

# Application of Quantitative Precipitation Forecasts in Australian Flood Warnings



Grafton, New South Wales, March 2001

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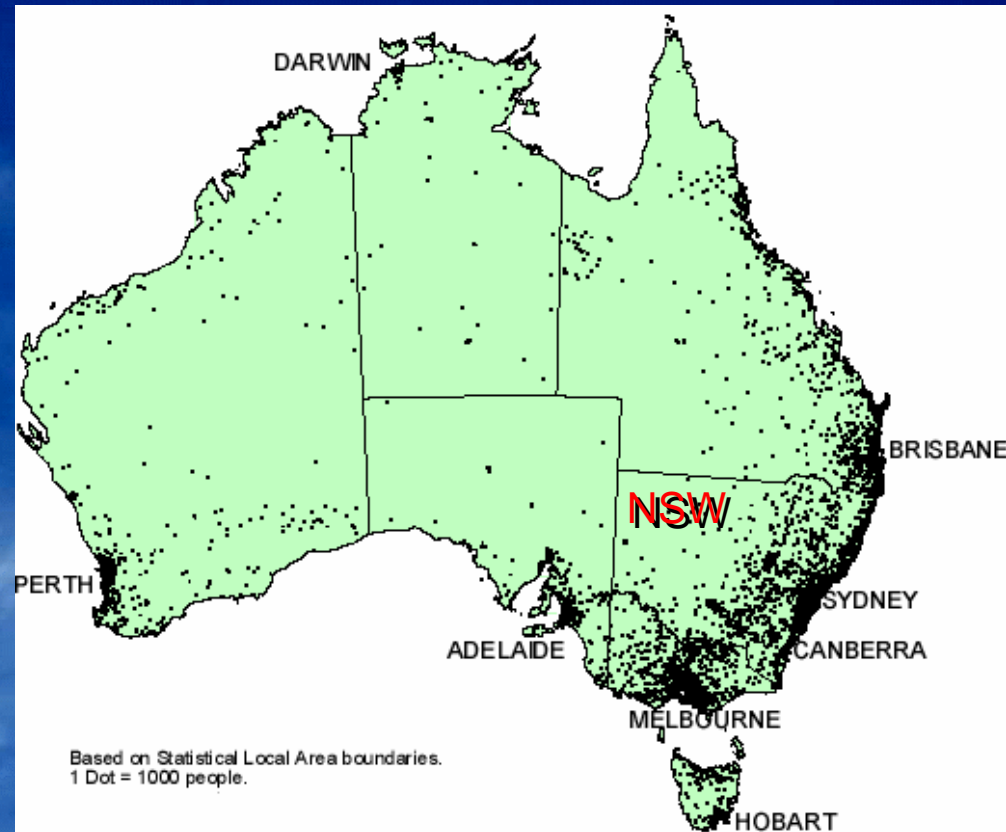


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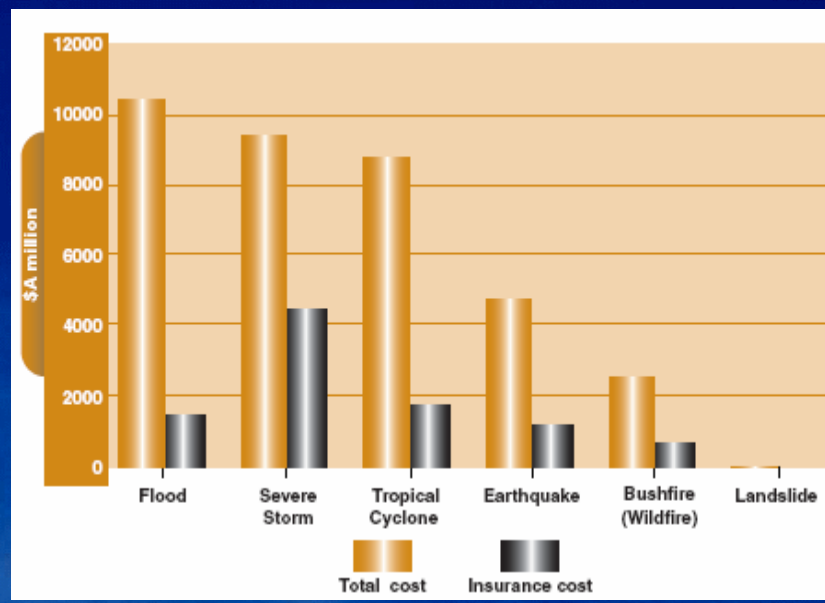
# Australia – Overview

