

THE JOURNAL OF AUSTRALIAN STORM CHASING

THE **Australian** *Storm Chaser*

Feature Chases

TAMWORTH HP SUPERCCELL

January 25th 2004

PREMER - WILLOW TREE

January 10th 2004

MENDOORAN

December 5th 2003

Regular

- *Feature US Tornadoic Event*
- *Chaser Education Series*
- *ASC Storm Spots*
- *Puzzles*

Plus

- *Weather Roundup*
- *Cloud classification*
- *Lightning, Lightning, Lightning!*

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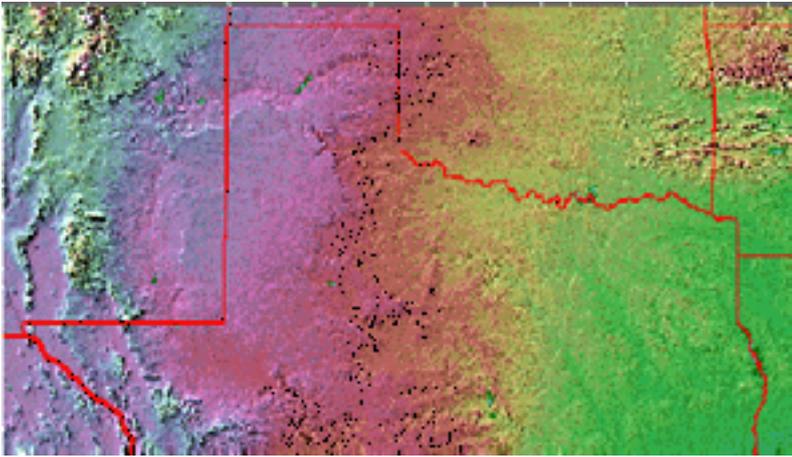
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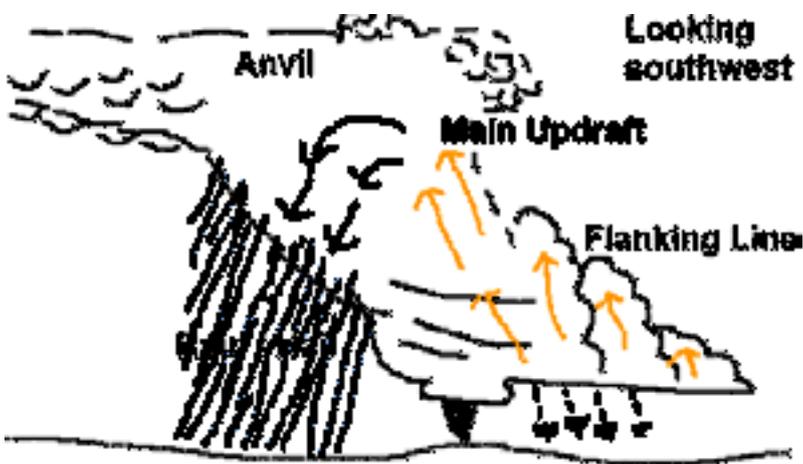
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Submissions

All submitted articles must be in MS Word format with photos and graphics in a separate file. Articles can be submitted by post on CD, email jbrislane@optusnet.com.au for address or alternatively articles that are not too large can be submitted via email to mpiper@bigpond.net.au or jbrislane@optusnet.com.au

100 kb is large enough for picture files and please give credits when taking pictures or graphics from sources other than yourself.

Letter from the Editor

Welcome to the new Dec/Jan edition of the ASC Journal, The Journal of Australian Storm Chasing!

What an amazing two months we have had storm wise. We have gone from a stormy start to December through a ridge over Christmas/New Year and then back into the second stormiest January ever. Well at least in Sydney anyway, although the rest of the east coast from Capricornia south to the Murray has seen regular storm events occurring as well. Some of these events you will read about in the following pages.

In this edition we have exclusive chase reports of Supercells at Tamworth, funnel clouds at Mendooran and of course an amazing HP beast we crossed paths with at Willow Tree. The HP Supercell at Tamworth stands out as the most amazing storm we saw over this period. It literally ate the mountain range it came over!

One of the major features of our weather in NSW during January was the amount and intensity of lightning we received in thunderstorms over that period. We have in this issue exclusive photos of the most amazing lightning strikes you are likely to see, with powerful branched CG's and beautiful spidery anvil crawlers.

We have two historical reports in this issue. One report on the Sydney hailstorm of April 14th 1999 and a feature US historical report of the April 1974 super tornado outbreak. Which still stands to this day as the most number of tornadoes ever recorded in one 24hr period in the United States!

We begin a new series this issue on chaser hotspots starting at the famous Caprock in the United States. We also continue our series on chaser/storm spotter education with an article on the flanking line.

Summer 03/04 to many people appeared to be relatively dry, but did you know that we actually had an average to slightly wet summer even though the daytime maximums were higher than average. You can read about this in our summer rainfall summary.

As part of the structure of the new Journal we are taking feedback from anyone out there whether good or bad. We want to know what you think and whether we can make any changes to suit you. This publication is your publication. All replies to the editor will be printed in subsequent editions just like a regular magazine. And all suggestions will be considered thoroughly by the editorial staff.

One last thing, this edition of "The Australian Storm Chaser" is the first fully interactive editon. Forget about scrolling, just click on any article title in the first two pages and you will transported to the appropriate page. Click on any of the ads and you will be instantly transported to the appropriate website.

Thankyou, and happy storm chasing.

Jeff Brislane.

Editor.

ASC Journal.

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All replies can be sent to the above address.

Stormchase to Mendooran Including Photos of a Funnel Cloud

5/12/2003 By Jeff

Brislane

Tomorrow was a Friday and unusually I had the day off. Which was great because it gave me three days to chase. All I needed were some storms and I was in business. The models weren't all that encouraging though with only weak LI's of around -2 to -3 and CAPE values of around 1200. What was good was the windshear, which according to GFS was going to be moderate speed shear over the North West Slopes. The Target area according to AVN plotter was around the Warrumbungle's near Coonabarabran.

The major factor for our days chase would be a northwest to southeast oriented cloud band that was clearing from the west that morning. Also ahead of this cloud band a large thundery rain complex had formed and was also gradually clearing to the east. We thought we would have to keep near any clear air we could find near our target area but as it turned out this was never a problem. Enough surface heating was attained in our target area although we never saw a fully developed thunderstorm.

After a last minute check of the current observations, I left and after picking up Matt we headed west for Lithgow and the Mudgee Road. North of Mudgee it became very humid as we drove into the air left by the thundery rainband. Just North of Gulgong we stopped and I took a few photos of the

developing cumulus line to our west. The towers were really leaning nicely, and so we knew the windshear was as good as the models had suggested. Our biggest concern now was the later formation of a squall line system instead of isolated storms.



Just after we left Dunedoo the air started to dry out. We were crossing an invisible boundary, but without instruments to measure dewpoints we could only guess how dry it had become. We were coming out of very humid air so the dew points probably dropped from around 22c to about 12-15c. At this point we noticed that the cumulus towers we had seen before were in fact following us. They were heading in a general North-North East direction and were in fact forming on a convergence zone.

We passed through Mendooran and turn onto the road to Coonabarabran, but just north of town we decided to stop watch the approaching convergence zone for

a while. What a good move this turned out to be!



