in reverse as they do in forward. Facing into the wind means that it is easier to hold the boat against the bank as the ropes are removed and to let the wind blow the houseboat back away from the bank.

Looking at the forecast for the 1st June, the wind is forecast to be a East-South-Easterly which indicates that the houseboat will be running with the wind and the wind waves most of the time, but there will be some areas where the river snakes back for a time and the houseboat will be running practically into the wind.



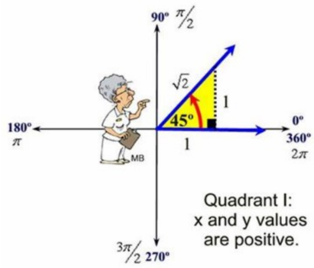
In most places, it doesn't really matter that the boat is running with the wind,

but it can be difficult if the wind is behind the boat at the entrance to a Lock. When the wind is strong, it is better to be running into the wind as you enter and leave a Lock as it is generally easier to control the boat, compared to a tail wind.
An inexperienced (or any) skipper trying to enter the Lock with a tail wind, can end up broadside in the Lock. They cannot easily control their boat because it will not steer effectively with the motors turning slowly because the wind, not the motor is driving them along. Using a combination of a river chart and MetEye can give an indication of whether it will be a good day to traverse a Lock.
The only problem with using MetEye is that Internet coverage along the river is very patchy and if you are moored at a nice spot in the middle of nowhere, it is likely that you won't have Internet or phone coverage—one reason why we have an EPIRB on-board in case we have an emergency.
As a matter of interest, if you want to see what it is like to go through the Lock, have a look at this SA Water safety video. At 1 minute into this video, you will see a houseboat that has a very strong resemblance to the houseboat shown on the previous page. That is, of course, because it is the same boat. It is normally moored just on the other side of the Blanchetown bridge that can be seen in the background. As a result, it has been by sheer coincidence in a few videos about Lock 1. I was going to provide a link where we came through the Lock on the *South Ozzie with Cosi* program, but unfortunately, the video no longer appears to be available. Fame — It's such a fleeting thing!
If you want to see what the river is like around Blanchetown, the first 15 minutes of the 2017 Australian Horror Movie *Cargo* (available on *Netflix*) were shot just upstream of Blanchetown near the Scout's Roonka Water Activity Centre, with houseboats from our marina providing toilets, dressing rooms, kitchens, etc for the film crew. I was asked if I wanted to provide my boat, but, unfortunately, I was still working at the time and could not be there. It is still something that I regret missing out on. It wasn't worth a lot of money, but from what I heard, it was certainly a lot of fun. *sigh*

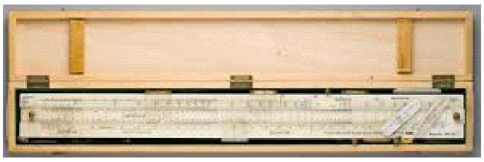
Below: Familiar person leaning on a sign at Casey Station, Antarctica. **Courtesy of Mark Little**

Weather Balloons – What do they do and how do they do it *** By Mark Little ***

I think we have all seen the iconic meteorological images of a weather balloon being released. It is usually taken by a person holding the balloon, often with what looks like a tin foil pyramid and a box connected by a long string hanging below. In an era of automatic balloon launches and GPS positioning, this image is starting to fade into history, so it is perhaps time to look at the weather balloon flights from a bit of an historical perspective.
Using balloons for meteorological purposes started in 1892 in France where they were used to measure barometric pressure, temperature and humidity. Because the materials of the time were not as flexible as now, the bottom of the balloon was open like a modern hot-air balloon. As the gas expanded with altitude, excess gas was lost, rather than the balloon expanding. When the temperature cooled in the evening, the lifting gas contracted, the balloon started to deflate and descended. Sometimes the balloons would travel hundreds of kilometres, making it hard to recover the instrument package.
Later balloon material was much more flexible, allowing the use of closed expanding balloons that could expand to up to 200 times its original volume before exploding at high altitudes. The payload was attached to a parachute that ensured that the speed at which it hit the ground (or a house) was limited.
The weather balloons were also used to measure the wind speed and direction above the Earth. This first method was called a pilot balloon flight, where the balloon was simply released and the azimuth (horizontal direction) and its vertical angle (elevation angle) were recorded periodically. If the rate at which the balloon rose could be estimated, the height of the balloon at the time that the azimuth and elevation were recorded could be inferred.
Knowing the height of the balloon and the angle of elevation from the observer to the balloon, the distance to the balloon can be calculated. If you know the azimuth angle from the observer to the balloon, you can figure out the direction that the wind blew the balloon. Repeating these calculations, allows the wind speed and direction to be calculated at different heights.

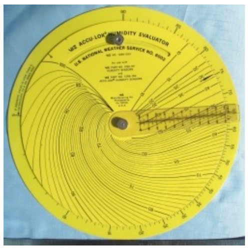


The problem with this method is that the rate at which the balloon rises was just a guess based on the lift measured when the balloon was filled. This problem was overcome by using radar to track the balloon.
Using radar means that the calculation to find the wind speed and direction is slightly different, because the radar measures the distance between the radar and the balloon. In this case, the height of the balloon and the distance along the ground to the balloon is calculated using the known distance to the balloon and the angle between the radar site and the balloon.
Back in 1976 when I went to Macquarie Island as a Technician/Observer, the way that these calculations were performed was using a large slide rule. Before leaving, I used to spend hours every morning practicing with that horrible slide rule so that I could do a wind calculation every minute and still be able to manually track the balloon with the WF2 radar. Being technically minded, and with the recent advent of programmable calculators, I decided that there had to be a better way, so I bought a programmable calculator and programmed it to do the calculations with just a few button presses.

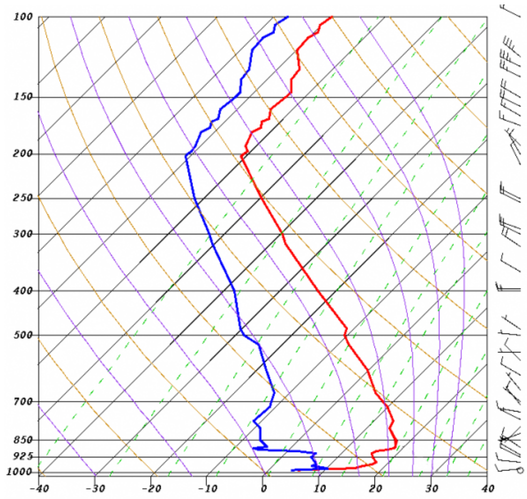


When I was on Macquarie Island, the weather observers saw how easy (and error free) it was to use the calculator, so I was able to trade off doing the radiosonde observations (more about them later) by allowing them to use my calculator.

