

# SEASCAPES

Volume 2, Issue 2

Spring 1999

## Modelling Severe Thunderstorm Wind and Hail Events

While parts of eastern Sydney are still yet to get back to normal after the recent devastating hailstorm, the severe thunderstorm season is again already upon us. The Australian community remains highly vulnerable to the impact of hail damage because of the widespread use of roofing tiles, many of which are also aged and brittle. Insurers can do little at this stage to prevent future damage bills but many are probably considering some premium increases and how to optimise their reinsurance arrangements. Likewise, reinsurers must be wondering just how much greater the losses could become in future events.

During 1995, an extensive study of the severe thunderstorm risks in South East Queensland was conducted by Systems Engineering Australia Pty Ltd for Sun-corp General Insurance. The highly sophisticated MIRAM tropical cyclone risk model was extended to include the im-

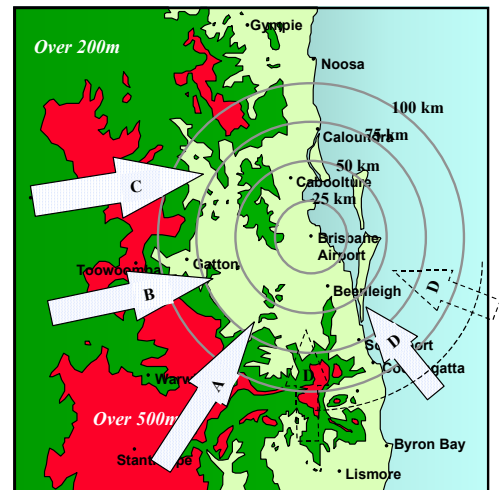
pacts of severe downburst winds, hail and also tornadoes. With the cooperation of the Bureau of Meteorology, an extensive database of storm events in the region was amassed and the model was developed and calibrated against several major historical events.

An example of the model capability to reproduce a single storm event very accurately is shown overleaf for the January 1985 hailstorm. This storm produced a record loss for Brisbane of \$180M at that time (ICA estimate).

As a consequence of this accuracy, the true power of the model lies in its ability to *predict* the long term statistical behaviour of wind speeds, hail size and resulting damages. For example, just how well the model predicts historical wind speeds can be seen by the comparison with records from Brisbane Airport over the past 44 years. The January 1985 storm is the high-

est recorded gust speed on this graph and appears as a statistical outlier. The model predictions place its potential return period at about once every 200 years on average. A similar return period curve has been

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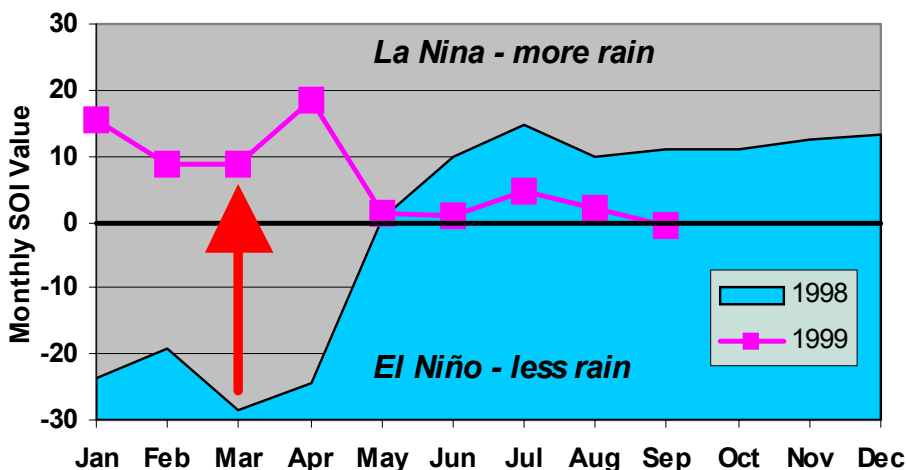


Schematic representation of typical severe storm classes in South East Queensland.

## La Nina Still Holding - Just!

Since the early season strong La Nina trend, the monthly Southern Oscillation Index (SOI) has trended lower and is now in a weakly neutral but still positive position. The majority of predictive models indicate neutral or La Nina conditions to persist for the next 6 to 9 months. This suggests a return to more long-term average rainfall and tropical cyclone activity in northern Australia. In regard to tropical cyclones, this will likely see an increase in occurrence relative to the past 10 years, which has been experiencing well below average occurrences.

*[Data and comments based on Bureau of Meteorology sources.]*



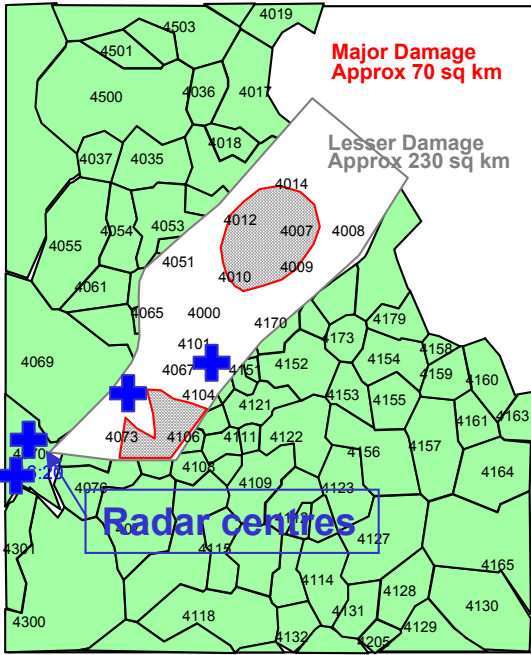
## SEASCAPES

SEASCAPES features the developing risk assessment capabilities of Systems Engineering Australia Pty Ltd (SEA). Our services include statistical analysis of tropical cyclone data, quantitative estimation of insurance losses, cyclone wind, wave and storm surge modelling, flood risk assessment and severe thunderstorm downbursts, hail and tornadoes.