We were watching it for around five minutes when out of nowhere a funnel dropped out of the base of one the towers! Within 30 seconds I was shooting away with my T-90. It lasted for around ten minutes or so as most do and in that time it went from being very curved to being basically dead straight. It formed right underneath a strong convective cumulus.





After the funnel dissipated we decided to keep heading north and stay ahead of the line. We got to Coonabarabran and decided that we would have lunch. At this point the cumulus line wasn't looking all that good and it appeared to have slowed down to near stationary about 20km south of town. After lunch we headed back south to see what else would happen. We sat on the side of the Newell Highway for a while before we decided to head down the road to Binnaway. About 10km's driving down this road through thick scrub we came out into a treeless valley. We stopped on a small hill, which gave us uninterrupted views to the south. By now the cumulus line was only about 5km's away and slowly approaching. We stayed here and watched it until it decayed. It was at this point that it became one of the most photogenic cumulus clouds I have ever seen. But unfortunately it never became a storm. There just wasn't enough oomph.



Later we headed North to Coonabarabran. By now a storm had formed out near Coonamble and the best stuff was even further North towards Walgett and Lightning Ridge. These were to far away and a night at Walgett just didn't seem like a good idea. I wanted to head south west to Dubbo were it looked like there was a small storm but Matt wanted to head North to Narrabri were there was a better chance of lightning but also thundery rain. We headed north and never saw any decent lightning and so our chase was over.

We went looking for storms and instead we found a beautiful cumulus funnel and I got some amazing photos of a nice cumulus convergence line. All up a successful chase!

Australian Severe Weather Event 14th April 1999

It is hard to believe that we are almost 5 years on from the most costly natural disaster in Australia's history. The 14th April 1999 seems to be remembered by many Australians in conversations about hailstorms. This event also touched world media perhaps since it occurred prior to the Sydney Olympics. Perhaps it was suggested this was typical Sydney weather?

In fact, this event was a freak combination of conditions that came together that devastating afternoon. A combination of cold upper air with temperature destabilisation to -20C, a cold front that would enhance a lifting mechanism triggering the storms, a dry cap that would hold down heating until late that afternoon, and an ingestion of moisture from the northeast that enhanced lower level flow feeding into the storms once developed. The wind shear was more than sufficient for supercells once storms developed.

Personally, I was in a phone conversation and on my balcony as I watched towers exploding

off the coast. Very powerful updraughts were leaning in the wind sheared environment. Who would have anticipated that this would develop into a supercell monster within an hour or two of my observation.

Michael Thompson in the meanwhile was sheltering in his vehicle south of Wollongong as cloud to ground powerful lightning bolts pierced the earth from a menacing cloud base with loud crackling thunder – a sure sign of powerful updraughts. He watched the storm's peculiar backbuilding behaviour once off the coast assessing its potential danger. A call to the Bureau of Meteorology was in order since Michael was a storm spotter for the warning system. With his skills of the local geography, he was concerned the storm was paralleling the coastline but would come ashore over the Royal National Park.

From here, the now powerful supercell was set on a course for the coastal suburbs of Sydney. Residents of the Southerland region first hit – the only warning was the impending hail roar. Crossing Botany Bay, the Sydney International Airport, its fleet and neighbouring suburbs were about to experience a barrage of gigantic hailstones few people had observed nor experienced. The hail roar unfortunately was not used as the warning by the unsuspecting residence. All most could do was take cover as the hailstones simply obliterated the slate and tile roofs. The city high-rise lay in its path but fortunately, this storm phase head weakened briefly. Another strong updraught developed just to the northwest – destination the northern beaches.

David Croan at Beacon Hill was far more prepared as the much weakened phase of this dangerous supercell dumped hail to the size of golf balls or slightly larger on the northern beaches. The storm tracked the coastline almost as far as Newcastle but despite the warnings, the supercells had claimed its victims.

From shortly after the storm event until months (even a year) afterwards is approximately the time taken for the cleanup process; the suburbs a tarpaulin city. Final damage assessment estimates had the storm at about 2 billion Australian dollars. Anything from roofs and the various vehicles in suburbs that lacked space for under cover car parks suffered such damage that perhaps never seen prior in this region. What made this event unique in some respects was that a second less violent hailstorm had followed almost an identical path. This meant that heavy rain dumped into the same region now with holes in the roofs; internal damage from collapsed ceilings the most common cause. This event compares well with some of the damaging hailstorms around the world in terms of cost.

References

http://www.australiasevereweather.com/storm_news/1999/docs/9904-01.htm

Some photographs of lightning and also the hailstorm damage including satellite image, lightning data and radar imagery

http://www.bom.gov.au/inside/services_policy/storms/sydney_hail/hail_report.shtml

Bureau report of the event

<http://www.ozthunder.com/chase/chase13.htm>

A report from Michael Thompson himself including the video stills

Premier-Willow Tree Severe Thunderstorm 10/01/2004 By Jeff Brislane

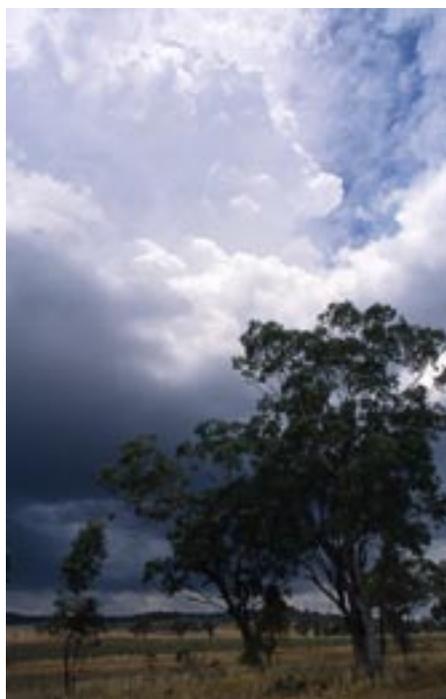
Every Christmas I go on holidays hoping that storms will pop up somewhere in NSW and almost every Christmas nothing does. Christmas 2003 would be no different as a mid level ridge took hold sending 850mb temps soaring to 27 degrees and 700mb temps to 12 degree in some districts. Clearly those conditions combined with no upper level support were not going to produce a skerrick for us to chase. So it was with great relief that the first half decent system showed up on the 10th of January. 500mb temps cooled down to around -8 degrees and 850mb temps dropped to around 18 degrees. And with a surface trough forming over the northwest slopes with decent moist northerly inflow and surface dewpoints of around 18 degrees, the atmosphere was primed for a decent storm outbreak.

GFS was showing a nice area of high cape in the order 2000+ over the western Liverpool ranges and lifted indices were around -4 also in the same area. Also of interest was the wind profile, which GFS

had plotted to show good lower level speed shear. After taking all the data in Matthew Piper and myself decided that we would head for the area north of Coolah where the moist inflow would be meeting the dry air behind the trough.

The drive north was pretty uneventful. We left Blaxland and drove over the Blue Mountains to Lithgow where we took the Mudgee road north to Dunedoo. From there we took the road north to Coolah. On the road to Coolah we passed through the trough line. The air for most of the trip was pretty dry but just south of Coolah we drove into a wall of humid air! That's what it was like. You could feel the humidity just suddenly skyrocket! A very good sign indeed and confirmation that we were now on the correct, or northeastern side of the trough.

