Thriving on Change

16th General Insurance Seminar

Institute of Actuaries of Australia

9-12th Nov 2008

Hyatt Regency Coolum

Waves, Wind and Water: Weather perils and insurance

Dmitry Gorelik

Weather and Insurance

- Recent quotes from the press regarding weather-related losses

"…our result for the 2008 financial year has been affected by…. succession of severe weather events"

"…we have been affected by the increased frequency of natural perils…"

"…raise premiums on personal products to offset more frequent claims after bad weather…"

"…sustained impact of volatile weather …"

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"How do you know it's an Act of God?"

Data and Loss adjustment

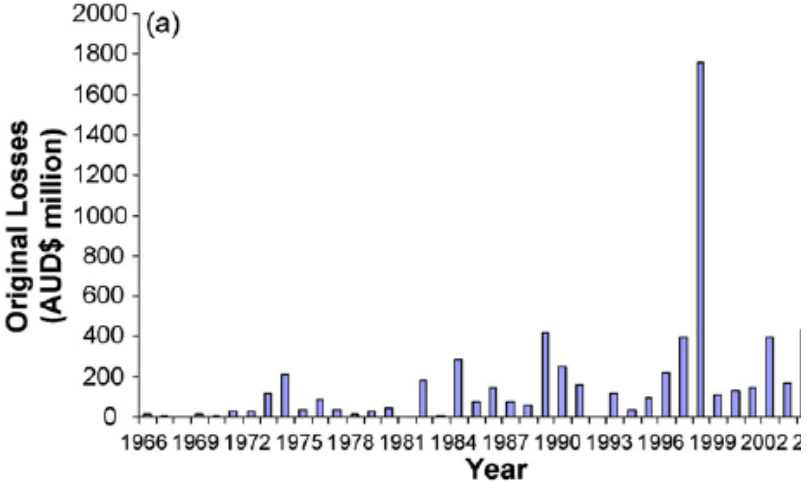
Data

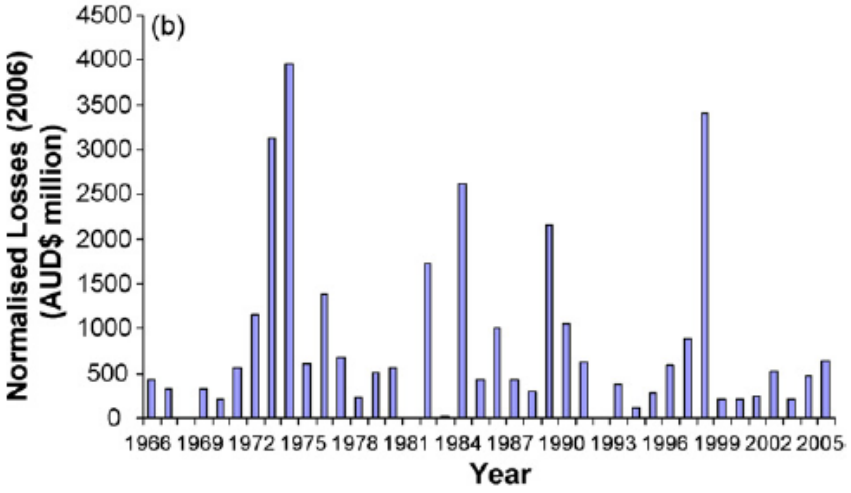
- ICA Natural Disasters Claims List
- EMA disaster database (www.ema.gov.au)
- Benfield market knowledge

Loss Adjustment

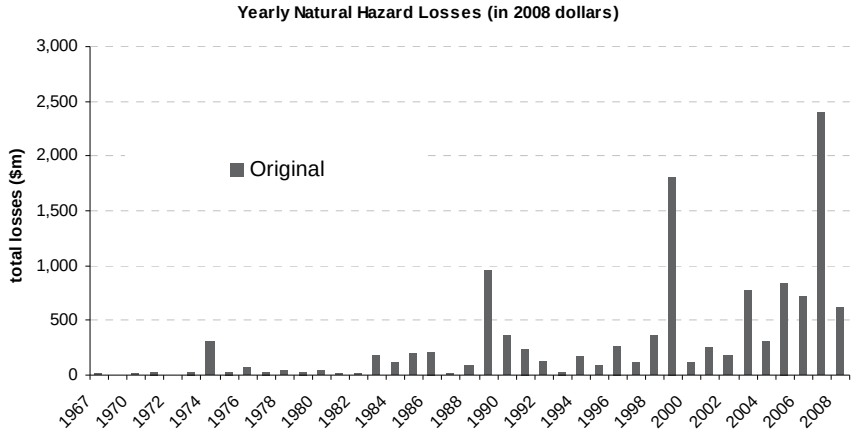
- CPI alone is not appropriate
- RiskFrontiers (Crompton and McAneney) use a combination of changes in population, wealth and inflation
- CPI and GDP used as a proxy for changes in wealth and inflation

