

[REDACTED]

---

From: [REDACTED] on behalf of [REDACTED]  
Sent: Tuesday, 9 March 2010 11:07 AM  
To: [REDACTED]  
Cc: [REDACTED]  
Subject: RE: [synoptic\_discussion] Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]  
Attachments: 50dbz.jpg; vil.jpg

Given I was riding the radar this day, I thought I would comment from memory:  
WDSS hail size estimate was constantly between 40mm and 70mm from the storm...all the way from Bacchus Marsh to Pakenham. The largest hail size estimated from WDSS that I saw was 100mm near Ferntree Gully! This is easily the highest estimate by WDSS that I have seen over Vic over the last few years. In the past Yarrowonga has tended to overdo the hail size estimate. YMML usually not too bad, although if anything a bit too high.

Looking at the NSW hail size guidance (which needs to be updated (I believe this is happening), and tuned to Vic radars etc (this isn't happening yet!)) --> <http://www.nsw.bom.gov.au/web/sevw/threshhailft.htm> or 2 images attached.

The freezing level over Melbourne was around 12000ft.

\*Thus to get >6cm hail the guidance suggests VIL (vertical integrated liquid) needs to be >120. Well the VIL from the storm was consistently between 100 and 250...peaking at around 320 near Ferntree Gully (easily the highest value anyone in the office had seen). BTW, if anyone can create a 'VIL loop', this captured beautifully the path of the storm.

\* Thus to get >6cm hail the guidance suggests 50dbZ to >12km. Well 50dbz was to around 10km in the cell....and it would have been pretty hard to get much higher than that given the tropopause was just above 10km!

Given the environment and radar evidence, as early as near Bacchus Marsh, it was pretty obvious to stick the 'Very dangerous thunderstorm' tag on the thunderstorm in the warning as it entered the outer western suburbs (I have never used this tag before, and I think it had only been used once or twice previously in VRO). So from a forecasting point of view I feel like I did everything I could. However it is kinda unsatisfying given the destruction that still occurs.....

[REDACTED]

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From: [REDACTED] On Behalf Of [REDACTED]  
[REDACTED]@bom.gov.au  
Sent: Tuesday, 9 March 2010 10:43 AM  
To: [REDACTED]@bom.gov.au  
Cc: [REDACTED]  
Subject: RE: [synoptic\_discussion] Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]

Taking one of [REDACTED] screen grabs, I think we can see TBSSs(three body scatter signatures). See attached. These are indicative of hail sizes comparable to the wavelength of the radar, which in Laverton's case is ~10cm. I'm a believer!

Anyone got an idea of the WDSS hail size estimates?

Cheers  
[REDACTED]

-----Original Message-----

From: [REDACTED]

Sent: Tuesday, 9 March 2010 8:46 AM

To: [REDACTED]@bom.gov.au

Cc: [REDACTED]

Subject: FW: [synoptic\_discussion] Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]

Grabbing some volumes off one of the nowcast server for a slice and dice.. A very quick inspection and the top return I found was a very impressive 73dBZ.

Attached are:

3dbzat16km: To give an idea of the echo tops.. 3dbz returns at 16km high... Now looking at the morning sounding the tropopause was at ~10km... That is an overshoot!

Bwer: Nice bounded weak echo region

Have to break it into two emails (3mb limit) so the rest of the images are in the next email..

Midlevel\_meso: Rotation in the midlevels

Cappiatminus10: Constant altitude slice at a height the corresponds to -10 degrees, 5km.. To see 70dBZ here is pretty amazing.

-----Original Message-----

From: [REDACTED]

Sent: Tuesday, 9 March 2010 08:58

To: [REDACTED]

Subject: RE: [synoptic\_discussion] Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]

For completeness if attempts are made to analyse hail swathes...

When the storm hit where I was walking at the time on Saturday afternoon, near the corner of Olinda-Monbulk Rd and Woolrich Road, the maximum hail size was about large grape size.

The next day near Sassafras there was a marked increase in the amount of leaf litter on the roads to the south of Sassafras village (e.g along The Crescent, indicating larger hail had affected the area)

[REDACTED]  
National Manager Fire and Air Quality Services, Weather Services Branch Bureau of Meteorology, GPO Box 1289  
Melbourne, 3001 T [REDACTED] Fax [REDACTED]

-----Original Message-----

From: [REDACTED]@bom.gov.au [mailto:[REDACTED]@bom.gov.au] On Behalf Of [REDACTED]

Sent: Sunday, 7 March 2010 11:07

To: [REDACTED]@bom.gov.au

Subject: RE: [synoptic\_discussion] Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]

I have a friend in Boronia (next to Ferntree Gully) who lost a number of concrete roof tiles to the hail. Another friend in Lysterfield lost roof tiles and had numerous house windows broken. The spotter reports I've seen suggest a swathe of cars damaged from just west of Bayswater through Ferntree Gully, Tremont, Belgrave/Lysterfield - one dint photo I've see looked close to 10cm. I have 3 friends whose cars have been written off - I'm guessing the

insured damages will be into the 100s of millions if the reports are to be taken at face value. The path of this particularly hail seems to be about 10-15km.

The storm sideswiped our place in [REDACTED] (the very large hail looks to have passed 500-1000m south of our house) but I understand there was some hail stones to 5cm (am away for the long weekend).

Regards,

[REDACTED]  
[REDACTED]@bom.gov.au

---

From: [REDACTED]  
Sent: Saturday, 6 March 2010 4:40 PM  
To: [REDACTED]  
Subject: RE: [synoptic\_discussion] Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]

I'm reading on the warning that 10cm hail has been reported at Fern Tree Gully?! Extraordinary if that is true, reports coming in all over the place of golf ball+ sized stones through most of the suburbs, radar signature was particularly impressive as it crossed near Monbulk, rotation quite evident - see attached area circled. No doubt this storm will give you something juicy to discuss and analyse post-event [REDACTED]

Regards,

[REDACTED]  
T02 Technical Officer (Observer)  
Darwin Airport  
NT  
Ph: [REDACTED]

---

From: [REDACTED]  
Sent: Saturday, 6 March 2010 2:08 PM  
To: [REDACTED]  
Subject: RE: [synoptic\_discussion] Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]

Hail measured up to 4.5 cm at Mt Waverley ~3.20 pm; saw bigger earlier (while under cover!) Saw blue-green cloud & got the car in the garage with seconds to spare!

[REDACTED]

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From: [REDACTED]  
Sent: Saturday, 6 March 2010 9:39 AM  
To: [REDACTED]  
Subject: Re: [synoptic\_discussion].Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]

And if you don't want to take [REDACTED] word, take a squiz at the NTFGS for today, attached.