Because the manual calculation of the wind needed to use the previous position of the balloon to calculate the next wind speed and direction, we had to fill in a form recording those readings. On the other hand, the calculator remembered all the values, so there was no need to write them down. I tried to convince the observers that these reading served no purpose for either the calculation or later checking and should be left out to make things even easier. This decision had to go back to the head office in 150 Lonsdale Street in Melbourne (jokingly called “bulls**t castle” in those less politically correct days).
Well, what furore that caused!!! Using a calculator to exactly, but more accurately, replicate the manual process clearly had people running around panicking that all the upper wind data has wrong – as if the Met IOC hadn’t checked the calculations like he was supposed to.
The panic eventually died down, but we still had to fill in the intermediate steps that served no purpose in the calculation. Funnily enough, there was a circular slide rule used with the radiosonde observations (similar to the image on the right), that was just begging to be replaced by the calculator, but alas although I asked for the formulas for that calculator a couple of times, I never even got a reply.



So, what is this radiosonde that I’ve mentioned a couple of times? Like the device used by the French in 1892, it measures pressure, temperature and humidity. Unlike the early unit, it transmits the readings back by radio. In “ye olden days”, the results were received and plotted on the strip chart shown in the photo on the left. That photo, by the way, came from Issue 227 of the “Bureau Of Meteorology Weather News” (July 1975). None of the technicians “going south” on the 1976 ANARE (Australian National Antarctic Research Expeditions) were from the Bureau. For those interested,



seated is Rob Hollins, and standing left to right Leon Blakely, John Tibbets and Mark Little – yes, I had hair on my head in those days and it wasn’t grey. The circular slide rule discussed above was used to decode the plots on the strip chart. The outcome of all that making measurements on the chart, calculating the reading from the chart measurements and then plotting the readings resulted in a thing called a “Skew -T diagram” that shows the temperature and dew point in a cross section of the atmosphere using pressure as the vertical axis and temperature as the horizontal axis. It is called “Skew-T” because as you go up the chart, the temperature axis is skewed and that has to do with lapse rates, but more about that and the other funny scale lines in another article.

As you can see, the right-hand side of the chart shows the encoded wind speed and direction that corresponds with the pressure levels on the left-hand scale. Because of the way that gases compress when under pressure, you will also note that the pressure scale on the left-hand axis is not linear, but again more about that in the Skew-T article in a future edition.
Even though automatic balloon launching, GPS location tracking and improved electronics has made significant changes to the radiosonde, its purpose is very similar to that of the French efforts in 1892 and goes to show that most things that we have today stand on the backs of intrepid individuals in the past who saw a need and set out to achieve results.

Note: Members wishing to know more about Skew T - Log P Aerological Diagrams (and who can’t wait) may like to consult *http://www.bom.gov.au/aviation/data/education/skew-t.pdf* **&** *http://www.bom.gov.au/aviation/data/education/vertical-stability.pdf* .

The Weather and its Impact on History

The vagaries of the weather, particularly unseasonable falls of rain, have had a significant effect on history and in some cases have changed the future of the nations involved.

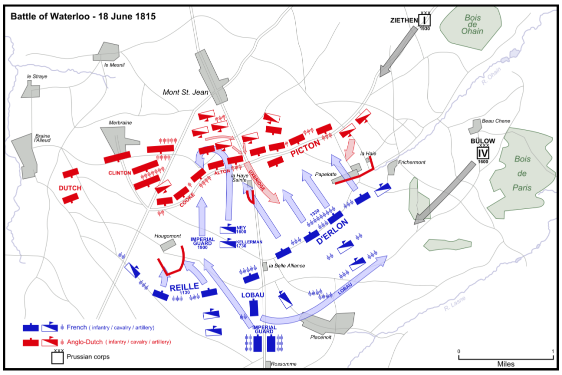
In the case of the Battle of Waterloo (18 June 1815), the defeat of the French by the British and their allies meant that Britain, not France, became the dominant country in the world in the nineteenth century.

The area in Belgium where the battle was fought had extremely heavy precipitation on the night before the fighting started. This had several results all of which hampered the French.

Firstly Napoleon had always relied on artillery - very successfully for most of his career. However the ground at Waterloo was so damp he was worried that the heavy guns would sink after they had been dragged over a short distance and would not get into the positions that were needed to successfully shell the British. Consequently he did not start his attack at dawn as he had originally planned.

Secondly, one of the advantages of artillery fire was that if the shell did not initially hit opposing soldiers, it tended to bounce along the ground for some distance with the possible result that it could do damage to those in the rear ranks. However, on the muddy ground at Waterloo, rather than bouncing, the shells just sank where they first landed.

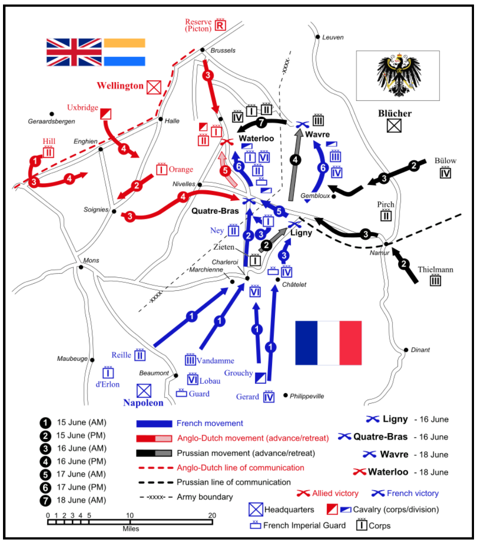
Panorama of the Waterloo battlefield as it is today



Map of the battle: Napoleon's units are in blue, Wellington's in red, Blücher's in grey.

The area on which the battle was fought was low lying and the mist which came after the rain, coupled with the smoke from muskets and cannon, limited visibility to an extent that accurately aiming the artillery was almost impossible.

Thus Napoleon did not start his attack until noon and this delay meant that the Prussians, who were coming from the east, arrived while the battle was still in progress. It was their numbers (approximately 48,000 men) and firepower that finally turned the battle against the French. If the ground had not been so boggy and Napoleon had attacked earlier in the day, it is quite likely that the more battle hardened French army consisting of 72,000 men compared to the British (mostly inexperienced) total of 68,000 - including allies - would have triumphed. See https://www.nam.ac.uk/explore/battle-waterloo



Map of the Waterloo campaign

Finally, the French always sent their cavalry ahead of their infantry and at Waterloo the mud so slowed their advance that they were easy targets for the English muskets. Once a rider or horse had fallen, the mire made it almost impossible for them to stand up again. The horses churned up the ground so that when the infantry did attack, it was hard going. As well, they had to try to negotiate the remainder of the cavalry who were still lying on the ground between them and the English.

An excellent account of the Meteorological conditions of the days before the battle (16th - 17th June) is available at ***The weather of the Waterloo campaign 16 to 18 June 1815: did it change the course of history*** *https://rmets.onlinelibrary.wiley.com/doi/pdf/10.1256/wea.246.04)*

This article was contributed by Dianne Davis, wife of committee member Bruce Davis. Although not a member of AMETA, Dianne has a background in History and it was felt that this may be of interest to members.

All the detail you could possibly want and more is available on the BoM website.

Visit http://www.bom.gov.au/climate and wander through the various archived climate reports and summaries which are available in text and graphical forms.

Another useful website is https://www.theweatherclub.org.uk/index.php/

The Pressure Altimeter - Part 1

by Bruce Davis

This article was prompted by a recent discussion regarding our sister publication the PWS journal. That made me think once more about the pressure altimeter, its workings and problems. I have relied on this instrument many times when flying.