About 15 kilometres north of Coolah is where our chase started. We could see a number of towering cumulus just ahead of us that looked to be on the verge of breaking through the cap. Nothing else around at that time looked to have anywhere near the same potential as these cumulus did. The sky was cluttered with cumulus at this time so we could only see the bases. Within a few minutes they started to precipitate. Then we started getting bursts of static on the FM band. Then a couple of more kilometres up the road they appeared to us through a small break in the cloud. They were now thunderstorms, and they were fast organising into a larger storm system and heading in an easterly direction.



After a couple of minutes for photographs we consulted the road atlas to try and find a way to follow this developing system. The roads in that area are pretty much non-existent as a lot of chasers know, so we decided our best bet would probably be to head north-east to the town of Premer. From there we had a decent road that could take us east with this thunderstorm as it developed and matured. Everything was going great until we came to a bridge covered in cattle being driven south! After a 10-minute delay watching cows, we were off again to Premer.



The Premer plain is an amazing place and it allows unobstructed views of any developing storms over the Liverpool ranges to the south. We stayed here for about half an hour to 45 minutes watching this storm system slowly evolve and track east.





By then we realised that we had better keep moving ourselves to keep up with it. Unfortunately for us the road we were on just didn't keep us close enough to the ranges and the thunderstorm. For most of the drive east we came no closer than about 30 kilometres, which is just too far away to observe storm structure in detail. There is a road closer to the ranges though. But it is dirt and we were not sure of it's condition. It was too risky to take without prior knowledge. Stick to the roads you know when storms are firing and only try new ones if they are sealed or someone you know has given you a good report on them. Anyway.



We came to Quirindi were at last we could head in a more southerly direction back towards to the storm. It was not long before the frontal features came into view and they looked just amazing! The storm had taken on more of a HP look about it and it was visibly consuming moisture into the front of the storm. You can see in this photo that there are three distinct inflow stingers feeding into the middle levels of this storm.





Although this storm wasn't a supercell that we could determine at this stage it was HP by nature at this time. We drove south into the rain under the core in the hope of seeing some hail, but we didn't see anything but extremely heavy rain and strong winds.

Unfortunately though there was no good low level inflow but this didn't matter to us, as we got closer because it was still a very impressive storm just the same.

It was when we were coming into the town of Willow Tree on the New England Highway that we were confronted with the full face of this now mature thunderstorm. It had a massive shelf cloud that went right up to the anvil. It had the most amazing fluorescent green light coming through the front at different levels above the gust front! Just like I have seen HP supercells do in the states!



After coming back out of the rain we drove southeast down the New England Highway all the way to Murrundi. We experienced more heavy rain on the south edge of this system but not much else. We turned around and drove north again back through Willow Tree to Quirindi. Here we went up onto "Who'd have thought it"

Lookout and watch the last parts of the storm decay over the southern New England tablelands. Of interest though was a forward flank updraft that we saw developing on the northern side of the decaying system. Although it was weak and didn't last long, it was quite round in its base and exhibited some features that a forward flank meso-cyclone would.



When it started to rain on us at the lookout we decided to head northwest to Gunnedah in the hope of seeing some fresh development nearer to the clearer air on the northwestern side of the trough-line. We stopped briefly on the Breeza plains too observe a storm to the south before heading off again to Gunnedah.



At Gunnedah we got petrol and we also got in contact with Jimmy Deguara who was out at Coonabarabran with Geoff Thurtell. No new storm development was now happening as the air had become more stable so we decided to head west and meet up with Jimmy and Geoff and spend the night at Coonabarabran.



All up this day for us was a complete success as far as our chase went. We forecast storms in the correct area and then we were there in time to watch them form from Towering Cumulus all the way to the finale as a massive HP bowing shelf cloud.

So it turned out to be a nice way to break a lull in the sunny weather and cure the Christmas storm blues!!!

The 1974 United States Tornado super outbreak.

The April 3 1974 super outbreak produced tornadoes on such a magnitude never observed in United States history. By the end of the period, the storm outbreak had spawned 6 F5's, 23 F4's, 35 F3's, 30 F2's, 31 F1's and 23 F0's. So in total of 148 tornadoes were reported on 3rd and 4th April. Considering that tornadoes of violent magnitude (F4's and F5's) statistically contribute to 1 to 2 % of reported tornadoes, it illustrates that conditions on the day

supported tornadoes becoming strong to violent once touchdown occurred. 13 states were touched by this outbreak covering central to northeast parts up to the Canada border. In comparison, the tri-state tornado outbreak on March 18, 1925 resulted in 746 deaths making it the deadliest outbreak. It was the frequency of tornadoes that made 1974 outbreak unique.

Unfortunately there were casualties: 330 deaths and approximately 5000 injuries. Not all casualties were tornado related though as some deaths were caused by straight line winds.

As one would expect in such outbreaks, tornadoes were long tracked and with the incredible shear would have enabled efficient separation of the precipitation cores and the tornadoes/mesocyclones. One such photograph from the event illustrates this with a massive mesocyclone of the order of 8 to 10 miles across and a violent F4 tornado well separated from the precipitation. Such behaviour enables mesocyclones (rotating updrafts that can produce tornadoes) to persist with tornadoes for longer periods of

time.

References

<http://www.april31974.com/>

Including some photographs in this following link

http://www.april31974.com/Photos_of_tornadoes.html

<http://kitty.net.tripod.com/321/id10.html>

More resources including a slide show of the tornadoes

<http://www.spc.noaa.gov/archive/tornadoes/st-dbyr.htm>

How does it compare?

<http://www.interaxs.net/pub/hgr/superoutbreak.htm>

Statistics including the path lengths of the tornadoes

<http://www.publicaffairs.noaa.gov/storms/boyd.html>

Eyewitness accounts of a meteorologist

<http://www.angelfire.com/ga/mrsweather/century8.html>

While your surfing the web why dont you check out the WDU Shop, a Journal of Australian Storm Chasing Partner.



Australias Leading Weather Instrument Retailer

Tamworth H.P. Supercell

25/01/04

By Jeff Brislane

When you chase storms at any opportunity you are bound to have busts where the situation just doesn't work out as forecast. The cap was too strong, or dry air invaded too early and the towering cumulus died or something else happened and you ended up busting out. This never happens when you only chase strong systems but in doing that you miss out on a lot of the local severe events that weak to moderate systems throw out from time to time. So by chasing a lot of the weak to moderate systems you sometimes bust out, but you are sometimes rewarded with the occasional locally severe storm or even the odd supercell.

This day was one of those moderate days where storms were generally a certainty in the target area. But supercells were not likely as the wind profile was not favourable for them. The 500mb winds were weak at around 25knt, and the lower levels were not much better in terms of decent speed shear. The notable exceptions were around Tamworth where a jet of around 25knt's at 700mb was forecast at 03z and 850mb wind was around the 15knt mark. This sort of wind would barely support supercells and only then if there was enough energy. And that's where the CAPE probably came into the equation. It was forecast to reach a staggering 3000 over the Liverpool ranges at 03z and that was matched with a lifted index of -6. This is probably why we had an isolated supercell form and

it's also no doubt why it was the HP type as well. The windshear was too weak for the formation of Classic supercells.