[REDACTED]

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From: [REDACTED]  
Date: Sat, 6 Mar 2010 09:17:17 +1100

To: [REDACTED]  
Subject: [synoptic\_discussion] Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]

Hi SevWx people - I have some musings in today's setup in the southeast -- [REDACTED]

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Hi folks,

I see a notable setup for today in VIC and S NSW. A big broad jet around the SA cutoff low sets up upper-level diverging flow over W and central VIC (read: lift). Current storms in W VIC, W NSW and SE SA provide further evidence that the inferred lift aloft is real. Said jet also overspreads the area with good strong flow needed for deep layer shear.

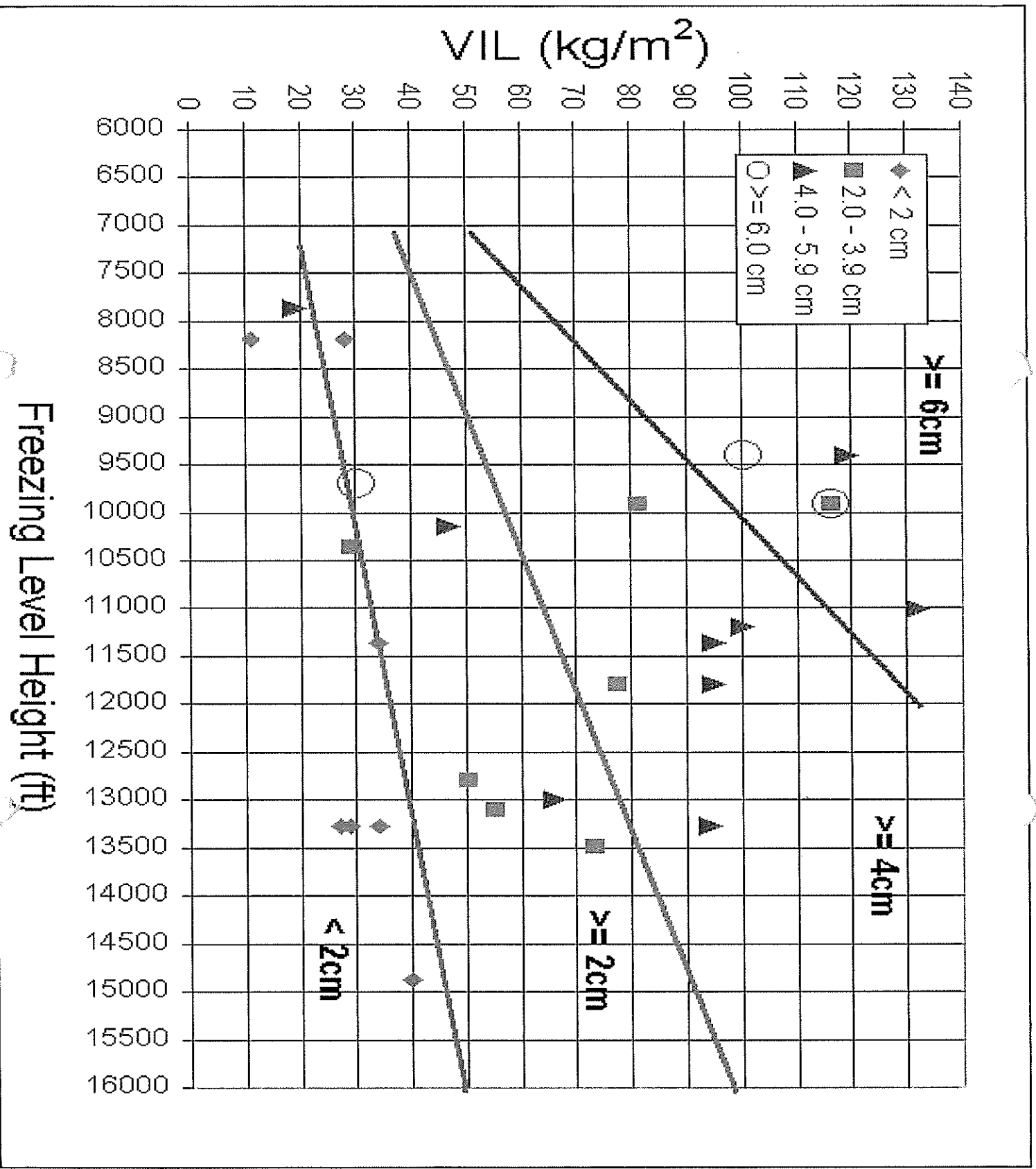
Underneath all this very deep moisture resides with mixing ratios of 12 g/kg through a depth of ~200 hPa in CEN VIC into S NSW. This moisture is not going to mix out in a hurry.

Lapse rates in last night's soundings from Melbourne and Wagga are pretty poor (dare I say [REDACTED] monsoonal), but in the cloud free areas today we might achieve something like a 28/17 parcel that will contain some CAPE through the lower and mid-troposphere.