At home I have an aneroid barometer, a gift from my parents in law over 40 years ago. It is a lovely instrument. I'm sure many of you have a similar device (although they are often replaced by electronic devices these days). At its heart is an aneroid capsule (a corrugated, hollow, metal disc from which air has been pumped out) that expands and contracts as air pressure falls and rises. This is connected to a needle rotating around a dial. Dial markings indicate barometric pressure. The instrument had to be calibrated initially to the correct Mean Sea Level (MSL) Pressure.

The basic pressure altimeter is just an aneroid barometer under another name. Only this time the dial markings show vertical distance (elevation), usually in feet but in some countries metres. Pressure altimeters are found in all aircraft – from the most sophisticated airliner down to the simplest trainer. The method of display may be electronic or analogue and the sensor may have changed from aneroid capsule to solid state but the principal of operation is the same.

The history of the pressure altimeter may be traced back to 1644 when the Italian Physicist Evangelista Torricelli postulated that air had weight and thus exerted pressure. It was traditionally thought (especially by Aristotelians) that the air was weightless - that is, that the air above us doesn't weigh down on the air at our level. Even Galileo had accepted the weightlessness of air as a simple truth.

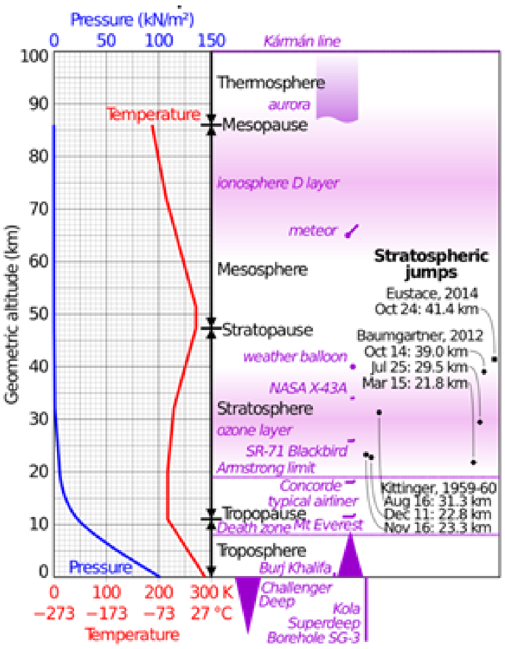


Figure 1—ICAO Standard Atmosphere

As a corollary of his belief, Torricelli surmised that air pressure might be less on mountains than at sea level. The first demonstration of this decreasing pressure with height (see Figure 1) was arranged by Blaise Pascal in 1648.

The next stage in our story may be thought of as occurring in 1843 when French inventor Lucien Vidie developed the first practical aneroid barometer. Soon it was realised that this portable barometer could be used to indicate altitude.

French physicist Louis Paul Cailletet is credited with inventing the altimeter in the 1870s.

These early altimeters were not very reliable or accurate. Even in World War 1 they were quite fragile and error prone.

In 1928 Paul Kollsman, a German born American, invented a practical aneroid altimeter. This was far more accurate, reliable and sensitive than older types and allowed pilots to fly at night and through cloud.

A further change occurred with the advent of solid state sensors in the late 20th century. These feed atmospheric pressure information into an Air Data Computer which in turn produces an electronic display (see Figure 4). Such devices can now be found on all types of aircraft. However, the aneroid type device is still very common and is often used as a sensor for an electronic display or as a backup instrument

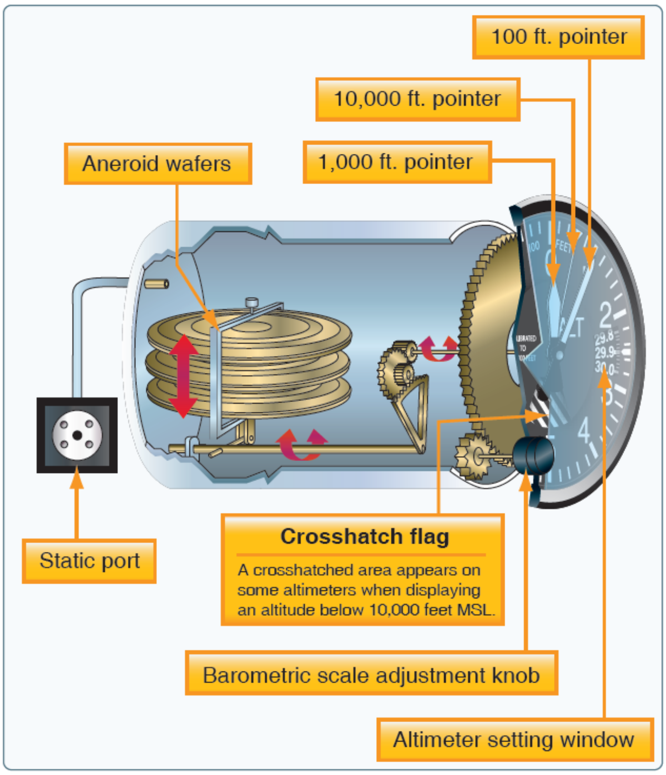


Figure 2 (above) - Exploded diagram of an Aneroid Altimeter

Diagrams of the basic pressure altimeter and its inputs are shown at left and below (Figures 2 and 3).

Atmospheric pressure is sensed at the static vent (or port) which is a small hole on the aircraft surface open to the atmosphere. From here the atmospheric pressure is "conveyed" by static lines to the sealed instrument casing. As this sensed pressure rises and falls the altimeter shows a decrease or increase in altitude.

The reading of the altimeter is called the ***Indicated Altitude*** and, as can be realised, it is actually the height above a preset atmospheric pressure level assuming certain atmospheric conditions. This pressure is set by the pilot and is indicated in the altimeter subscale setting window. The setting can be hectopascals (as used in Australia and most of the world) or inches of mercury (as used in the United States).

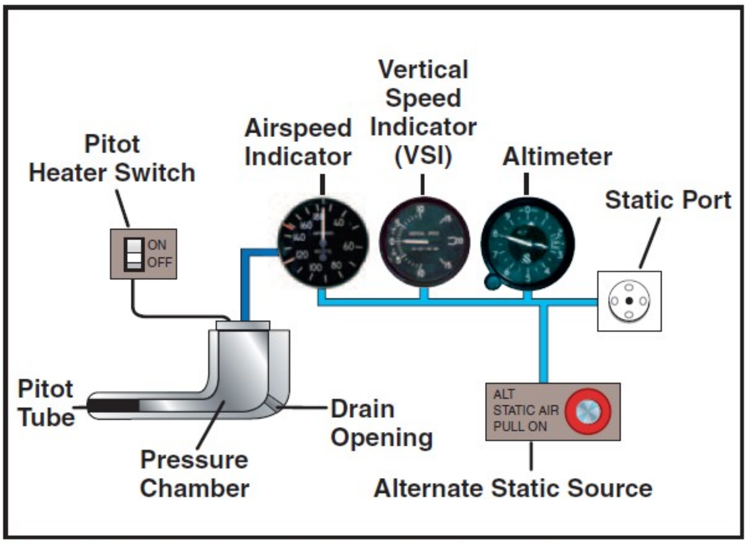


Figure 3 (at right) - Pitot-Static System

(Source: FAA)

Figure 4 — ELECTRONIC FLIGHT INSTRUMENT DISPLAY — (source FAA)

As you can probably guess the instrument is prone to a number of errors.