The other notable exception to the forecast today was the region around Glenn Innes. Up there on the Northern Tablelands the forecast wind profile showed excellent turning from the northeast at 1000mb all the way around to the southwest at 500mb and although the speed values were not that high the turning effect would have been enough to get rotation going. The convergence was also better around Glenn Innes with a low level northeast wind forecast to converge with a northwest wind in that region. Both were forecast to 15knt. The only problem with the Glenn Innes area was the CAPE and LI values were not forecast to be as high as the plains. They were around 1400 CAPE and -4 LI respectively. But this wouldn't be a problem we thought with the wind profile it had to support it. This was the reason why we chose the New England Highway north of Armidale as our target area on this day.

After last minute checks on the morning of the 25th we were away. I picked up Mathew Piper and we headed north this time up the Putty road to Singleton. We knew that Jimmy Deguara and David Croan and others would be chasing on this day but we deliberately chose not to contact them or anyone else so that we could chase different storms and

get different viewpoints of the day's events. It's always better to chase separately and meet up later. That way we all cover more storms than we would otherwise and we don't all have the same reports. There are some exceptions to this rule though and at times chasing together is better.

From Singleton we headed north towards Tamworth. We encountered a lot of early rain in the upper hunter as a large MCS or Meso-scale Convective System, which had formed early that morning northeast of Dubbo was slowly moving east over this region. This had us concerned as it looked to be completely covering the Northern Tablelands. If it didn't move east quickly enough it would affect the days storm chances in our target area by robbing it of vital daytime heating. Never the less though it was a very impressive system, and when we got closer to it near Scone it revealed a deep green tinge in its massive heavy rain shaft. We later heard that this system produced large hail to 5cm's and damaging winds over the southern New England tablelands around Nowendoc. It also produced major flash flooding, which we witnessed just east of Quirindi on the New England Highway.

By the time we reached Tamworth at around 12 noon we realised that the MCS was not going to be clearing the Tablelands in a hurry. With that in mind we headed into town and got lunch at KFC.



It started forming slowly and at first I couldn't pick what was happening. The ragged cloud appeared under the base of the storm and then we realised something significant was happening.

We then drove out to the western side of town to make up our minds what to do next. We knew that the highest CAPE of the day was forecast to be just southwest of Tamworth at 03z and that seeing that there was clear air here we decided to stay and see what popped up in the clear air behind the MCS.



Having never driven around Tamworth I took the opportunity to search for some good viewing spots. I headed west on a back road south of the Airport.

After about 5km's we found a road that headed south into the grazing country south of the Oxley Highway. We drove down this road and noticed that a convergence line was producing weak storms on the ranges west of Tamworth. We found a spot about 5km down this road that had a good view to the west and we waited to see what would happen. By 1pm the MCS was still covering the Tablelands east of Tamworth and to the south we could see convection in the upper Hunter Valley. To the west the convergence line was getting stronger with a nice rain shaft forming.



Matt called out to me to check it out and after about 10 minutes of watching we realised that a high precipitation supercell was forming right before our very eyes on the northern side of the convergence line.



You could see the cumulus tower exploding directly above the lowered ragged base. The supercell intensified further until the ragged base was touching the mountains below!



probably now at it's strongest. We watched the supercell as it slowly came off the mountain range and it appeared to be heading in an east-northeast direction.



Tamworth got an absolute dumping of rain by all reports. We didn't go back to find out, because by now we were hoping for another supercell to form north of the last one. More storms did develop on the northern side but none of them were supercells or even severe.

We headed further north to Manilla

By now it had a beautiful rounded base from a low level mesocyclone and it was drawing an inflow band in from the southeast. Within 10 minutes the inflow band had joined onto the base of the supercell and it was



We took some more photos and video and then decided to head back east to Tamworth to try and stay ahead of it and to maybe even get onto the northern side of it. At Tamworth I filled up the petrol tank (doh!, should have done that earlier!) and we headed north out of town on the road to Manilla. We just managed to get across it's path and onto the northern side but by now it had weakened completely. The core was nice and green and it had an outflow shelf cloud now were the updraft used to be.

and then onto Barraba. We were on the verge of heading over the Nandewar ranges when we saw a new tower exploding in clear air over the Northern Tablelands in the vicinity of Glenn Innes.



It was absolutely huge and right over our original target area! That was enough for Matt, so we headed north to Bingara and then east to Inverell and finally onto Glenn Innes. By now it was dark and we were treated to an amazing anvil crawler display before crashing for the night.



Today was a completely successful chase in which we modified our target area and ended up seeing a supercell. It just goes to show that you always have to be watching and contemplating your next move in the context of the weather around you. If we had gone onto our target area instead of waiting at Tamworth we would

have been in heavy rain the whole trip and we would have missed a HP supercell, although we would have seen the impressive convection that occurred later on, on the northern side of the MCS. However by not realising that the northern edge of the tablelands was in fact clear we missed out on the latter storm that was in

our original target area, which we could have reached if we had headed up straight after the supercell. It just goes to prove that in storm chasing you never get them all, but you always hope to get some! I'll modify my target area for a supercell any day!



WDU Weather Expo 2004

Saturday 17th April 2004

12.00pm – 5.00pm

245 George Street Windsor NSW

Schedule of events for the 2004 WDU Weather Expo

Storm Chasing # Weather Observation
Weather Equipment (how to get the most out of it)

Storm Chasing

- Preparation and plotting the storm
 - Safety • Equipment
- Finding and following the storm

Weather Equipment (how to get the most out of it)

- Choosing a weather station
 - Mobile weather stations
- Software –Choosing the right software
 - Setting up your weather station

Weather Observation

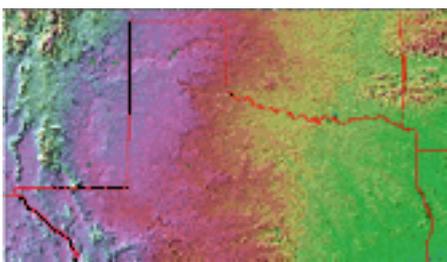
- El Nino
 - Hail • Lightning
- Tornadoes (US and Australia)

ASC Storm Spots

“A bi-monthly wrap which look at the worlds hottest storm chase destinations - only at ASC”

-- The Cap Rock Escarpment and Texas Panhandle, USA --

One of the most recognisable topographic features of the Texas landscape is the Cap Rock Escarpment - an extensive north-south oriented plateau that rises abruptly from about 100 to 300 m from the adjacent plains, in a horizontal distance of only a few kilometers. The eastern face of the Cap Rock is most pronounced face and runs from the Permian Basin northward through the Panhandle into Oklahoma, dividing the Texas High Plains from the Low Rolling Plains. In part this is due to erosion from a dominant southeast wind. The escarpment is cut by several canyons, including the Palo Duro Canyon to the south of Amarillo.



Above: The level nature of the Cap Rock escarpment (purple) is evident in this image of Texas

This remarkably flat, treeless landscape was originally grassland though is now used for farming. From a storm chaser's perspective, the Cap Rock is noted for just that - its flatness. Indeed there are few areas that are as level. During spring,

low-level moisture can build up against the escarpment and become a focus for thunderstorm development or intensification. In winter the elevation of higher areas of the escarpment means cold temperatures. The coldest temperature ever recorded in Texas was observed near Seminole, -30.3C (-23F), on the 8th February, 1933.