- Population 20.5 million
- Area =  $7.3 \times 10^6$  sq. km.
- 1/3 desert
- 84% live in 1% of area



# Flooding is Australia's Costliest Natural Disaster

- 170,000 homes flooded by 1% event
- \$314 million Average Annual Flood Damage (2001)



Total Cost of Natural Disasters in Australia 1967 - 1999

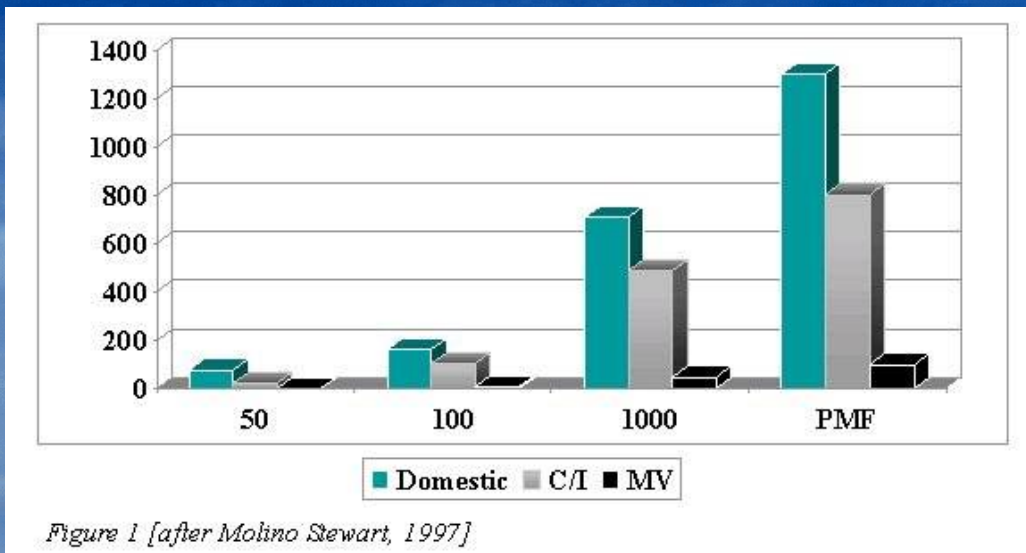


Figure 1 [after Molino Stewart, 1997]

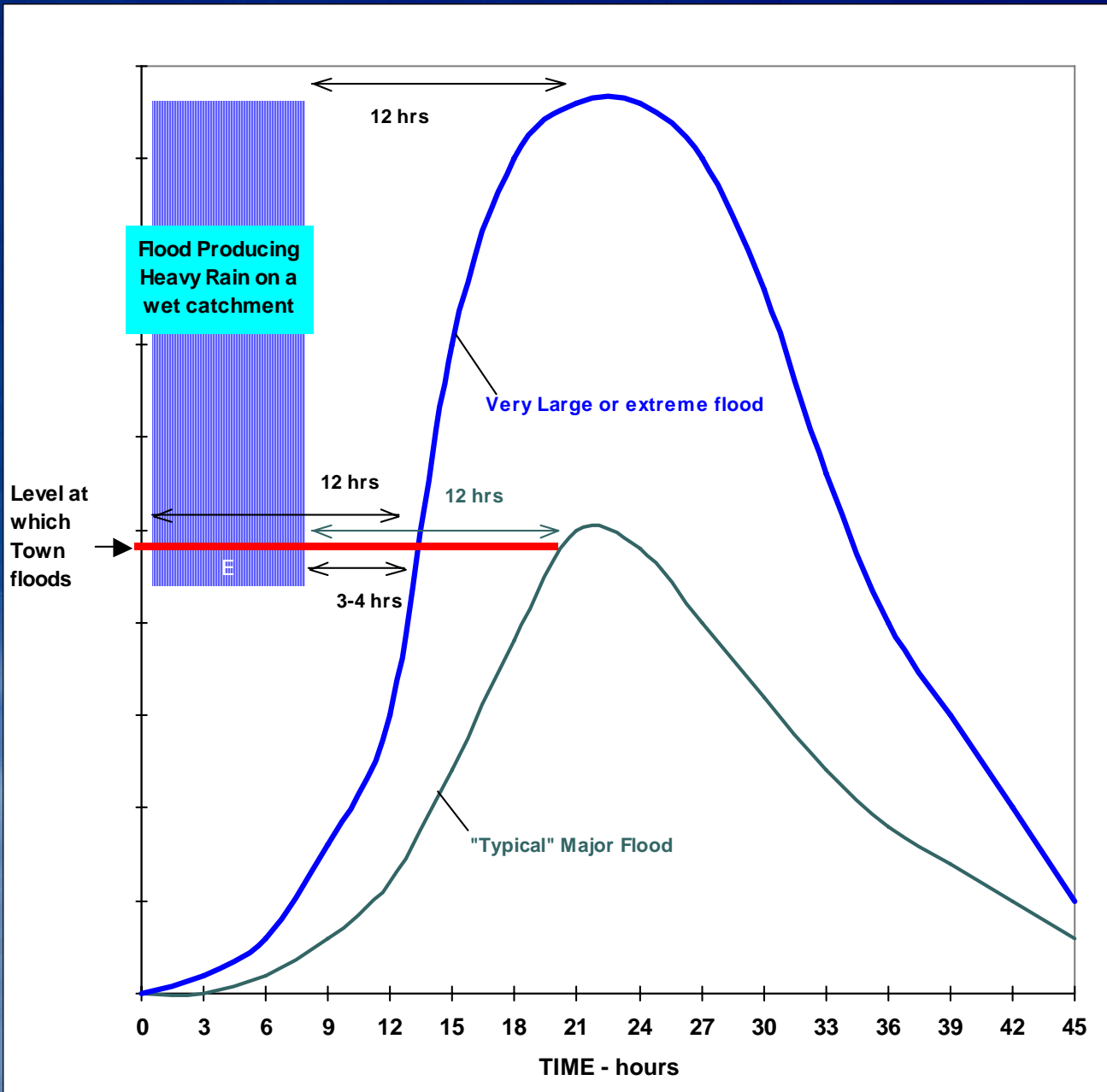
Flood Damage – Hawkesbury Valley (near Sydney)