The first of these is Instrument Error. This is due to errors in manufacturing. In modern altimeters at low altitude these can usually be ignored (although errors of up to 100ft are allowed in certain circumstances). However, we can see from the atmospheric diagram above (Figure 1) that the decrease of pressure with altitude is not constant. At MSL it is about 30 ft per hpa whereas at 30000 ft it is about 100 ft per hpa. This can reduce altimeter accuracy at altitude.

The second error is position error. Altimeter accuracy requires the pressure of the atmosphere unaffected by the passage of the aircraft. Hence the term ***Static Pressure***. Modern aircraft designers are quite skilled at finding somewhere on the aircraft structure where this error is minimal (usually on the fuselage). However, in certain flight attitudes or manoeuvres this may not be so. If necessary, the Pilot's Manual will contain information for any required corrections (see Figure 5 at right). It is also common for static vents to be "balanced". I.e. there will be at least 2 static vents, one either side of the fuselage. This has 2 advantages. First, during a manoeuvre such as a sideslip to the left, the increased pressure on the left static vent will be "balanced" by the reduced pressure on the right. Second, if one vent gets blocked by e.g. icing then, hopefully, the other will still be clear. To allow for both vents becoming blocked there must be an alternate static source available (see Figure 5 at right). In an unpressurised aircraft this is usually in the cockpit and in a pressurised aircraft it will be in an unpressurised compartment.

However, the greatest source of danger probably comes from the properties of the atmosphere itself and this is a topic I will address in a future article.

SECTION 5
PERFORMANCE

Cessna. MODEL 310R

ALTIMETER CORRECTION

ALTERNATE STATIC SOURCE

NOTE:
1. Add correction to indicated altimeter reading.
2. The following calibrations are valid for pilot's and copilot's altimeters when the standard static system is installed.
3. An alternate static source is not available for copilot's instruments when the optional dual static system is installed.

PILOT'S FOUL WEATHER WINDOW CLOSED

Altitude	Sea Level			10,000 Feet			20,000 Feet		
Gear	Up	Down	Down	Up	Down	Down	Up	Down	Down
Flaps	0°	15°	35°	0°	15°	35°	0°	15°	35°
KIAS	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet
80	0	-13	-4	0	-19	-6	0	-25	-8
96 *	-8	-19	-15	-11	-23	-23	-15	-32	-32
100	-8	-23	-18	-11	-32	-25	-15	-44	-34
120	-20	-34	-34	-28	-46	-46	-38	-63	-63
140	-34	-45	-57	-46	-62	-79	-63	-84	-107
160	-50	-59	----	-69	-81	----	-95	-111	----
180	-74	----	----	-102	----	----	-139	----	----
200	-94	----	----	-130	----	----	-176	----	----
220	-114	----	----	-157	----	----	-214	----	----
PILOT'S FOUL WEATHER WINDOW OPEN									
80	-69	-70	-86	-95	-97	-118	-130	-132	-161
100	-94	-94	-114	-130	-130	-157	-176	-176	-214
109 *	-109	-114	-134	-157	-157	-180	-214	-214	-246
120	-131	-131	-151	-180	-180	-208	-246	-246	-286
140	-174	-168	-194	-241	-231	-268	-328	-315	-365
160	-208	-207	----	-287	-287	----	-391	-391	----
180	-258	----	----	-356	----	----	-485	----	----
200	-304	----	----	-420	----	----	-572	----	----
220	-355	----	----	-490	----	----	-668	----	----

*Recommended Minimum All Engines Approach Speed At 5400 Pounds With 35° Wing Flaps.

ALTITUDE CORRECTION PROCEDURE

[INDICATED ALTITUDE TO FLY] = [DESIRED ALTITUDE (MSL)] - [ALTIMETER CORRECTION]

Figure 5-4

Figure 5 — Altimeter Correction Table using Alternate Static Source.

(KIAS = Knots Indicated AirSpeed)

(Cessna 310 Pilot's Operating Handbook)

Greater Adelaide in April 2020: wet, with cool days

Rainfall in April was above to very much above average at all sites across Adelaide and the Hills, with the city having its wettest April since 1998. Daytime temperatures were cooler than average for April, despite two warm days in the middle of the month. Night-time temperatures were cooler than average in parts of the south and the Hills, but close to average or warmer than average in the city and some northern suburbs.

For more information plus a summary of April's statistics please see:
http://www.bom.gov.au/climate/current/month/sa/archive/202004.adelaide.shtml

Adelaide (West Terrace / Ngayirdapira), South Australia
April 2020 Daily Weather Observations