The local tornado climatology of West Texas is marked by a maximum that covers the area ranging from the east-central Panhandle to the southwest. A strong correlation exists between the West Texas tornado maximum and changes in elevation associated with the Cap Rock. Linley (1997) noted the following:

- “The tornado maximum appears to run roughly parallel to the 3,500 ft contour.”
- “Out of 119 significant tornadoes in the Panhandle and the extreme northwest part of West Texas cited by Grazulis et al, 1993), only eight percent occurred north and west of this line as it extends southwest from Palo Duro Canyon to the southeast side of the Llano Estacado.”

and concluded:

“This seems to verify that severe, and sometimes tornadic, convection commonly initiates near the leading edge of the deep moisture layer along the Caprock and the Llano Estacado.

The area of the dryline is a favored location for thunderstorm initiation (Rhea 1966). Typically, the dryline moves from west to east during the day and in many cases, the dryline is incapable of advancing beyond the increased depth of the moist layer present east of the Caprock.”



(Chaser David Croan shoots a large tornado near White Deer on the Caprock, May 29, 2001)

The editors at ASC, having chased the panhandle on numerous occasions, can each vouch that it really is a wonderfully unique environment. The said landscape; the towns...Dumas, Porger, Pampa and, of course, Amarillo; and of course the storms - the Cap Rock has long been associated with majestic thunderstorms and powerful tornadoes. You really haven't seen a storm until you've seen a Pampa storm. Need more convincing -who can ever forget June 1995 - Project Vortex!

Reference: Lindley, T (1997) *Effects of Texas Panhandle Topography on Dryline Movement* Technical Attachment SR/SSD 97-39, NWSFO, Amarillo, Texas

Storm Spotter / Chaser Education Series

-- The Flanking Line --

***Flanking Line** - A line of cumulus or towering cumulus clouds connected to and extending outward from the most active part of a thunderstorm, normally on the southwest side. The line normally has a stair-step appearance, with the tallest clouds closest to the main storm, and generally coincides with the [pseudo-cold front](#).

Reference: Branick, M. A COMPREHENSIVE GLOSSARY OF WEATHER TERMS FOR STORM SPOTTERS. NOAA Technical Memorandum NWS SR-145 (<http://www.srh.noaa.gov/ou/numerical/glossary.php>).

The flanking line provides an observer with a number of visual clues that are useful in the diagnosis of storm intensification. The flanking line is produced by convergence along an outflow boundary extending from a thunderstorm. New convection forms along the flanking line as the moist inflow air rises as it approaches the cool thunderstorm outflow air at the surface.

In the southern hemisphere, an observer looking southwest at a thunderstorm will view the flanking line, generally, as a series of developing cumulus clouds / towering cumulus extending north or northwest from the storm's main updraft tower. The cumulus closer to the main updraft tend to

be more mature and eventually merge into the parent storm.



The following image, looking south, shot by storm chaser Michael Bath, reveals the typical flanking line 'step structure'; with tower height increasing with proximity to the main updraft of the parent storm (left side). The tower in the centre would soon become the main updraft in this multicell storm. Powerful cauliflower-like flanking line towers are a good sign that a storm is maintaining, if not gaining in intensity.



Multicellular thunderstorms actually consist of a series of evolving cells. In an environment of modest wind shear, each dominant updraft tower has only a limited lifespan before being undercut by its own outflow. Strong low-level convergence favours the generation of new towers upwind. As a result the movement of multicell storm systems is determined by combining that of new cell development with actual cell direction resulting mean direction in the 500-700 mb layer. Supercell thunderstorms may also possess a clearly visible flanking line, which usually rises

abruptly, vertically into the parent storm. Rather than 'compete', the flanking line towers of a supercell actually reinforce the parent updraft. In addition to being a source of convection, the flanking line also appears to be associated with vorticity maxima and may be involved in low level mesocyclogenesis. This is the subject of ongoing work using computer simulations.

LIGHTNING FEST

JANUARY 2004

A collage of video captures by Matthew Piper



Lightning, Lightning and more

Lightning!!!

January 22-23-24th

2004

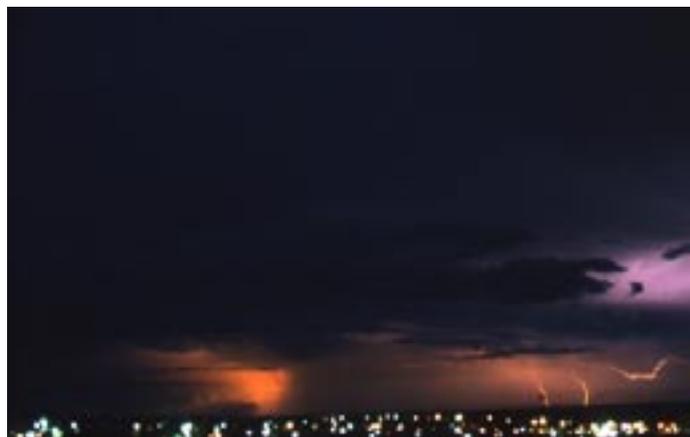
After literally months of no photogenic after dark storms in Western Sydney we had one of the most exciting lightning shows that I can remember. We had a number of days with nighttime lightning in Sydney over January but it was the 22nd, 23rd and 24th of January that will long be remembered by others and myself as the best three days in years!

The following photos were taken by me over that 3-day period and show some of the amazing colours and types of lightning we saw. We saw everything from branched staccato and strobing CG's through to some spectacular anvil crawlers and intra-cloud lightning.

Enjoy!