# Need for QPF in Flood Warning Services

Extend warning lead times :

- For smaller watersheds and highly flood prone areas – tourist parks
- To meet community's expectations for early warning of the flood crest
- To facilitate planning ahead of flood producing events – public education
- To cover overnight flooding scenarios





- Provide sufficient warning lead time for extreme floods



**PMF – Top  
of Pole**

**August 1949**

**June 1950**

**May 1963**

**March 2001**



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# Flood Warning Services

- Flood Watches –issued 24 to 48 hours ahead of flood producing rain. Usually

cover s

- Flood V  
location  
flood pr

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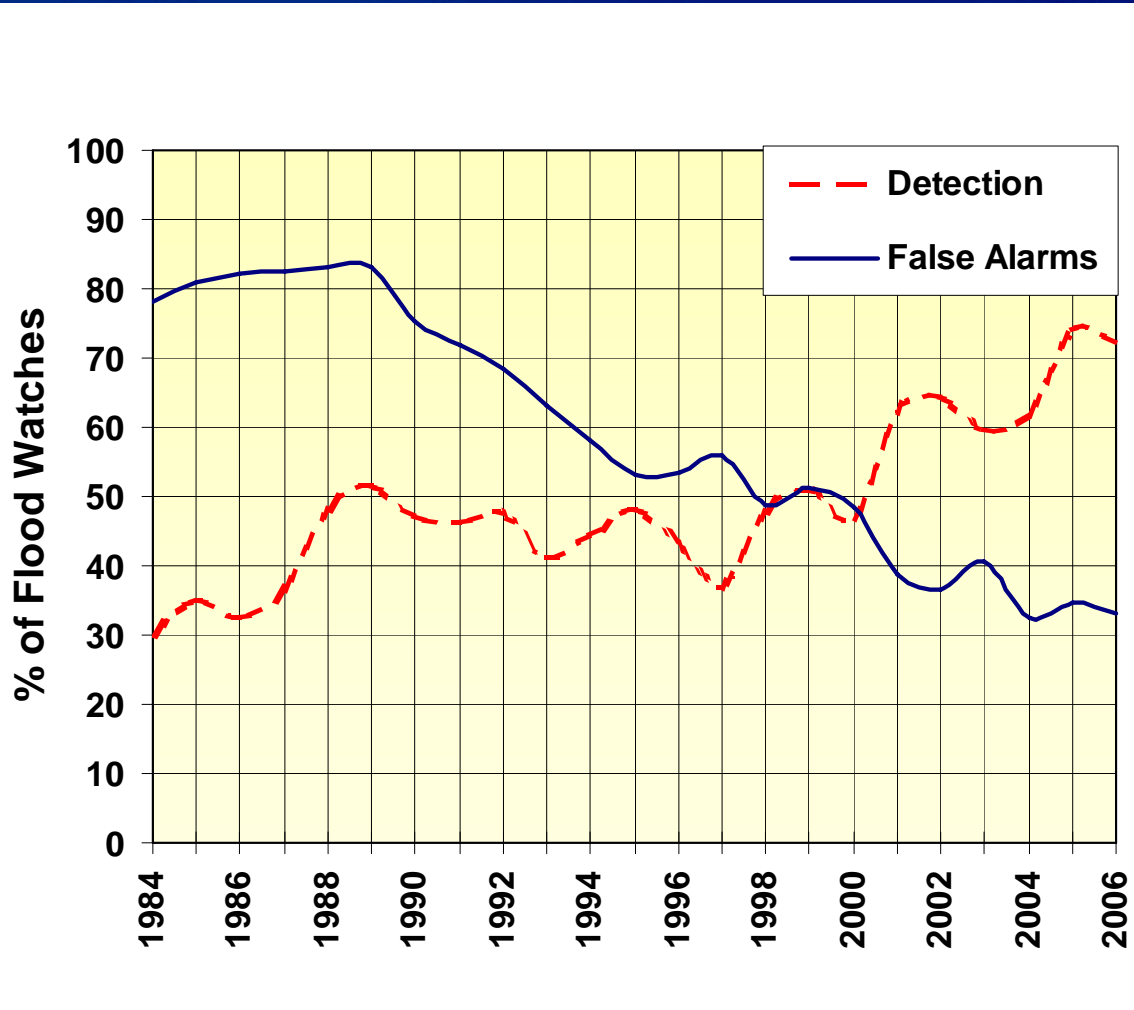
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## QPF in Flood Watches