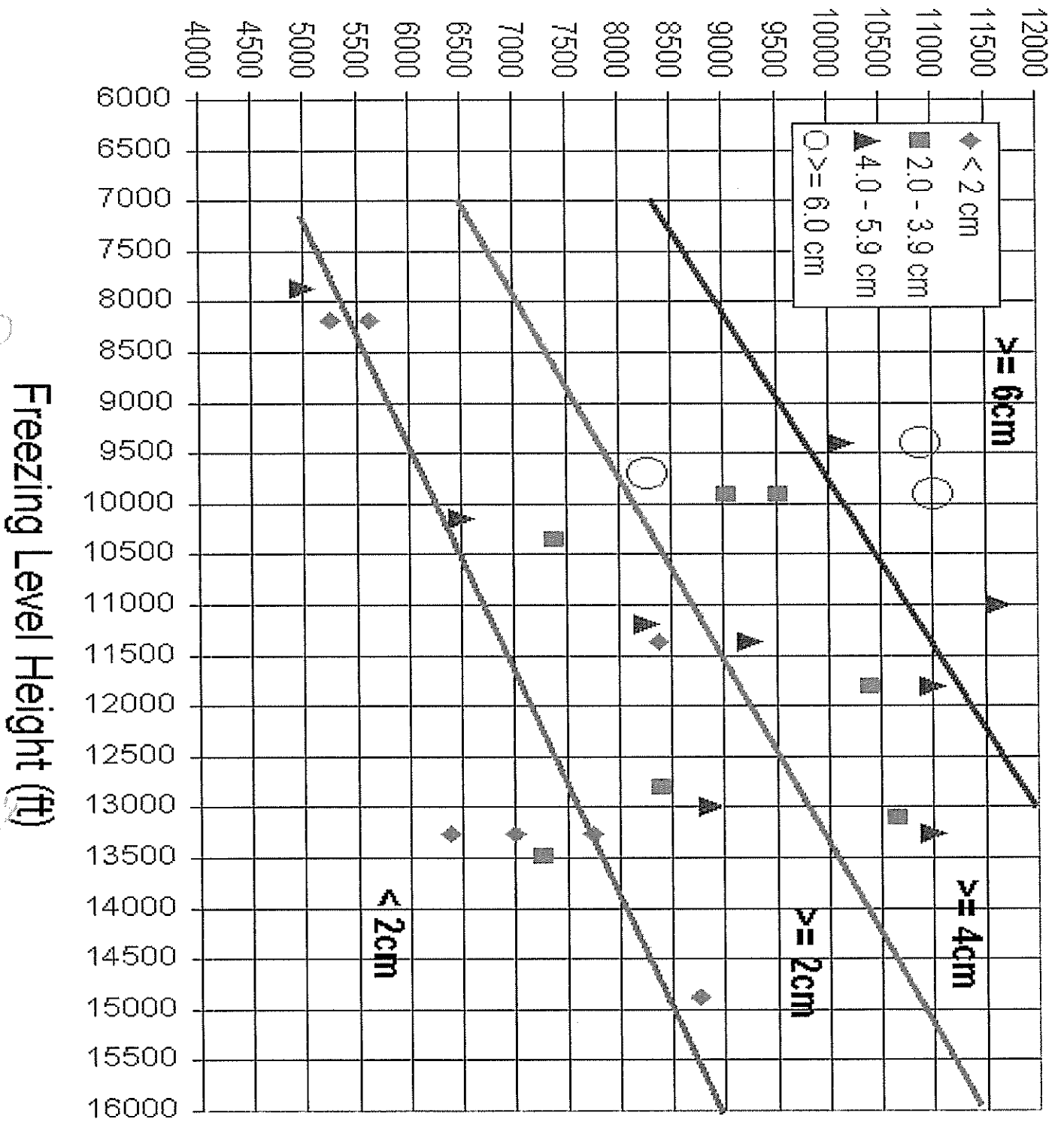
This should create thermals strong and long-lived enough for the deep shear to take effect and create storm-scale rotation.

I expect the odd low-topped supercell today along convergence boundaries in the insolation-rich parts of the deep moist boundary layers. I shall wait for the 23z/5 soundings to ponder on the low-level rotation potential in some of these storms.

Cheers, [REDACTED]



# Maximum Height 50dBz (m)



[REDACTED]

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**From:** [REDACTED] on behalf of [REDACTED]  
**Sent:** Tuesday, 9 March 2010 9:46 AM  
**To:** [REDACTED]  
**Cc:** [REDACTED]  
**Subject:** FW: [synoptic\_discussion] Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]  
**Attachments:** 3dbzat16km\_20100306\_0415.png; bwer\_20100306\_0415.png;  
extract\_skewt\_from\_adam.pl.png

Grabbing some volumes off one of the nowcast server for a slice and dice.. A very quick inspection and the top return I found was a very impressive 73dBZ.

Attached are:

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Bwer: Nice bounded weak echo region

Have to break it into two emails (3mb limit) so the rest of the images are in the next email...

Midlevel\_meso: Rotation in the midlevels

Cappiatminus10: Constant altitude slice at a height the corresponds to -10 degrees, 5km.. To see 70dBZ here is pretty amazing.