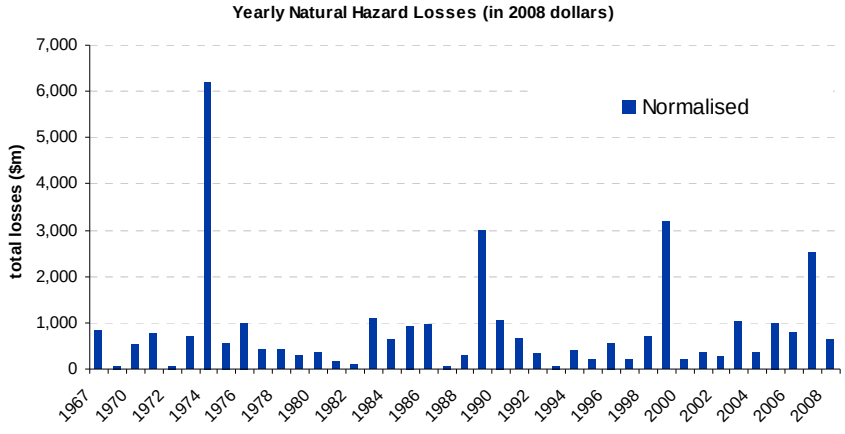
Historical loss adjustment





Crompton and McAneney; 2008



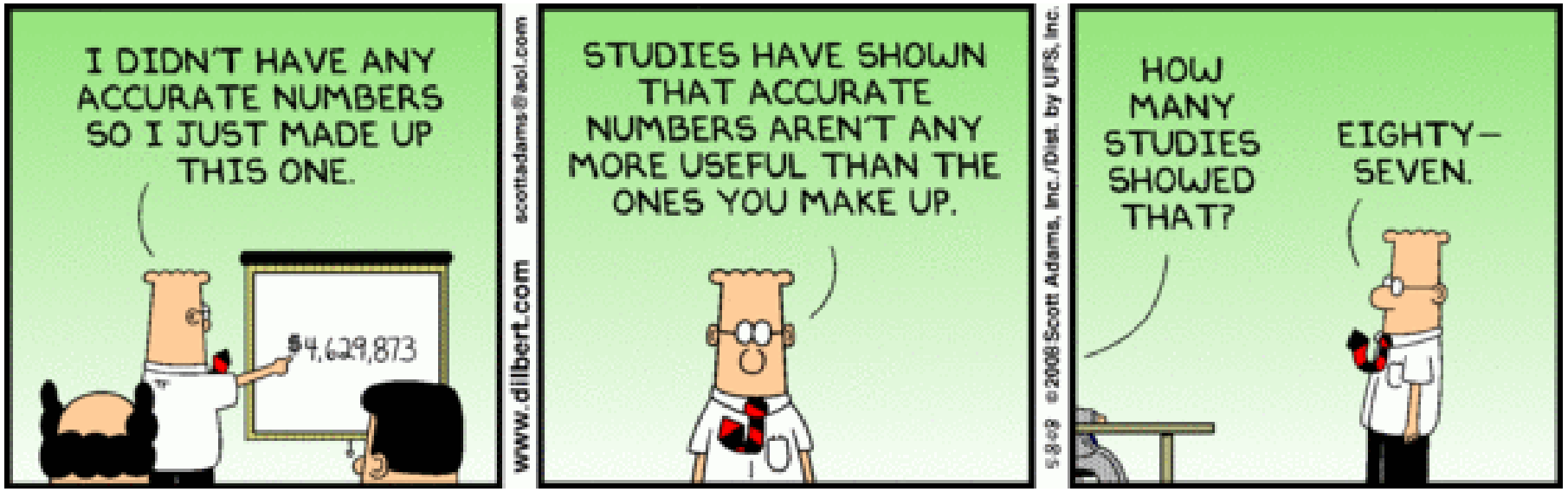


Historical loss adjustment – a few examples

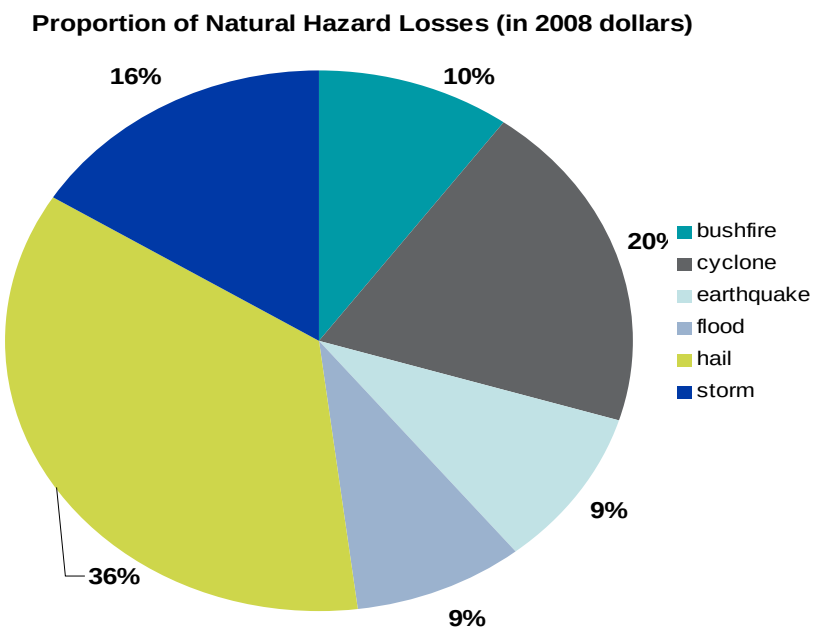
- Comparison of top 10 natural peril insurance losses ($m) as at 2006

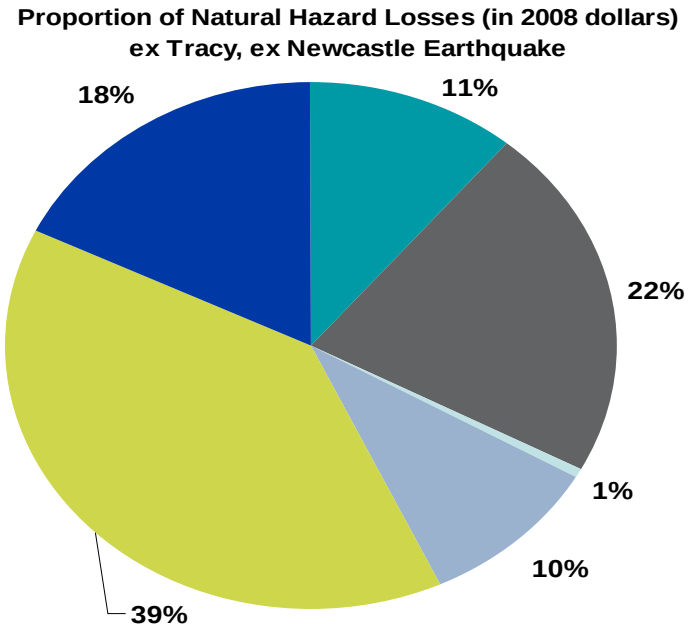
Rank	Event	Year	Location	Original Loss	Normalised Loss (Crompton/McAneney ,2006)	Benfield (CPI and GDP)	Benfield (CPI/GSP and population)
1	Tropical Cyclone Tracy	1974	Darwin	200	4120	3944	3635
2	Hailstorm	1999	Sydney	1700	3300	2990	3114
3	Tropical Cyclone Wanda	1974	Brisbane	68	1790	1341	2433
4	Ash Wednesday Bushfires	1983	*Multiple*	176	1610	1100	983
5	Hailstorm	1990	Sydney	319	1480	688	773
6	Hailstorm	1985	Brisbane	180	1430	886	1512
7	Tropical Cyclone Madge	1973	*Multiple*	30	820	683	1280
8	Hailstorm	1976	Sydney	40	740	560	708
9	Hailstorm	1986	Sydney	104	710	465	533
10	Flood	1984	Sydney	80	670	446	515

Why is weather hard to model?


I DIDN'T HAVE ANY ACCURATE NUMBERS SO I JUST MADE UP THIS ONE.
$4,629,873
www.dilbert.com scottadams@aol.com
STUDIES HAVE SHOWN THAT ACCURATE NUMBERS AREN'T ANY MORE USEFUL THAN THE ONES YOU MAKE UP.
5-8-09 ©2008 Scott Adams, Inc./Dist. by UFS, Inc.
HOW MANY STUDIES SHOWED THAT?
EIGHTY-SEVEN.