- Use “Poor Man’s Ensemble” (PME) as broad guidance, individual models for maximums
- PME use QPF results from US, UKMO, JMA, ECMWF, CMC, DWD, Australian GASP and LAPS NWP models
- Flood Watches are generally for larger areas so NWP scaling issues less of a problem
- Professional opinion of senior operational meteorologist is an over-riding input



# NSW Flood Watches – QPF is improving!



# Application of QPF in Quantitative Flood Forecasting

- NWP model resolution usually large compared to watershed area
- QPF values (grid data) not taken literally – use regional interpretation for individual watersheds
- Flood Warnings –MesoLapsPT125 provides best quantitative guidance
- Professional opinion of senior operational meteorologist is an over-riding input



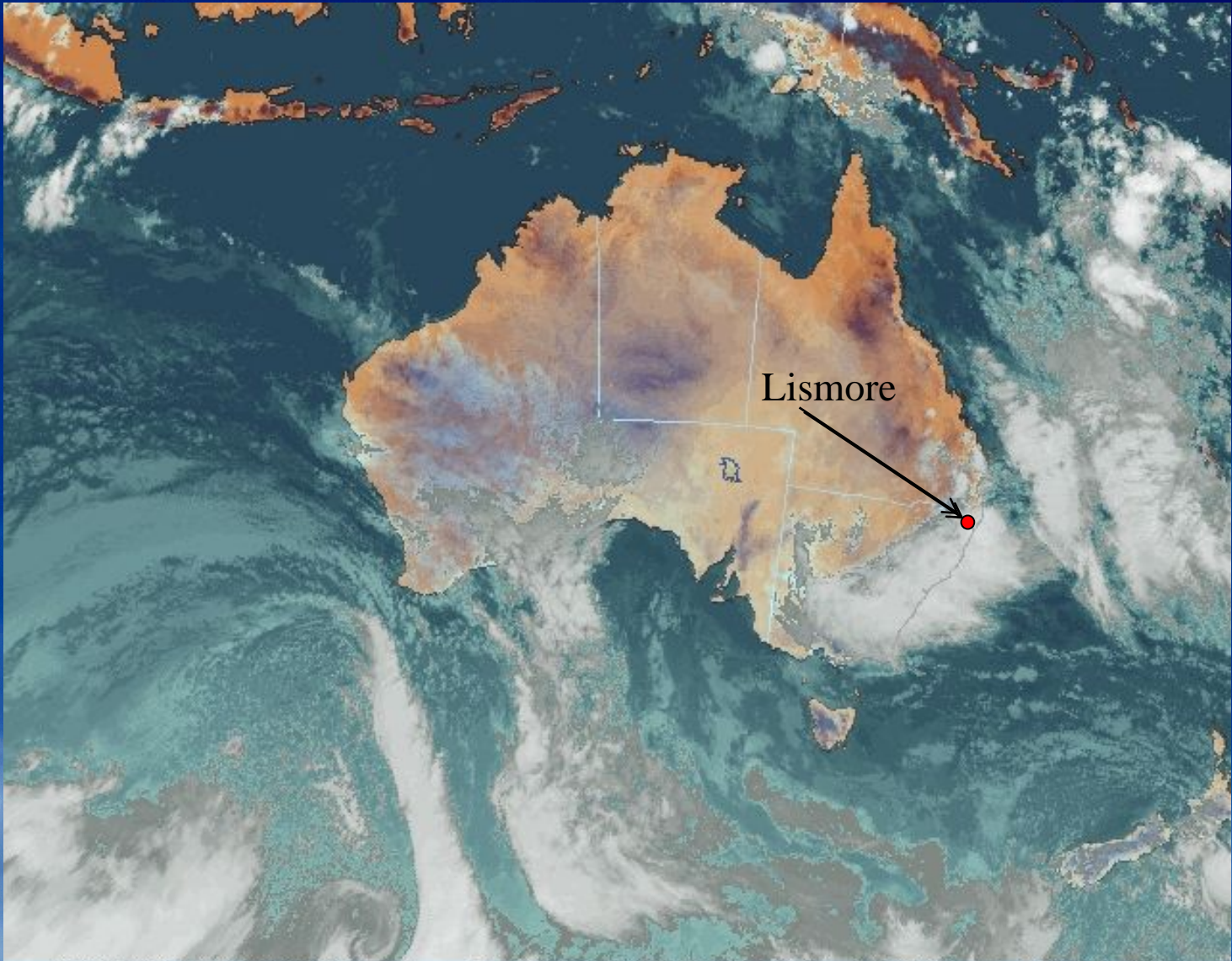
# QPF Case Study – Lismore NSW 30<sup>th</sup> June 2005