REMAINDER OF EMAIL THREAD DUPLICATES

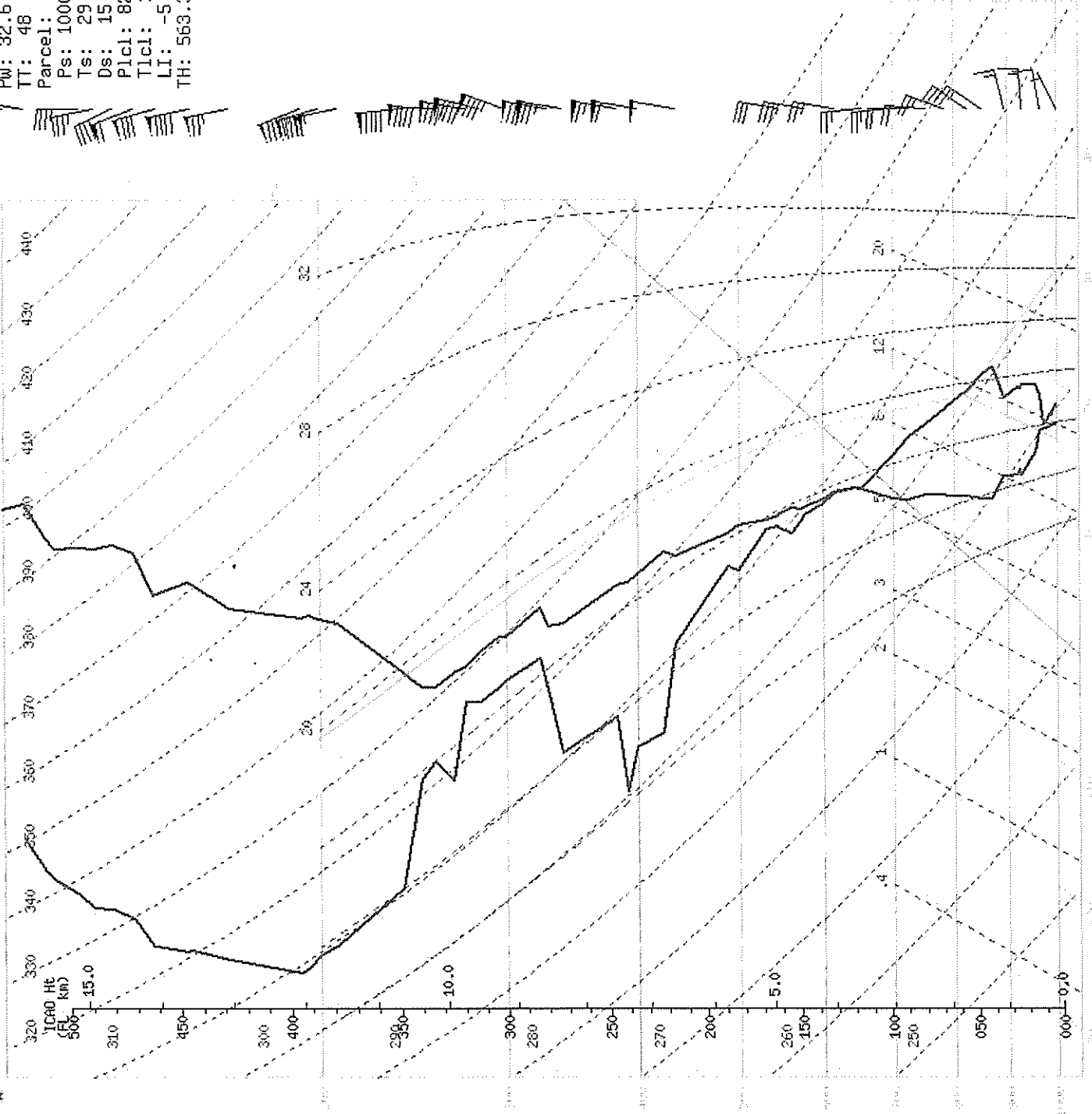
DOC 23

Australian Government  
Bureau of Meteorology

Aerological Diagram

Melbourne Airport (086282) 06/03/2010 2300 UTC

PW: 32.6 mm  
TT: 48  
Parcel:  
Ps: 1000hPa  
Ts: 29.1C  
Ds: 15.6C  
P1cl: 820hPa  
T1cl: 12.5C  
LI: -5.4C  
TH: 563.3 dm



Melbourne Airport (086282)

06/03/2010 2300 UTC

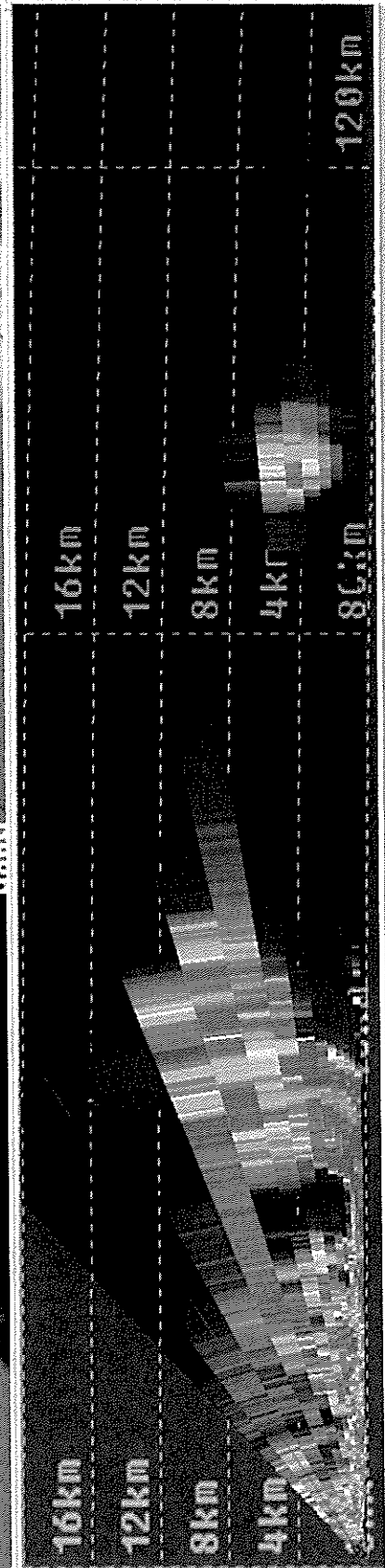
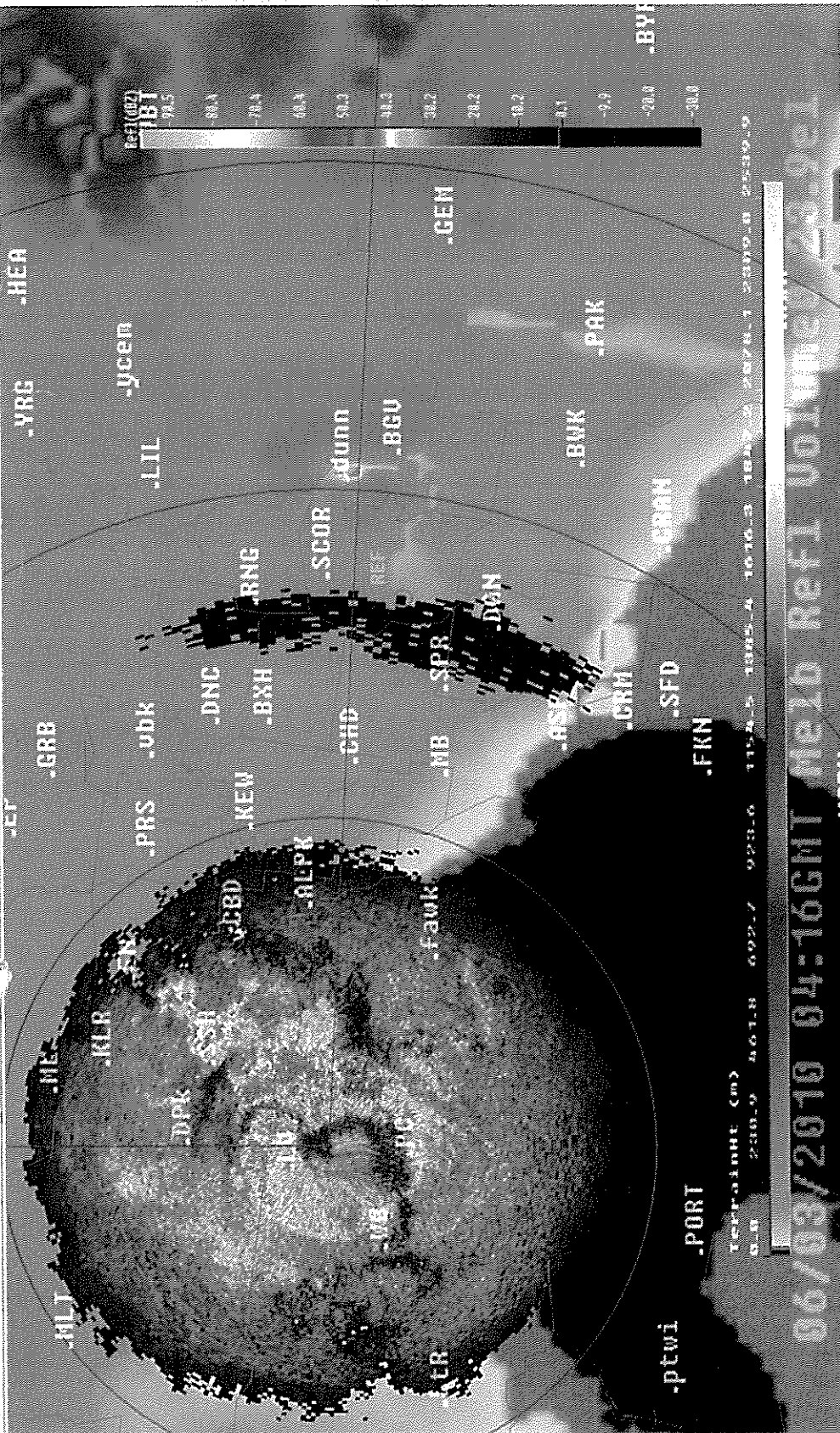