The official site for Adelaide, having reopened in May 2017.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	We	16.6	22.7	0			ENE	31	16:15	18.7	56		SW	2	1014.1	19.6	68		ENE	15	1011.8
2	Th	11.5	25.4	0			WSW	24	13:53	15.1	75			Calm	1012.4	23.1	48		WSW	13	1008.2
3	Fr	14.2	24.8	0			WSW	65	15:33	17.1	67		NNE	9	1003.5	22.7	44		W	17	1000.0
4	Sa	12.7	18.3	21.4			WSW	54	11:07	15.5	60		SW	20	1009.3	17.4	60		WSW	28	1010.7
5	Su	13.4	20.3	1.2			W	43	15:58	14.9	82		WSW	15	1016.5	18.5	74		WSW	19	1016.0
6	Mo	11.4	20.6	1.8			SW	28	13:26	16.9	71		SSE	2	1023.0	19.6	55		SW	13	1021.5
7	Tu	14.3	20.5	0.2			S	24	14:43	17.7	69		ESE	4	1023.7	19.9	62		SSW	13	1021.1
8	We	11.2	20.8	0			SE	26	10:07	15.9	55		E	13	1025.4	20.2	40		ESE	13	1022.8
9	Th	9.7	20.8	0			SW	26	13:18	16.5	65		W	6	1025.3	19.8	58		WSW	17	1021.4
10	Fr	12.5	22.8	0			WNW	30	14:52	16.9	76		N	7	1019.8	21.5	48		W	19	1014.7
11	Sa	15.3	20.1	0			SSW	41	03:03	16.8	63		SW	15	1016.9	19.2	34		SSW	19	1017.5
12	Su	9.5	18.6	0			WSW	28	14:46	14.4	52		SE	9	1023.3	17.2	48		WSW	15	1020.3
13	Mo	7.9	23.5	0			NNW	24	09:49	17.4	44		NNE	6	1020.3	22.7	29		W	9	1018.5
14	Tu	14.3	29.5	0			NE	24	02:06	21.0	31		NE	11	1021.5	28.8	14		NNE	2	1019.3
15	We	18.4	28.6	0			NW	41	12:56	22.4	23		NNE	15	1016.9	27.7	18		NNW	17	1012.4
16	Th	16.0	20.1	0			SW	37	12:25	18.5	69		WSW	15	1015.5	19.4	54		WSW	19	1015.7
17	Fr	13.7	20.6	0			WSW	35	05:04	16.9	53		SW	15	1020.2	19.3	53		WSW	13	1018.5
18	Sa	11.9	18.9	2.0			WSW	20	13:50	14.5	87		ENE	9	1018.7	17.9	61		W	9	1015.6
19	Su	10.4	22.1	4.4			NNE	39	22:59	13.9	84		NNE	9	1014.9	20.6	47		NNW	9	1009.4
20	Mo	13.8	19.6	0.2			NW	46	00:11	17.9	66		WSW	17	1013.2	18.4	52		SW	13	1014.9
21	Tu	12.6	23.7	0			NNW	35	12:50	16.4	61		NNE	13	1017.4	22.8	50		WNW	17	1015.5
22	We	12.3	22.8	0			NNW	28	13:00	17.5	79		NNE	7	1022.0	22.4	43		NW	15	1018.6
23	Th	13.3	20.4	0			NE	35	11:19	20.4	43		N	13	1016.5	17.2	85		NE	9	1015.0
24	Fr	12.7	21.7	9.4			WSW	24	10:44	16.8	73		W	9	1021.3	21.0	51		N	7	1019.4
25	Sa	12.9	24.0	0			WSW	37	23:07	18.7	63		NE	13	1016.7	21.9	62			Calm	1013.8
26	Su	15.8	19.4	28.2			WSW	31	12:18	17.0	80		SSW	15	1019.7	18.6	53		SSW	17	1019.9
27	Mo	11.1	20.1	0			NNE	20	12:09	15.1	62		NE	9	1025.0	19.6	53		SW	6	1021.2
28	Tu	13.8	20.2	0			NNW	39	13:35	17.9	58		NNE	17	1014.8	17.2	79		N	6	1010.9
29	We	11.5	16.5	11.0			W	43	02:47	12.6	88			Calm	1008.3	14.5	59		SSW	13	1007.5
30	Th	8.5	15.1	12.8			SSW	48	12:56	10.9	75		SE	7	1015.8	14.5	58		SSW	20	1016.1
Statistics for April 2020																					
	Mean	12.8	21.4							16.7	64			10	1017.7	20.1	52			13	1015.6
	Lowest	7.9	15.1							10.9	23			Calm	1003.5	14.5	14			Calm	1000.0
	Highest	18.4	29.5	28.2			WSW	65		22.4	88		SW	20	1025.4	28.8	85		WSW	28	1022.8
	Total			92.6																	

Observations were drawn from Adelaide (West Terrace / Ngayirdapira) {station 023000}

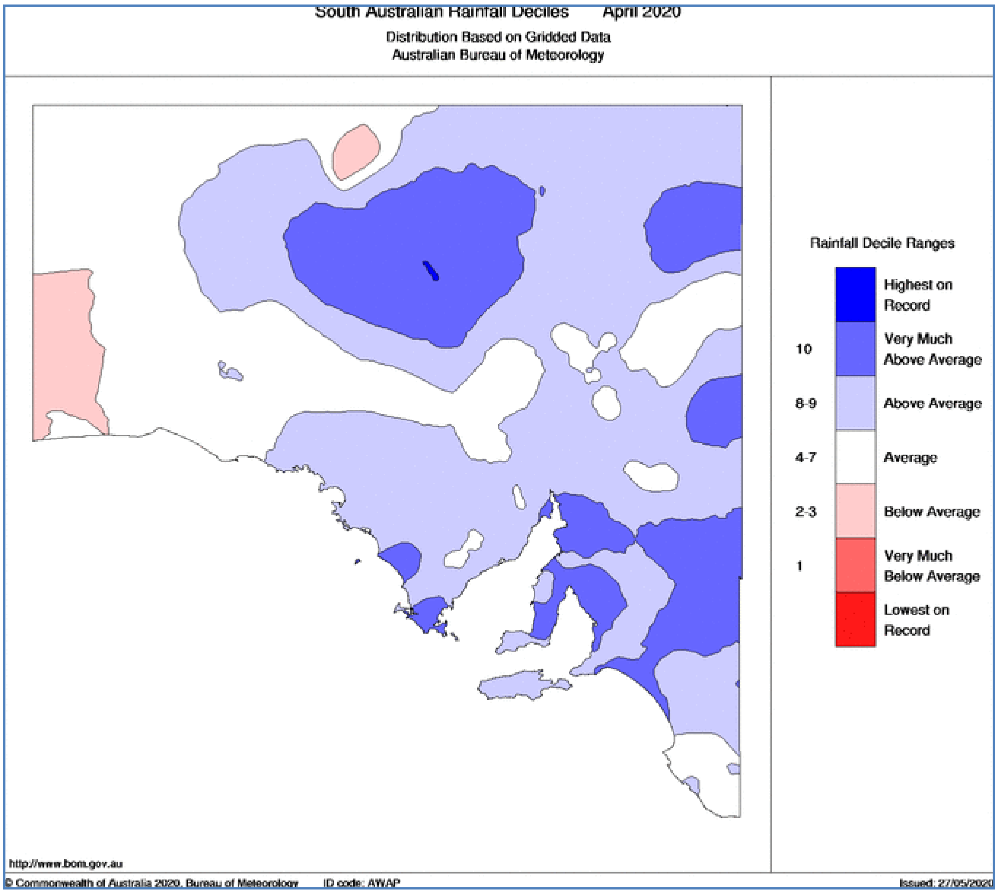
This is now the "official" site for Adelaide, having reopened in May 2017. Observations are also available from the Kent Town site {station number 023090}.