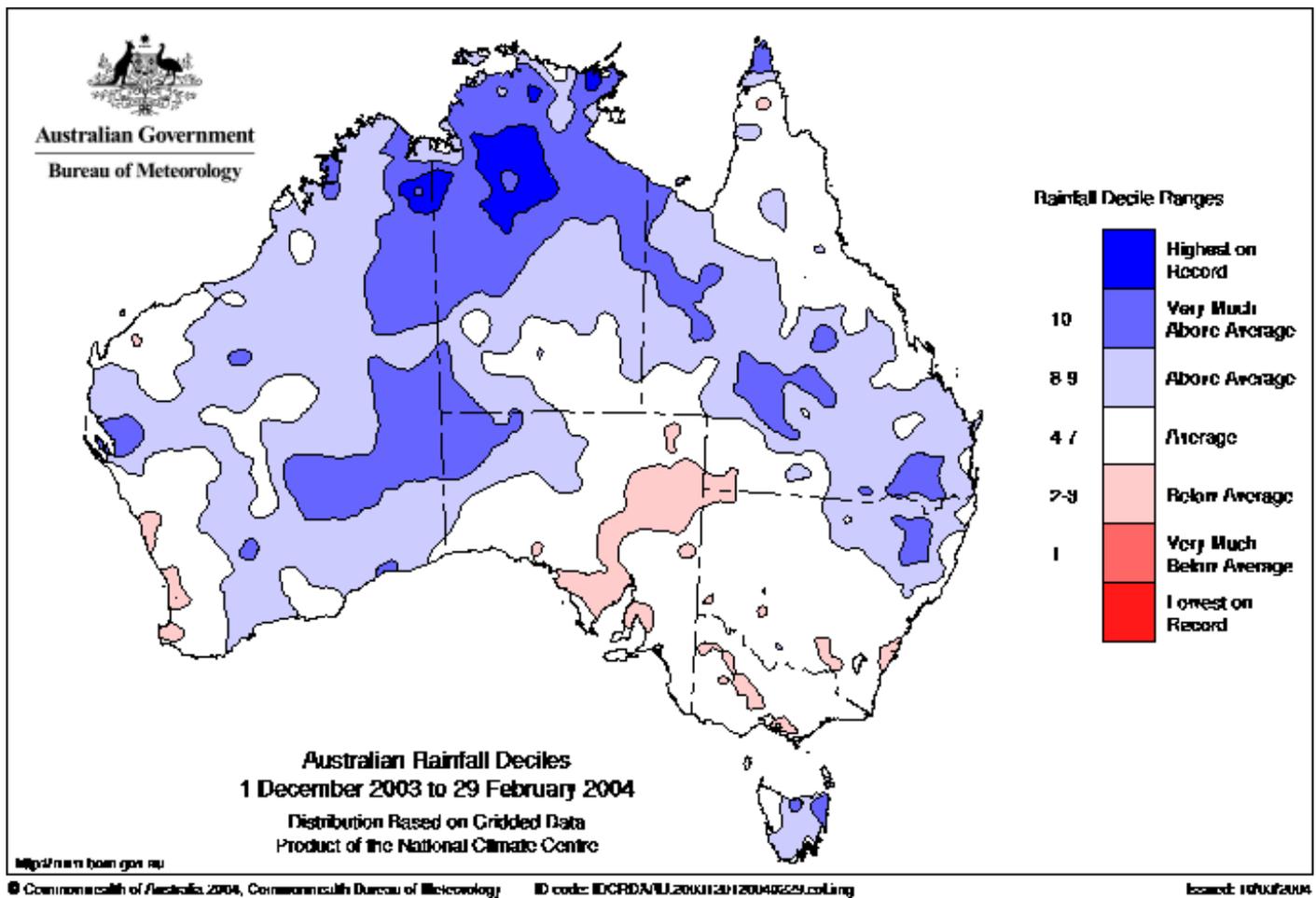


Summer 2003-2004 Rainfall Summary

There has been much debate in 2003 about whether or not the summer of 03-04 would be wet/dry or average. After two years of El-Nino conditions in Australia anything would have been better than going through a drought again.

As it stands the summer of 03/04 has turned out to be on the whole an average to slightly wet summer as far as the rainfall record shows. On the following Bureau of Meteorology maps you can see that there has in fact been substantial rainfall over the last 3 months.

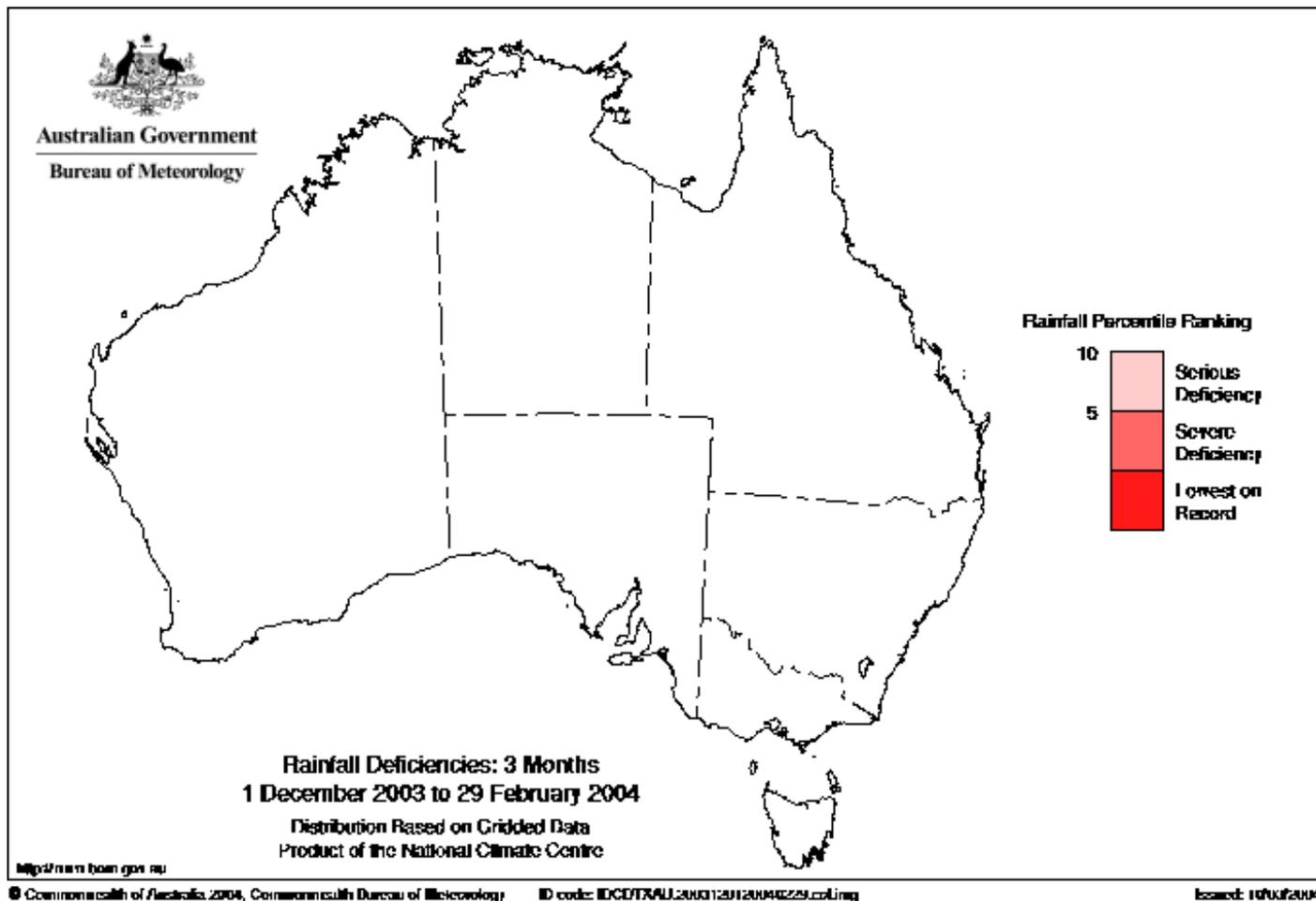
The first map is the Australian Rainfall Deciles map. This map shows the amount of rainfall that has fallen in relation to the average. This is measured in "Deciles". Basically the blue areas are above average rainfall and the red areas are below average rainfall. Also the darker the blue or red, the more above or below average the readings were.