PR1/VXsect - El=23.9 Az=93.0deg Obs Ltg NoWinLks

Display Sequence Tools Overlays

Help



0.000 11000.000 0.00000m rnlr=22.2w/148.1deg 04:16:400T

[REDACTED]

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From: [REDACTED]  
Sent: Sunday, 7 March 2010 6:32 AM  
To: [REDACTED]  
Cc: [REDACTED]  
Subject: RE: [synoptic\_discussion] Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]  
Attachments: sevts100306.ppt

Hi all,

Some further info on yesterday's MCS/supercell which crossed Melbourne (-also see attached PowerPoint):

(1) These statistics will need checking, but the (official) 10cm-diameter hail report from Fern Tree Gully at 3.30pm rates as the largest hail ever recorded in the Melbourne area (previous record of 7.5 x 4.5cm hail at Somers 17/1/93). The largest Victorian hail reports in the new on-line database are two 8cm reports in 1993, however the older, excel/access database does include a report of 11cm hail at Everton in the northeast, on 3/1/93. Calves were killed by the large hail in this earlier event.

(2) [REDACTED] referred to the capping inversion on the Melbourne trace at 23Z - a sequence of AMDAR soundings indicated that this cap was eroded about 2 hours later, suggesting the presence of strong dynamics/uplift - see slide 1.

(3) The GFS upper-tropospheric pattern suggests the presence of one of the ingredients necessary for "the perfect storm" - i.e. strong upper-level forcing associated with the (right) exit of a strong jet streak east of upper-level cyclogenesis - see slide 2.

(4) An AVHRR-NOAA enhanced image valid ~0415Z (slide 3) shows a couple of features suggestive of the intensity of the system:

(a) an over-shooting top of -59C over the southeastern suburbs. Due to the proximity of a tropopause fold/jet (in the GFS diagnostics), it is hard to assess how much lower this temperature was than the tropopause. However, assuming that the broader cirrus canopy associated with the MCS was at the tropopause, I get a storm top temp. 14C lower than the tropopause. This is exceptional for a Victorian storm;

(b) head-blocking (i.e. a small band of significantly warmer radiances - see arrow in inset) is evident due to the very strong tropopause-level NNW'ly flow being blocked by the intense, over-shooting updraft associated with the ESE moving cell).

A second NOAA image 50 minutes later indicated maintenance of the very cold storm top, then over the Drouin area.

Regards,

[REDACTED]

-----Original Message-----

From: [REDACTED] On Behalf Of

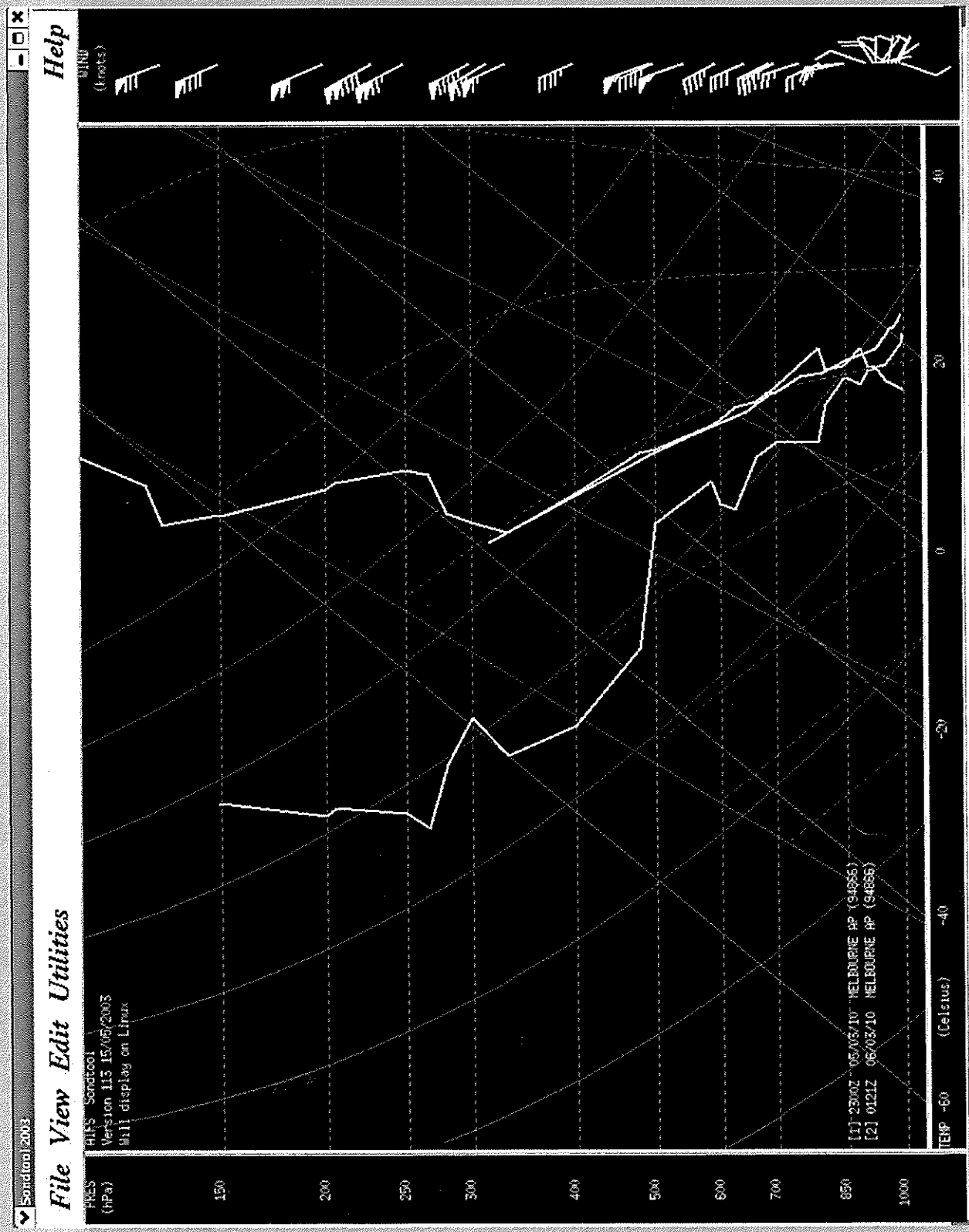
Sent: Saturday, 6 March 2010 2:52 PM

To: [REDACTED]