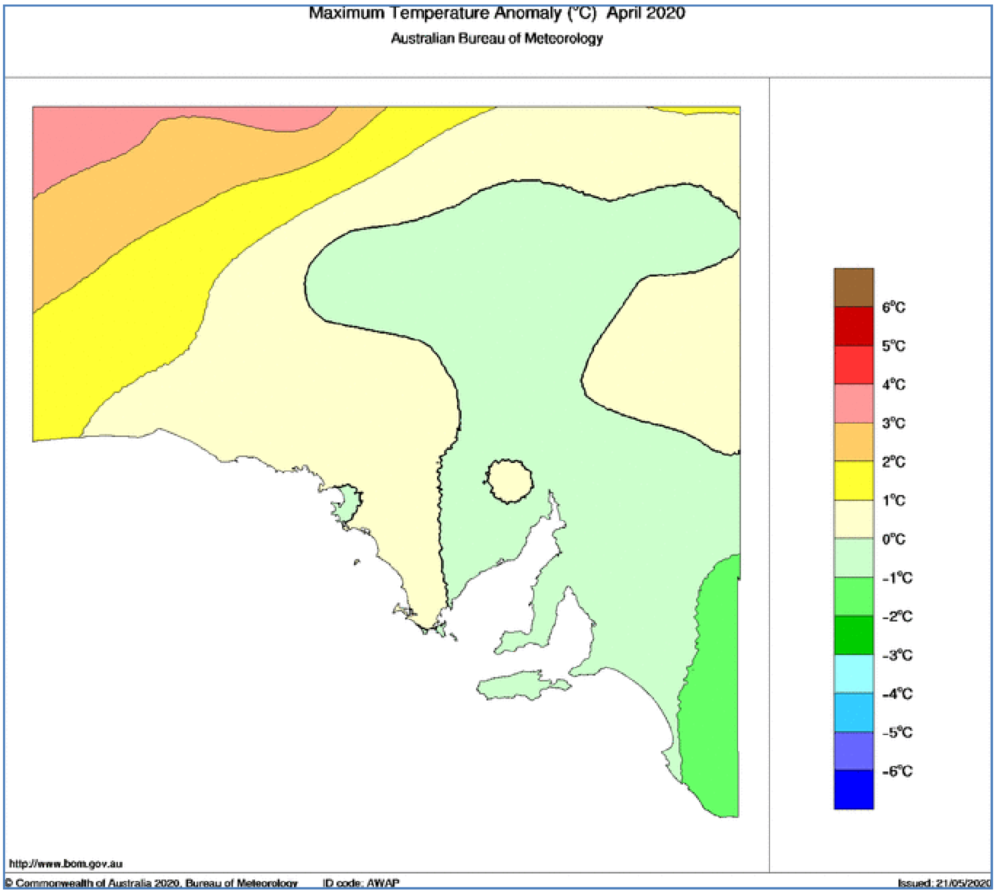
IDCJDW5081.202004 Prepared at 13:02 UTC on 21 May 2020

South Australia in April 2020: cool days in the south, wet in the south and far north

Rainfall in April was above average over much of northern and southeastern South Australia, including around Adelaide, thanks to heavy falls both early and late in the month. However, it was drier than average in the far west and across some southern areas of the Pastoral districts. Daytime temperatures were cooler than average in southeastern districts, but warmer than average in the northwest. Night-time temperatures were particularly warm in the northwest and generally close to average or above average elsewhere.

For more information plus a summary of April's statistics please see:
http://www.bom.gov.au/climate/current/month/sa/archive/202004.summary.shtml





Greater Adelaide in May 2020: Average rainfall with cool days

Rainfall in May was near average across Adelaide and the Hills. Daytime temperatures were cooler than average for May, with two short-lived warm spells during the month. Night-time temperatures were also cooler than average particularly in the middle of the month.

For more information plus a summary of May's statistics please see:
http://www.bom.gov.au/climate/current/month/sa/archive/202005.adelaide.shtml

Adelaide (West Terrace / Ngayirdapira), South Australia
May 2020 Daily Weather Observations

The official site for Adelaide, having reopened in May 2017.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Fr	10.7	17.3	5.0			WSW	56	10:33	14.8	70		SW	28	1015.9	16.9	59		SW	28	1014.8
2	Sa	12.8	18.0	4.0			SW	46	00:44	14.4	85		WSW	22	1017.3	17.0	69		SW	20	1017.9
3	Su	9.8	15.7	0.2			SW	19	11:47	13.3	65		SE	4	1027.4	14.7	62		W	9	1026.4
4	Mo	10.0	18.0	0			W	22	15:46	13.6	71			Calm	1030.1	17.1	54		SSW	11	1027.4
5	Tu	9.0	19.8	0			NNW	28	10:36	14.8	55		NNE	11	1028.3	18.9	47		NNW	9	1024.5
6	We	11.9	20.6	0			NNE	41	22:56	15.2	44		NE	13	1022.4	20.2	26		N	15	1016.7
7	Th	15.0	20.8	0			W	46	12:01	17.9	62		NNE	13	1010.4	20.4	50		WNW	24	1010.5
8	Fr	12.2	19.0	3.8			W	44	20:16	14.1	88		N	11	1014.6	18.0	59		NNW	22	1011.2
9	Sa	9.8	15.9	16.8			WSW	57	05:53	13.1	54		WSW	26	1015.9	14.2	66		WSW	20	1018.9
10	Su	8.5	16.3	0.2			WSW	22	14:33	10.7	87		NNE	7	1028.0	15.1	61		W	13	1027.2
11	Mo	8.5	17.6	1.4			N	22	11:42	12.4	74		NE	9	1029.9	16.8	54		NW	11	1026.8
12	Tu	10.6	19.1	0			NW	41	12:56	12.3	63		N	13	1023.8	18.4	42		NW	20	1020.5
13	We	7.4	15.2	0.4			SE	24	09:59	11.8	76		S	9	1028.2	14.3	61		SSE	7	1027.2
14	Th	9.7	15.1	0			SE	20	12:16	12.8	49		ESE	9	1031.1	14.1	47		S	9	1029.4
15	Fr	6.9	16.4	0			E	26	11:28	11.1	57		NE	9	1030.9	16.1	37		NNW	7	1027.8
16	Sa	4.3	18.5	0			N	22	12:08	12.1	55		NNE	9	1029.2	17.7	43		WSW	11	1027.2
17	Su	5.3	20.7	0			N	20	12:29	11.7	71			Calm	1030.4	19.8	36		NE	11	1027.1
18	Mo	10.7	21.6	0			NE	31	10:24	16.8	54		NNE	15	1026.2	21.3	36		W	7	1021.7
19	Tu	14.8	22.2	0			W	57	16:56	17.8	43		N	17	1018.2	20.7	32		NW	15	1013.2
20	We	11.7	15.4	2.8			WNW	46	14:35	14.1	61		WNW	15	1019.2	14.7	67		NW	24	1015.1
21	Th	5.9	14.4	7.8						11.2	70		S	9	1023.9	13.4	64		SW	13	1023.3
22	Fr	9.5	15.9				SW	30	12:59	10.8	95		NNE	6	1024.6	15.0	84		SW	15	1020.7
23	Sa	9.6	16.4	1.8			SSW	31	12:09	12.5	84		S	9	1023.1	14.7	74		SSW	17	1021.6
24	Su	10.3	14.0	0.2			S	26	01:19	12.9	67		SSE	11	1026.1	13.8	58		SSE	11	1024.8
25	Mo	4.5	14.7	0			E	22	00:59	9.7	69		NNE	6	1025.7	13.9	55		NNE	13	1022.7
26	Tu	8.5	16.6	0			N	39	10:20	12.6	59		NNE	17	1020.7	15.8	46		N	11	1016.4
27	We	10.8	17.4	0			NNW	31	12:43	12.4	65		NNE	11	1020.1	16.2	71		NW	13	1018.3
28	Th	10.2	17.0	0.6			NW	24	11:11	12.0	84		N	11	1023.6	16.0	59		NW	11	1022.7
29	Fr	7.8	19.3	0			NNW	33	13:20	12.5	64		NE	9	1025.7	19.0	40		NNW	17	1022.3
30	Sa	12.5	19.5	0			N	59	13:17	15.4	42		NNE	22	1015.2	16.0	49		N	19	1010.8
31	Su	10.4	14.9	2.8			WSW	46	22:37	10.8	94		N	11	1015.5	13.7	77		N	13	1012.1
Statistics for May 2020																					
	Mean	9.7	17.5							13.1	67			11	1023.3	16.6	54			14	1020.9
	Lowest	4.3	14.0							9.7	42			Calm	1010.4	13.4	26		#	7	1010.5
	Highest	15.0	22.2	16.8			N	59		17.9	95		SW	28	1031.1	21.3	84		SW	28	1029.4
	Total			47.8																	