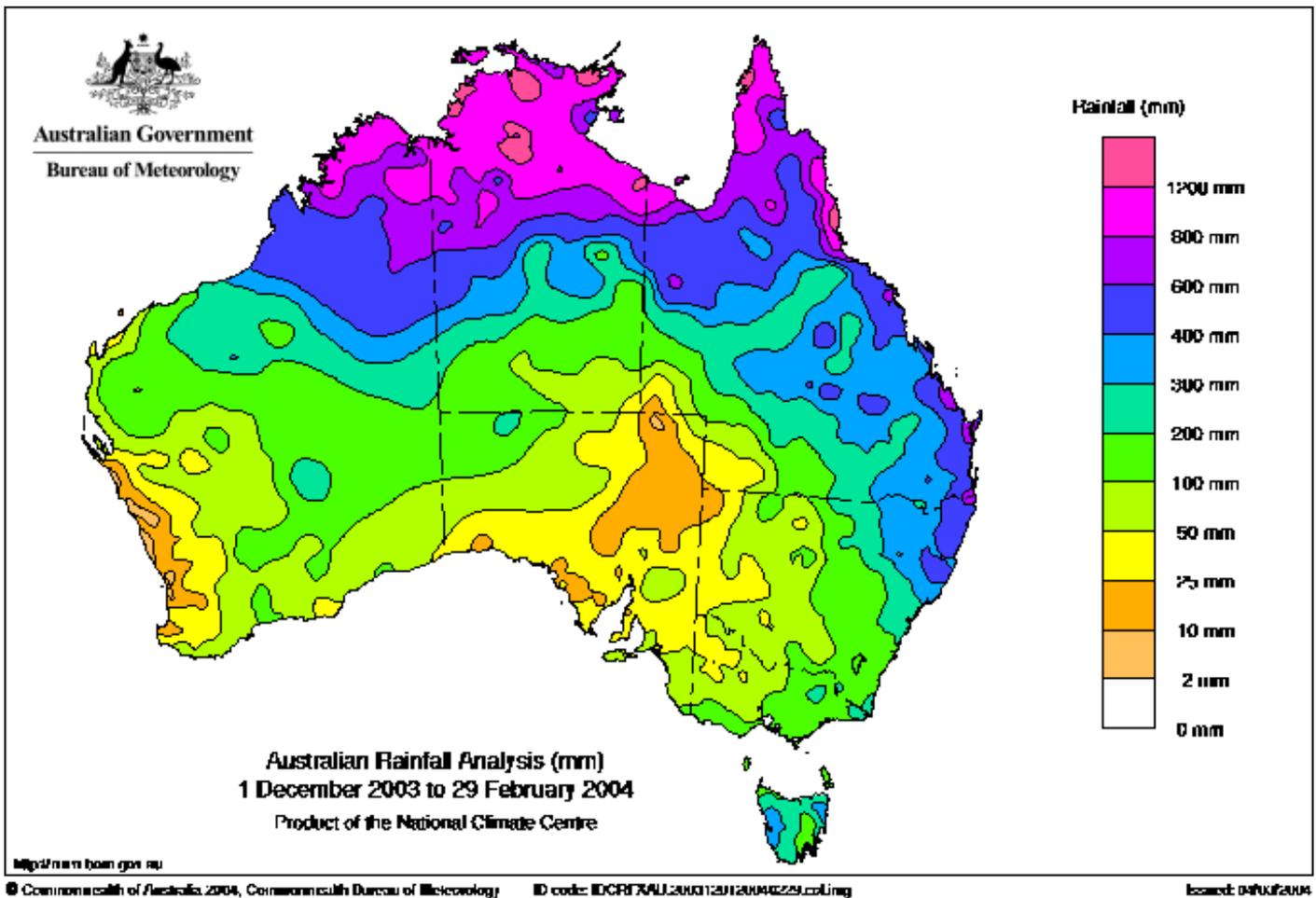
As you can see, most of Australia has seen rainfall that has been above average to some degree, while most of the remainder has seen mostly average rainfall. Only a few small areas have seen below average rainfall. Now while it looks on the map that we have had mostly above average rainfall, one important thing must be realised from the information, and that is that most of Sydney, Perth, Adelaide and Melbourne are in areas of slightly below average rainfall. So it would be more than likely that about 60% of the population of Australia lives in areas that have received slightly below average rainfall.

Also most of the major dams in those cities would also be in the same areas, hence the ongoing water crisis.

The next map shows “Rainfall Deficiencies” for the 3 months of summer 03/04. As you can see there is not much to talk about on this map! Although some areas have seen slightly below average rainfall this summer, it has not been enough to rate as a serious deficiency.



Lastly we come to the “Australian Rainfall Analysis” map for summer 03/04. As you can guess this map shows the accumulated rainfall totals from the 1st of December through to the 29th of February. This map is useful in seeing at a glance how much rain an area has received over a season. But it is not a good indicator of whether or not that rainfall is enough or average. As you can see some areas of Australia’s north received large rainfall totals over summer but that does not necessarily mean that they have received enough rainfall. Only an averages map such as the deciles map can tell you that.



In summary I think that we have had in general over most of Australia a slightly wet summer, although it must be pointed out again that most of Australia's population lives in city's that have seen slightly below average rainfall.

All three maps are from the Bureau of Meteorology Australia and are used with their stated permission for analysis purposes only. For further information on rainfall observations visit the BoM website

www.bom.gov.au

The Journal of Australian Storm Chasing Parent Website

STORM CHASING

Australian Storm Chaser News & Events

www.stormchasing.com.au

For all your storm chasing resources

Observing clouds

Thank you to the original author, Jimmy Deguara, for allowing this document to be reproduced. The original can be found at:

<http://australiasevereweather.com/techniques/simple/cloudobs.htm>

Most people have developed some concept of cloud structure.



Cloud is a representation of water vapour in its liquid or solid state and is why they are visible. The typical features that are normally associated with clouds are that they normally consist of white tops and dark bases. Now it is important to note that we are referring to three dimensional shapes and that clouds are part of this three dimensional space. You only can see the outer component or boundary surface. If you can see one part of a cloud you cannot possibly see the other side because it is hidden from your view by the inner core of the cloud.



The base or bottom of the cloud is usually darker because sunlight must pass through billions of cloud water droplets or ice crystals from the cloud top or sides (depending on the sun's position in the sky). The more condensation that occurs, the more particles available within the cloud mass and therefore the darker the base will appear. Also the larger the cloud, the less sunlight that can penetrate through to the base. Large thunderstorms therefore usually have very dark bases as a result of the base to top heights.



The shapes of clouds depend on how they are formed and their height above the ground. There are several different types of clouds which are classified generally according to height. This classification system will be discussed later in the more advanced observation section. At this stage, we will consider the white, puffy, cauliflower-shaped cumulus cloud which are amongst the easiest to recognise or lines of clouds (stratocumulus).

At this stage, we must introduce a three dimensional picture of the cloud. Questions we must try to answer are: How distant is the cloud? Is the cloud a large cloud or is it small? Is the cloud situated at a great height or is it fairly low? Which way is the cloud moving? Is the cloud approaching or moving away? Is there perhaps more than one type of cloud? At this stage, we will assume that the cloud does not change significantly in size and shape.

As an observer on the ground, your view is restricted. You therefore must rely on the following three dimensional techniques which can be applied to other weather observations and observations in many other fields.

Let us consider that the earth is a sphere and that the clouds move around along a spherical path above the earth's surface. The boundary where the sky seems to meet the ground is the horizon. Of course this will vary in a mountainous region as compared to flat region (plain). The amount of sky observed will be greater over a plain than over a mountainous region. We will assume that our view of the ground is flat although it is slightly curved part of the earth's sphere.