Showing Richmond River High School



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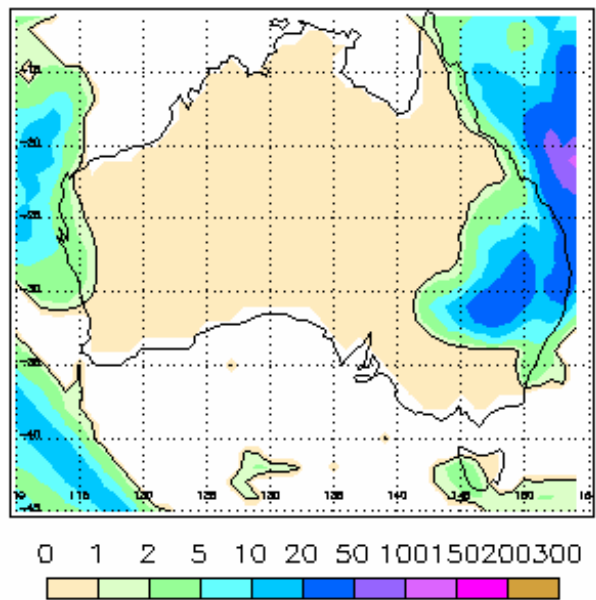
AUSTRALIAN GOVERNMENT - BUREAU OF METEOROLOGY 29 JUN 05 16:13 UTC



Australian Government  
Bureau of Meteorology

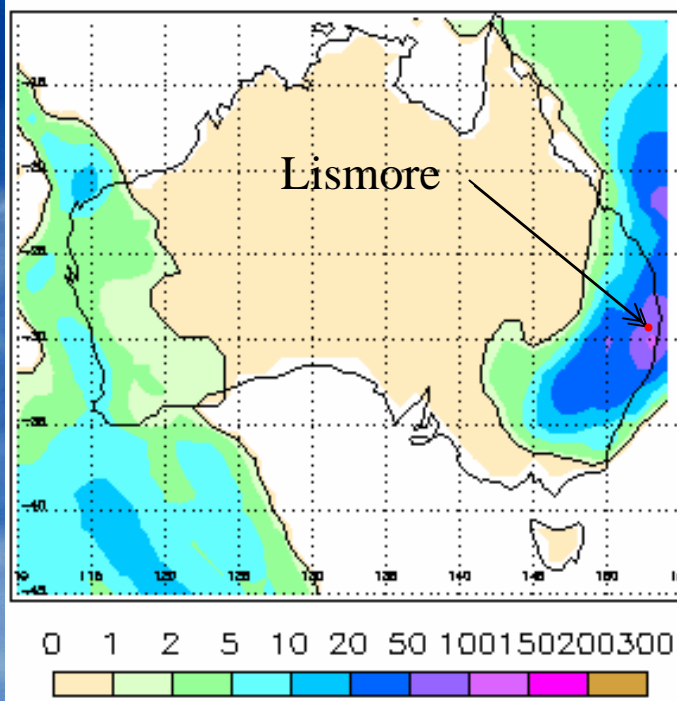
# QPF from PME 29-30 June 05 (whole event) used for Flood Watch