Observations were drawn from Adelaide (West Terrace / Ngayirdapira) {station 023000}

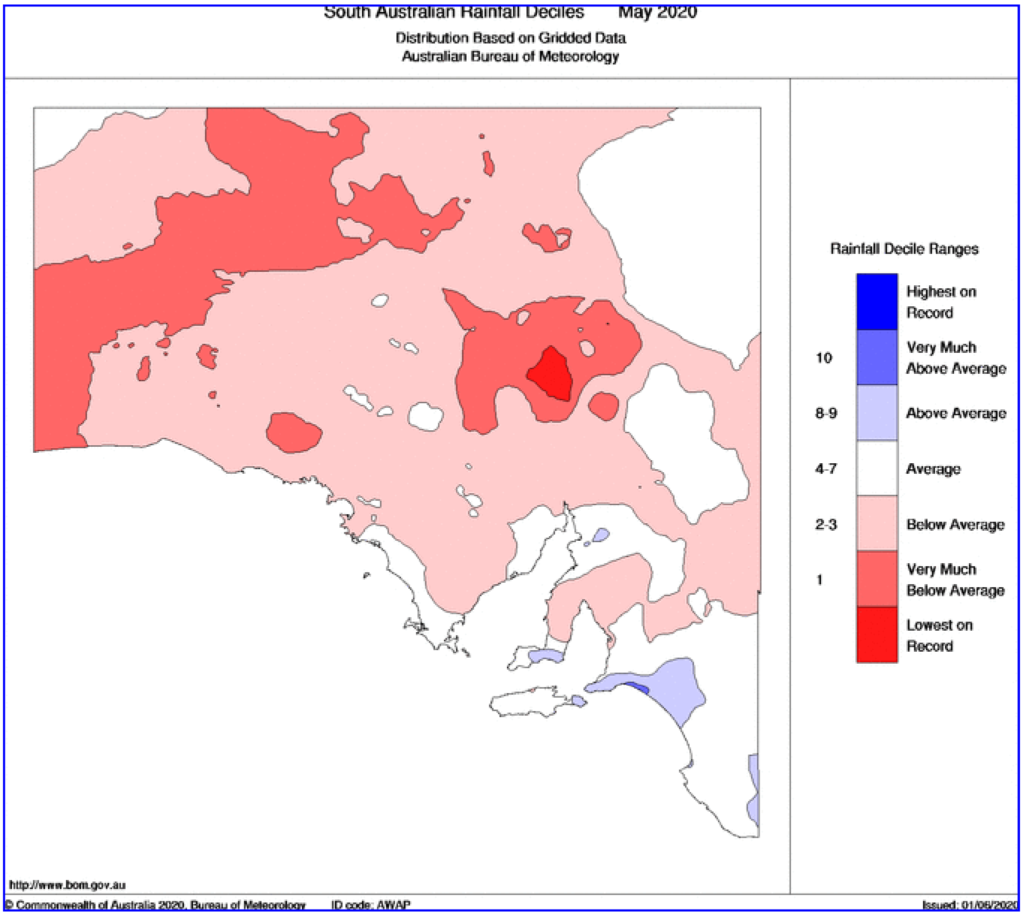
This is now the "official" site for Adelaide, having reopened in May 2017. Observations are also available from the Kent Town site {station number 023090}.

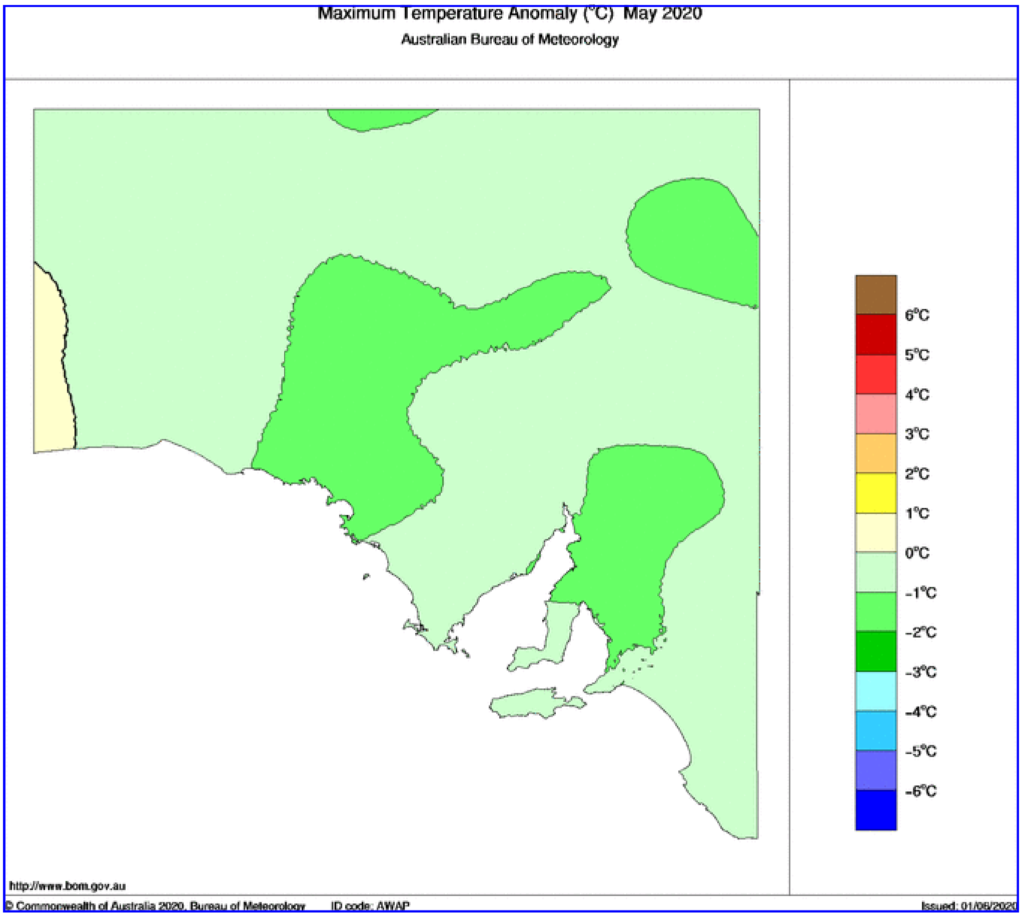
IDCJDW5081.202005 Prepared at 07:15 UTC on 1 Jun 2020

South Australia in May 2020: Drier and cooler than average

Rainfall in May was below average for South Australia as a whole, but it was wetter than average in some southern Agricultural districts and coastal areas. Both daytime and night-time temperatures were cooler than average.