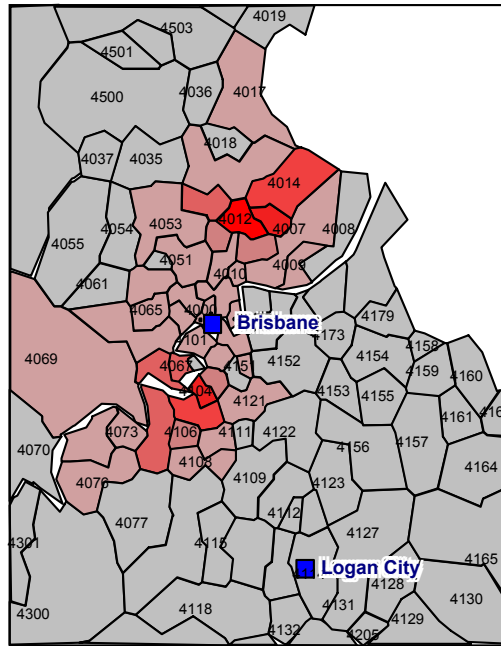
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## Damage Survey Map



## Modelled % Damage



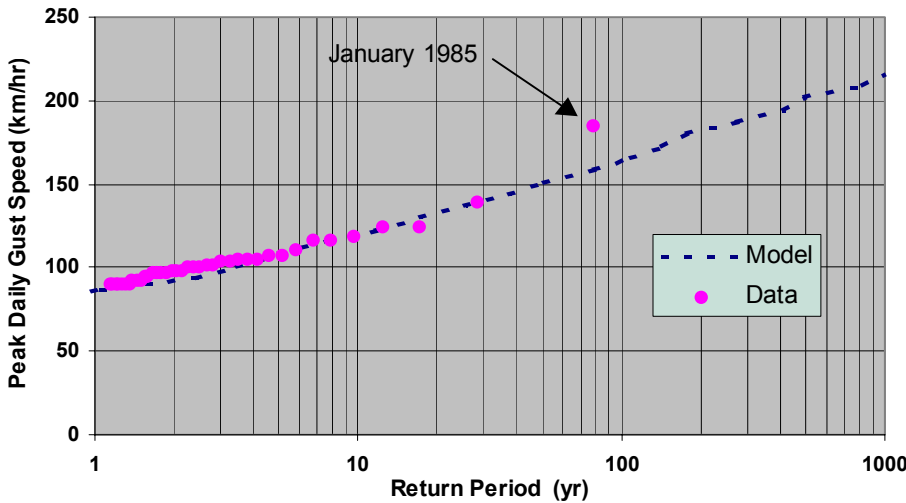
% Loss Range (No.)	
3.12 to 3.63	(1)
2.6 to 3.12	(2)
2.08 to 2.6	(2)
1.56 to 2.08	(4)
1.04 to 1.56	(4)
0.01 to 1.04	(27)

**Modelling of the Jan 1985 Hailstorm in Brisbane:**  
 Comparison of the extent of damaged regions from ground surveys (left) and MIRAM model estimates on a postcode basis (right). The table above shows the variation in % loss across the 50 postcodes affected by this very severe thunderstorm, which agrees very closely with industry loss rates for the major damage areas of about 4%.

(Continued from page 1)  
 developed for hail size and the model can be extended to other geographical regions in Australia or overseas.

Similar statistical predictions can be obtained for estimated insured loss as a function of the particular hazard, i.e.

wind, hail, tornado or total loss on a postcode basis. The model shows that at different return periods, the contribution to the total loss varies according to the hazard. This may even allow separate reinsurance arrangements depending on the type of damage incurred.



A comparison of the statistical analysis of modelled (MIRAM) and measured (44 year record) peak gust wind speeds for Brisbane Airport which demonstrates the exceptional model accuracy.

### Some of the SEA Clients Since 1996

**Tropical Cyclone Risks:**

- RACQ-GIO Insurance
- Commercial Union Insurance
- SUNCORP General Insurance
- FAI Insurance
- Aon Group Australia Limited
- Qld Dept Emergency Services

**Severe Thunderstorm Risks:**

- SUNCORP General Insurance
- Macquarie University, Natural Hazards Research Centre

**Flood Risks:**

- RACQ-GIO Insurance, Qld.

**Coastal and Ocean Hazards:**

- Woodside Offshore Petroleum, WA.
- Dept Natural Resources, Vic.
- Environmental Protection Agency, Qld.

**Research:**

- The Risk Prediction Initiative,

## Multi-Hazard Risk Studies - Qld

Systems Engineering Australia is currently providing specialist tropical cyclone (wind and storm surge) and severe thunderstorm analyses and advice to the Queensland Dept of Emergency Services through Queensland Risk Management Consultants and BHP Engineering. The study considers multiple hazards for Hervey Bay, Mackay and Cairns and is jointly funded by the respective local authorities in each region. One of the aims of the study is to develop a generalised risk management template.

**Real risk management decision-making tools for your business.**

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