PM 24h valid 00 UTC 20050629

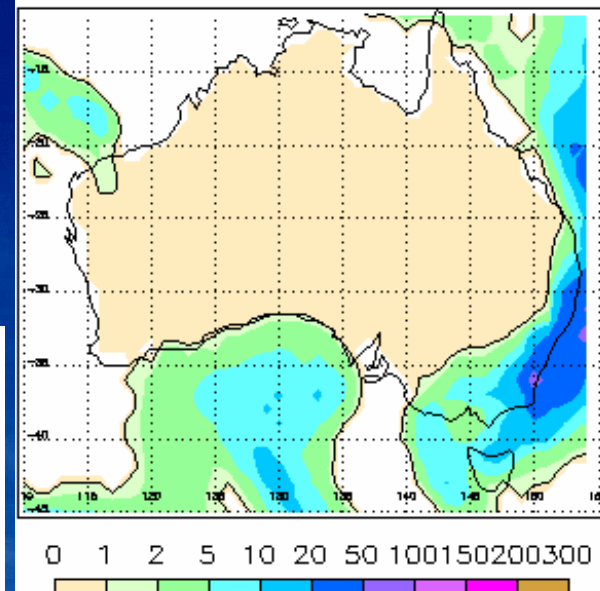


QPF from ensemble of NWP models 100 to 250 mm over a 48 hour period 29 to 30<sup>th</sup> June over the New South Wales North Coast