For more information plus a summary of May's statistics please see:
http://www.bom.gov.au/climate/current/month/sa/archive/202005.summary.shtml





Greater Adelaide in Autumn 2020: Cooler days, average rainfall

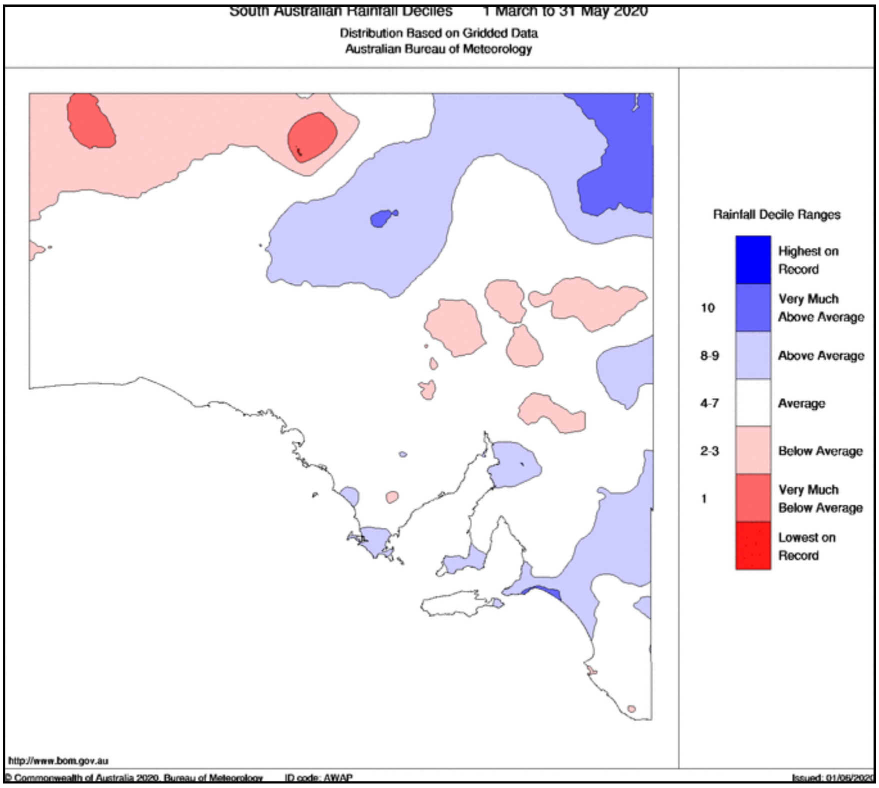
Rainfall in autumn was average across Adelaide and the Hills, despite a wetter than average April. Daytime and night-time temperatures were generally cooler than average throughout Greater Adelaide for the season as a whole, with the season ending with particularly cool nights throughout of May.

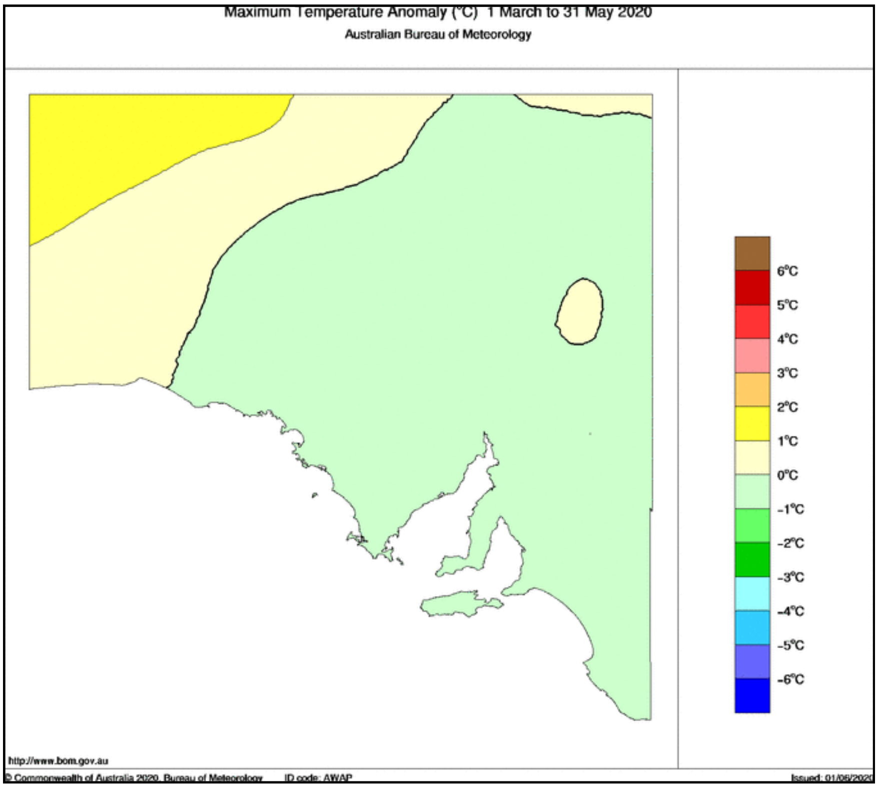
For more information plus a summary of Autumn's statistics please see:
http://www.bom.gov.au/climate/current/season/sa/archive/202005.adelaide.shtml

South Australia in autumn 2020: Average rainfall, cooler days in the east

Autumn 2020 was the coolest for South Australia as a whole since 2015. Daytime temperatures tended to be below average for the central and eastern districts but above average in the far Northwest of the State. Rainfall was above average for parts of the east, including the Riverland and far Northeast districts, but below average across central and Northwest Pastoral areas.

For more information plus a summary of Autumn's statistics please see:
http://www.bom.gov.au/climate/current/season/sa/archive/202005.summary.shtml





NEXT MEETING—POSTPONED UNTIL FURTHER NOTICE. **(SEE PAGE 1)**

Article Competition

The Australian Meteorological Association (AMetA) magazine *Monana* is running an article writing competition until October 2020. The competition has the following conditions:

(1) The article must have a ***weather related theme****;*

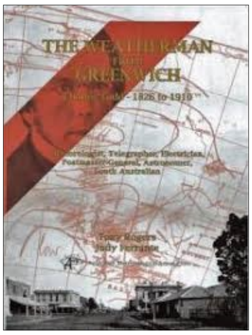
(2) The article size should between 250 words and 500 words (½ to 1 A4 page of normal text). Accompanying photos encouraged, but not essential.

(3) The competition is open to all financial AMetA members (excluding Committee members);

(4) Only one prize per edition will be awarded. If multiple articles are published, the final decision for awarding prizes will rest with the magazine editors.

*(5) Subject to availability, the winner may select either an Arduino with prototype shield, or a copy of the AMetA publication "****The Weatherman from Greenwich****".*

(6) Entries are to be emailed to monana@ameta.org.au as plain text, word or Publisher files with photos as .png, .jpg or .gif (if not included in the file).



AMETA president Mark Little and wife Alexa dressed in local costume when we doing a home stay on the banks of Lake Titicaca. The lake is shared between Peru and Bolivia. For details of a local joke regarding the lake please see Mark.

Courtesy of Mark Little

For further information about AMETA & meeting details please contact:

Secretary:	Darren Ray
Phone:	0427872983
Email	secretary@ameta.org.au

For newsletter contributions, comments or suggestions please contact:

Monana	monana@ameta.org.au