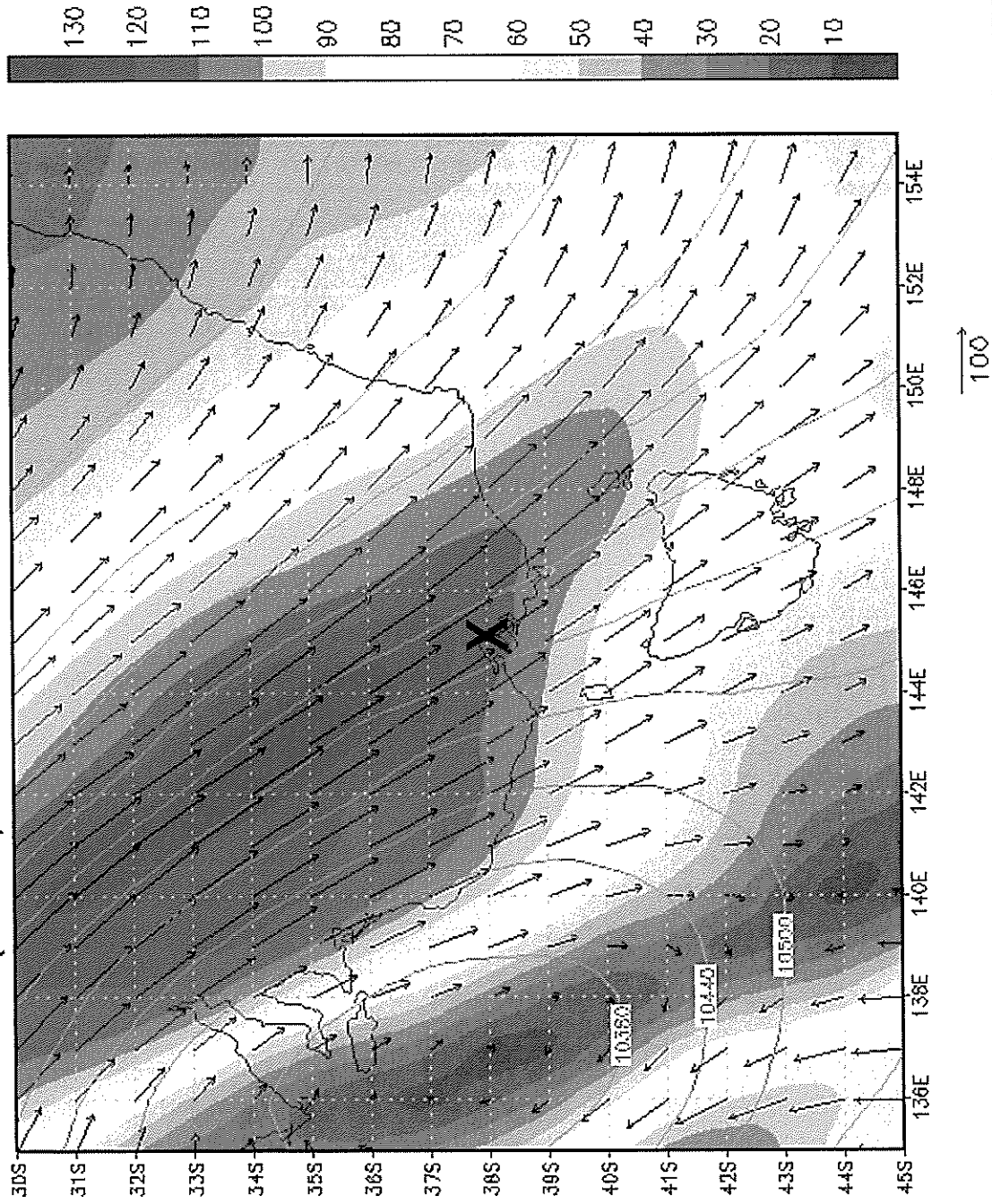
Subject: RE: [synoptic\_discussion] Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]

Me again -

The capping inversion around 800 hPa in the 23z soundings, probably connected to subsidence on the wrong side of the jet, has kept initiation at bay in the better moisture to the east of C VIC and N from there. Instead, a linear convective mode developed out of the initially elevated storms this morning.