If a cloud which we will call cloud A was to approach you directly from the horizon, three observations must be taken into account.

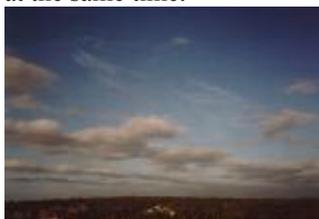


First, the cloud will appear to rise from the horizon slowly, until it moves overhead and then towards the horizon on the other side and then disappear.

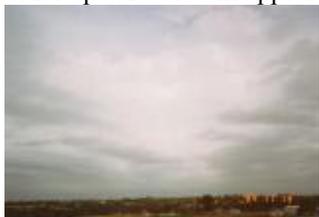


It follows the same pattern. Second, as the cloud rises, it will gradually increase in speed reaching a maximum as it passes overhead and then gradually decrease speed as it 'sinks' towards the other horizon. Third, as the cloud approaches, it will generally appear to increase in size reaching a maximum overhead, even if the cloud is not actually growing. If you have problems following these procedures, apply these concepts to a plane as it approaches you. A cloud can be considered like an approaching object, although most people do not generally study clouds and so do not apply these techniques to clouds.

Now, consider a cloud **B** identical in size to cloud **A** but approaching you over a curved arc in the sky slightly towards the left and at the same time.



In this case the cloud will still follow a similar pattern as described in the previous example but to a lesser degree. It will not rise as far upwards. It will appear smaller. It definitely will not pass overhead. A further observation should be noted.



The cloud will appear to move slightly to the left until it passes over the half way point and then begin to slowly move closer towards the other horizon. It should also cover a shorter curved path. A cloud to the right of cloud **A** will follow a similar pattern to cloud **B** but remain on the right hand side of the cloud **A** and its path. Again, this requires practice.

Another observation is that as the cloud approaches, depending on its shape, you will observe more of its base and less of its front outer boundary. As it passes overhead, the base of cloud **A** will be the only part observed. However, in the case of cloud **B**, you will observe different views of its outer boundary but still observe its base from different viewpoints. Remember, the further to the left or right that it passes from you, the more of the outer boundary and the less of the base you will observe.



The last observation that will be noted is the change in the contrast or varying colour of the cloud. There is no general simple rule for this observation except that the base seems to become slightly lighter as it approaches. This occurs because there is less sunlight passing between you and the cloud as it approaches and hence less contrast. This is especially notable if the cloud obscures the sun.

These techniques are difficult to master because they are optical illusions. You simply cannot reach out and feel the clouds. So it is important to practice with real clouds as many times as is necessary to develop a true concept of the shape of a cloud from various viewpoints before proceeding to other observations.

Word Finder Puzzle

The puzzle on the next page is based on the article on Observing Clouds. Most of the words in the puzzle are listed underneath it. However, two words are in the puzzle but not listed. A clue for the “mystery” words is provided under the puzzle:

Observing clouds

Geoffrey Thurtell

HGN A I R T H I N A U C L S H
E N O M T S A R T N O C N O N E
I A C S B M A S F O O T E P T C
G A G A S R A D A I U L P T C S
H D S L C O N D E N S A T I O N
T E T S R T P E C N O C P C L O
D I M E N S I O N A L O N A O I
N F C S T R A T O C U M U L U S
R I N T S E U Q I N H C E T R U
N S S R D D R C T V O C R E U L
E S M U I N C E A H A Z R M O L
E A O C N U H E V F G P I C U I
G L O T M H C I R E R I O R U R
C C D U I T R U E E A T L U O T
R H L R N E S O S B H R E N R H
H U I E R E N C B N V P L S U T
S N B V I E W P O I N T S C D S

arc	concept	cloud
cumulus	condensation	illusions
height	sphere	observation
sunlight	stratocumulus	thunderstorms
surface	vapour	base
colour	horizon	optical
techniques	viewpoints	dimensional
classified		

Mystery Words clue: “Supercells exhibit excellent _____ and _____.”

The solution will be provided in the next edition of the journal.

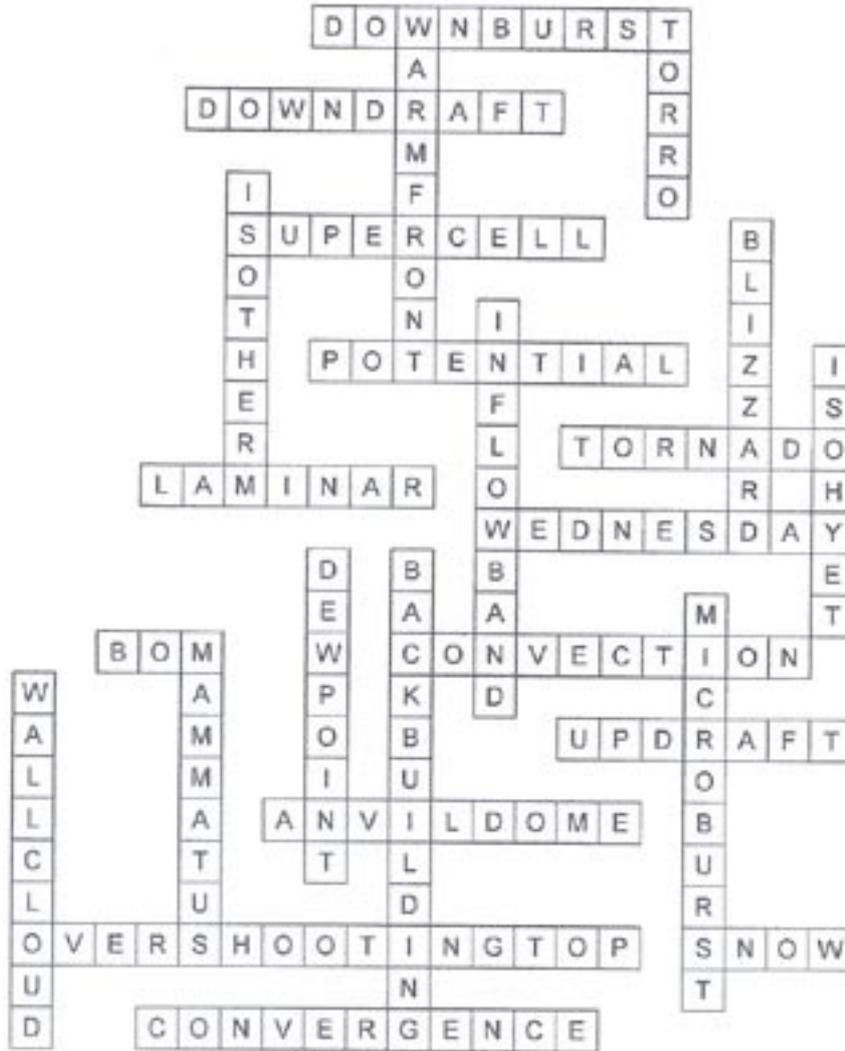
Puzzle generated at: <http://www.armoredpenguin.com/wordsearch/>

Solution to last issues Crossword

Custom Crossword Puzzle

Page 1 of 1

ASC Crossword No 1



<http://www.variety-games.com/CW/Puzzles/281241681-solution.htm>

1/11/03

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Issue 1 Dec 2003/Jan 2004 All Rights Reserved