PM 24h valid 00 UTC 20050630



PM 24h valid 00 UTC 20050701

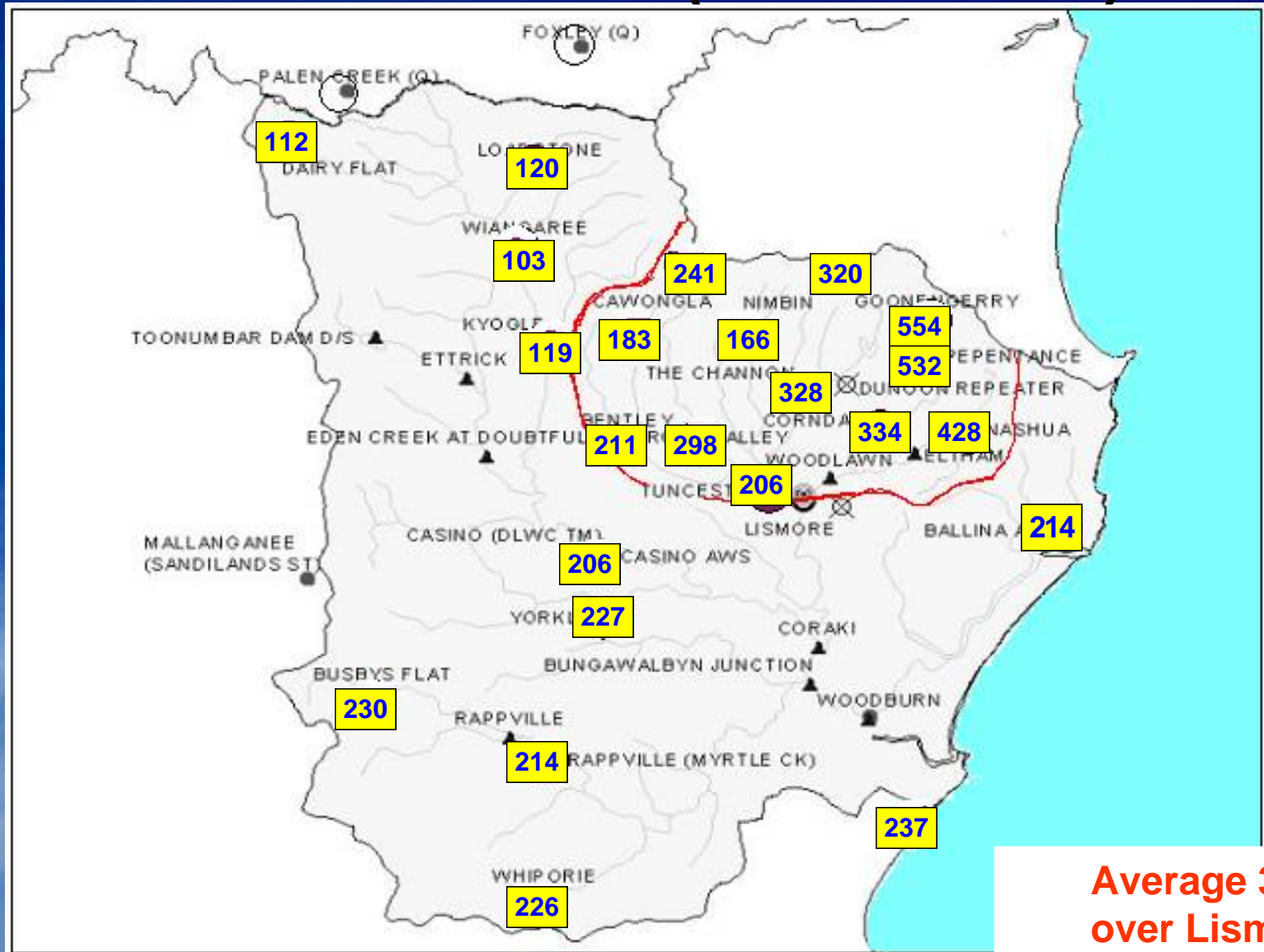


Ensemble maximum QPF located near 30° south – about 100 km south of Lismore



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# Recorded precipitation 29-30 June 05 (whole event)

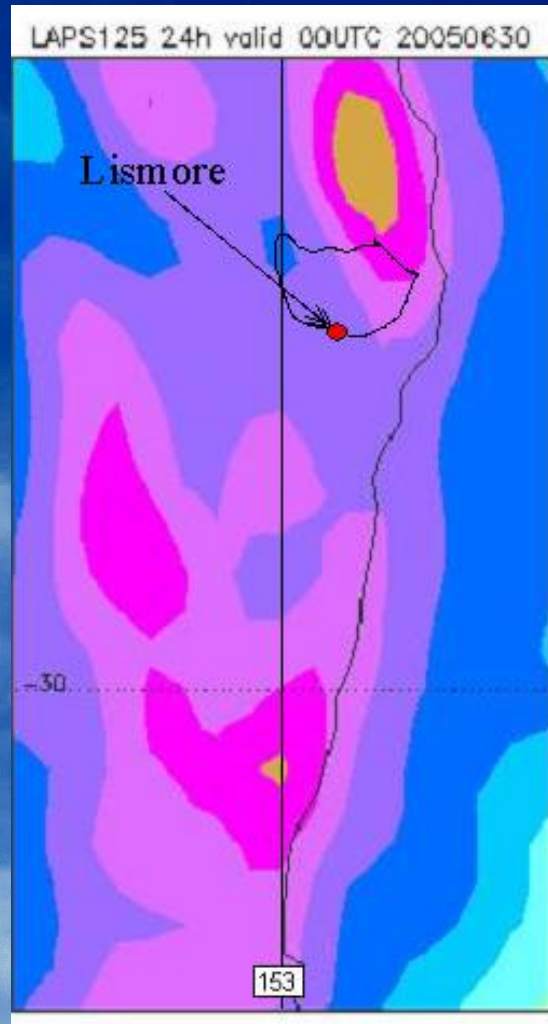


**Average 310 mm  
over Lismore  
watershed**

# QPF (PT125) for main part of the event - used as guidance for Quantitative Flood Forecasting

Precipitation for remainder of event after 1500 hours 29 June 05 :