250 hPa winds (knots), HGT at 03Z Sat 06mar2010



BRIT

255

245

235

225

215

205

195

185

175

165

155

145

135

125

115

105

95

85

75

65

55

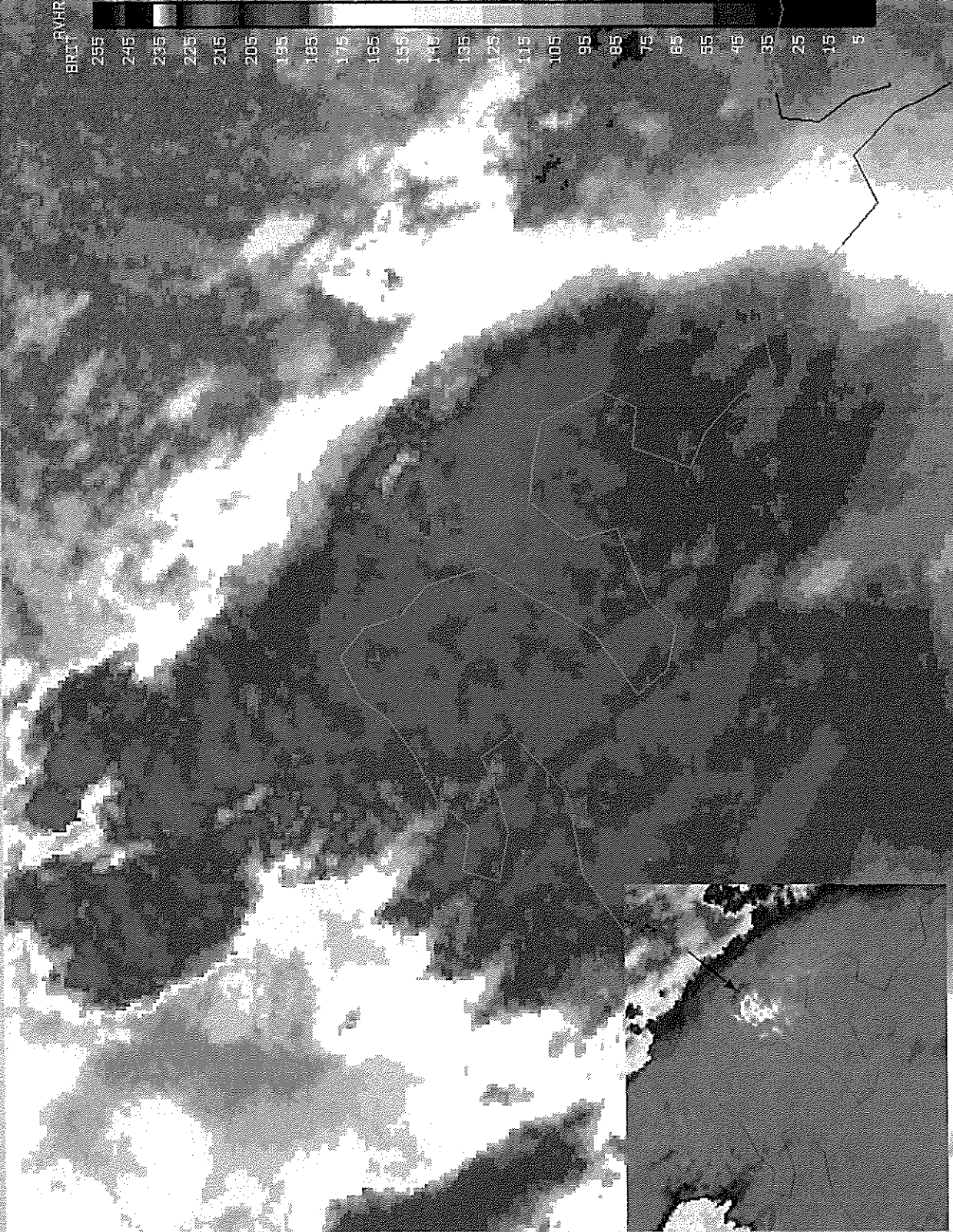
45

35

25

15

5



[REDACTED]

---

From: [REDACTED]  
Sent: Sunday, 7 March 2010 8:10 AM  
To: [REDACTED]  
Cc: [REDACTED]  
Subject: RE: [synoptic\_discussion] Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]

[REDACTED]

Thanks for posting those gems. Of particular note is the 0121z AMDAR profile from Melbourne Airport. It shows that a decent cap can be removed in a two hour time frame, most likely through lift rather than advection. The existence of morning storms NW VIC is consistent with a front right quadrant lift assumption associated with the jet, a ribbon of lift that steadily progressed east throughout the day.

The shear profile is remarkable. It shows strong low-level turning to 850 hPa, a vital ingredient for supporting low-level storm rotation. Above that a \_monotonic\_ increase in flow means that the similar vertical shear vector in all layers would have created \_vertically coherent\_ storm scale pressure perturbations. This not-so-common setup can support very healthy supercells.

In some sense the linear storm mode might have saved Melbourne from something more spectacular. High relative humidity levels in the boundary layer embedded in the strongly curving hodograph was an environment conducive to tornadogenesis. More isolated storm modes with more controllable cold pools might have put down a vortex or two.

Any reports on that front?

[REDACTED]

---

From: [REDACTED]  
Sent: Sunday, 7 March 2010 6:32 AM  
To: [REDACTED]  
Cc: [REDACTED]  
Subject: RE: [synoptic\_discussion] Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]

Hi all,

Some further info on yesterday's MCS/supercell which crossed Melbourne (-also see attached PowerPoint):

---

Rest of email duplicated in Doc 25



[REDACTED]  
[REDACTED] of [REDACTED]  
From: [REDACTED]  
Sent: Friday, 12 March 2010 10:00 AM  
To: [REDACTED]  
Cc: [REDACTED]  
Subject: RE: [synoptic\_discussion] Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]

I believe the previous record for Melbourne was the widest point (as the stone was oblong).

There was a 9cm stone also recorded at Knox (a suburb which sits west of Lysterfield).

Regards,  
[REDACTED]

*Please consider the environment before printing*

[REDACTED]  
Head of Climate Monitoring and Prediction

National Climate Centre  
Bureau of Meteorology  
GPO Box 1289, Melbourne  
Victoria 3001, Australia  
email : [REDACTED]  
Ph (work) : [REDACTED]  
Fax : [REDACTED]  
Ph (mobile): [REDACTED]

---

From: [REDACTED]  
Sent: Friday, 12 March 2010 09:46  
To: [REDACTED]  
Cc: [REDACTED]  
Subject: RE: [synoptic\_discussion] Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]

We have been talking in the RFC this morning about our call of having had 10cm hail during this event. Prior to this photo it was based on a Bureau person report, who has since emailed a fuller account. It turns out that the 10cm hail he experienced was quite a few examples of two 5cm balls (similar to the hail above the ruler below) definitely congealed together that broke apart once they hit the ground. The photo below you would probably say the two bottom left hand ones are about 9cm at their widest.

The question is do we use the widest width of the congealed balls as our 10cm claim?

[REDACTED]  
Victorian Regional Office  
Bureau of Meteorology  
ph 61 - [REDACTED]  
fire weather operations [REDACTED]  
GPO Box 1636, Melbourne VIC 3001  
email [REDACTED]

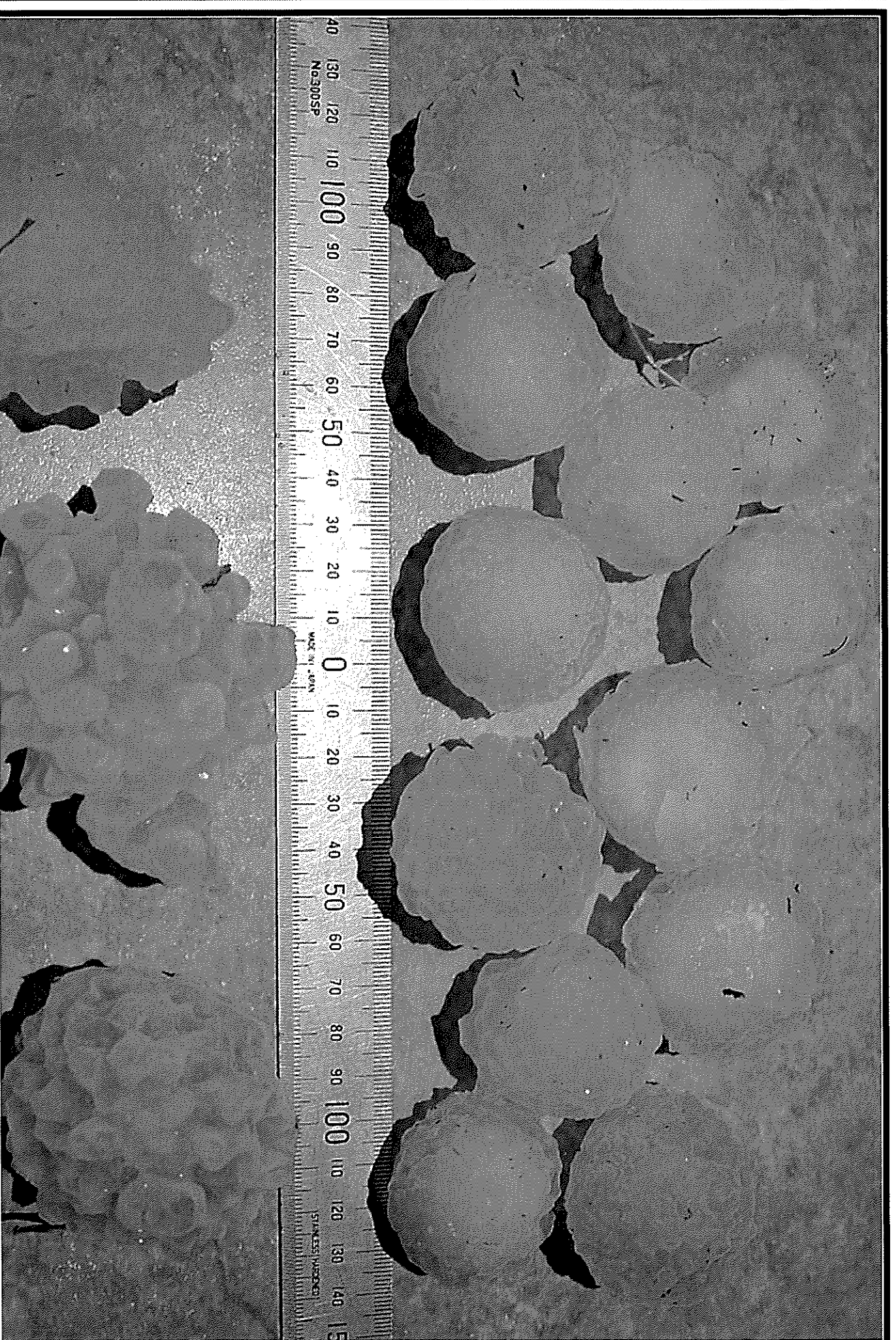
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**From:** [REDACTED]  
**Sent:** Friday, 12 March 2010 09:23  
**To:** [REDACTED]  
**Cc:** [REDACTED]  
**Subject:** RE: [synoptic\_discussion] Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]

For info below are the large hail stones I've seen photographed with the storm - these were from Lysterfield. The largest stones appear to have a maximum width of near 10cm.

Regards,

[REDACTED]



[REDACTED]

Head of Climate Monitoring and Prediction

National Climate Centre  
Bureau of Meteorology  
GPO Box 1289, Melbourne  
Victoria 3001, Australia

email : [REDACTED]  
Ph (work) : [REDACTED]  
Fax : [REDACTED]  
Ph (mobile): [REDACTED]

**From:** [REDACTED] On Behalf Of [REDACTED]

**Sent:** Friday, 12 March 2010 10:05

**To:** [REDACTED]

**Cc:** [REDACTED]

**Subject:** RE: [synoptic\_discussion] Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]

Hi all,

[REDACTED] (NMOC) has sent the following report on the hail he encountered in Ferritree Gully last Saturday. I have attached 3 reduced-size images from his original emails.

Regards,

[REDACTED]

[REDACTED] and [REDACTED]

Apologies for taking so long to get back to you, but I have been "between shifts" until tonight. The actual "chunks" of ice which I told [REDACTED] about during the storm were what I described as "compound" hailstones. The large and ragged chunks were composed of smaller hailstones, which individually measured in excess of 50mm (2 inches) across. Occasionally a "compound stone" would land in a puddle on the driveway and we could see it split into 2 or 3 smaller (50mm) hailstones. Even with my dedication to "the cause", I was not so bold as to venture from cover to take the world's greatest catch and grab a chunk before it landed and broke up on the ground. In the photos, the

2 pieces in "2From1" came from the same compound halstone which landed "softly" in the puddle, but by the time I was able to retrieve it the ice holding the 2 balls together had fallen off.

I have often heard of people describing the sound before the storm as like a train, and have wondered about that description. I can now say that I have experienced that sound, along with the vivid green shading of the cloud which was more widespread and distinct than I have ever seen before.

My damage report? Broken skylight, a few broken roof tiles, perforated shade cloth, shredded and broken plants. I managed to get the car into the garage, but some of my neighbours were not so lucky.

Regards,

NMOC

From: [REDACTED] On Behalf Of [REDACTED]

Sent: Sunday, March 07, 2010 1:00 PM

To: [REDACTED]

Cc:

Subject: RE: [synoptic\_discussion] Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]

I have had 4 different reports from Ferrtree Gully area confirming the hail stones were approaching 10cm:

- [1] [REDACTED] in Boronia had tennis ball size hail (about 7cm diameter)...one of which crashed through a skylight and into her house.
- [2] [REDACTED] in Bayswater had a lot of big hail (size to be confirmed), that turned her old pergola laserlight into swiss cheese.
- [3] [REDACTED] from NMOC was in Ferrtree Gully and collected hail that he measured to be about 10cm.
- [4] A spotter rang because his wife was at home in Ferrtree Gully and reported hail stones as big as tennis balls. He didn't believe her!, so called her back 30mins later to get her to measure some and there were several 6-8cm hail stones still around outside.

Back to the radar, again.....

-----Original Message-----

From: [REDACTED] On Behalf Of [REDACTED]

Sent: Sunday 7 March 2010 11:07

To: [REDACTED]

Subject: RE: [synoptic\_discussion] Sat 6 March 2010: VIC/NSW [SEC=UNCLASSIFIED]

I have a friend in Boronia (next to Ferntree Gully) who lost a number of concrete roof tiles to the hail. Another friend in Lysterfield lost roof tiles and had numerous house windows broken. The spotter reports I've seen suggest a swathe of cars damaged from just west of Bayswater through Ferntree Gully, Tremont, Belgrave/Lysterfield - one dirt photo I've see looked close to 10cm. I have 3 friends whose cars have been written off - I'm guessing the insured damages will be into the 100s of millions if the reports are to be taken at face value. The path of this particularly hail seems to be about 10-15km.

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