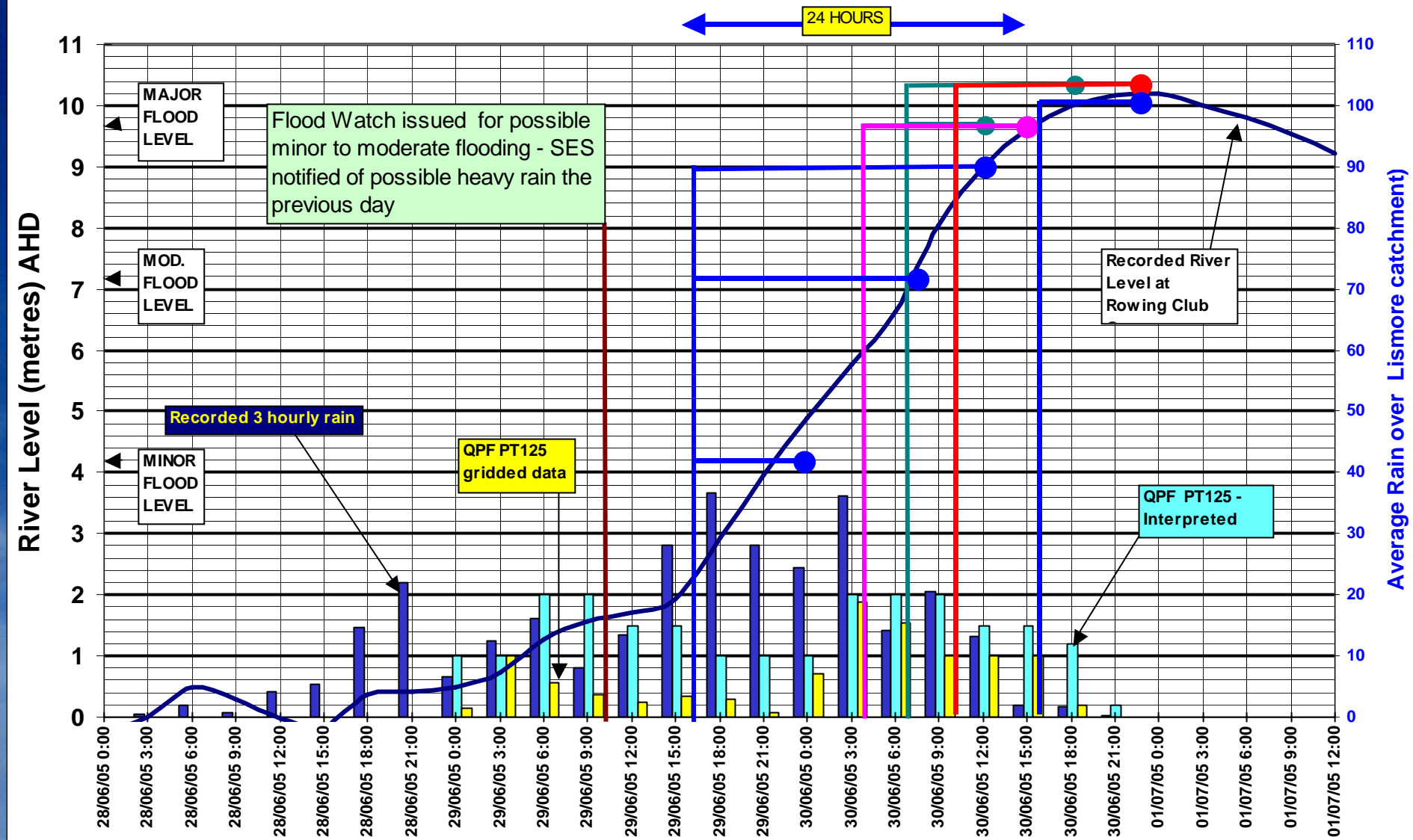
- PT125 Model QPF (grid points) 80 mm
- QPF Interpreted Estimate 130 mm (used for hydrological modelling)
- Recorded precipitation 180 mm



PT125 retained ensemble maximum QPF near 30° south – but developed a new one to the north of Lismore



# FLOOD WARNINGS - LISMORE JUNE 2005



# Achieving Outcomes with QPF based Flood Warning Services

- QPF used to meet formal warning lead time requirements to help communities achieve a maximum reduction of risk to life and property from flooding
- However, there are still some people who only respond to physical evidence of flooding rather than warnings



# Achieving Outcomes with QPF based Flood Warning Services (cont.)

- A survey of Lismore survey showed only 6% think that floods pose a risk to life, 80% did not fully understand Flood Watches yet 70% understood Flood Warnings
- Survey shows the need to enhance communication of warnings and education programs to realise the maximum outcomes from QPF based flood warnings



# Future Improvements

- Higher resolution modeling for extreme rainfall and smaller catchments – improve accuracy
- Better definition of the probabilities associated with QPF – particularly for extreme events
- Improved short term QPF (up to 6 hours) using blended NWP outputs and radar – Alan Seed
- Improved graphical forecasting tools to automate the present manual processes.



# Conclusions

- QPF accuracy has improved markedly over the past 15 years giving flood forecasters more confidence to use them quantitatively
- Need to improve accuracy and reliability of QPF from NWP models before applying grid point input straight into hydrological models
- Application of QPF also needs to be fully discussed with key stakeholders so there is a common understanding of the risks and benefits from this approach

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