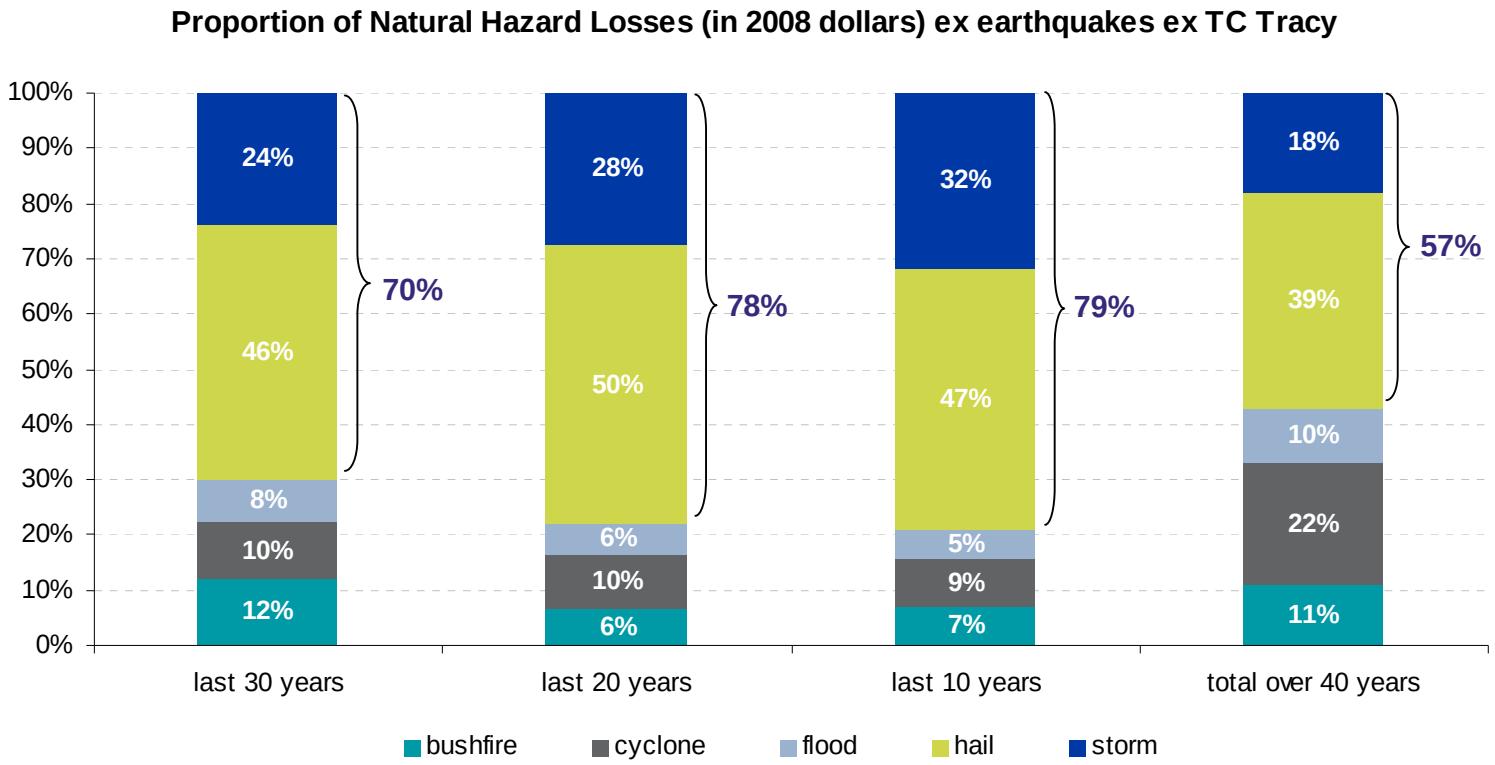
Natural Peril losses through time (1967 – 2008)





- Hail and Storm losses account for more than half of all natural peril insurance losses
- Difficult to differentiate between “Hail” and “Storm” events
- The “outliers” cannot be clearly defined where natural perils are concerned

Natural Peril losses through time



- Almost 80% of natural peril losses in the last 20 years were storm related
- However, this split is influenced by inclusion of large events such as “Ash Wednesday”, Sydney Hail Storm, Cyclone Larry etc

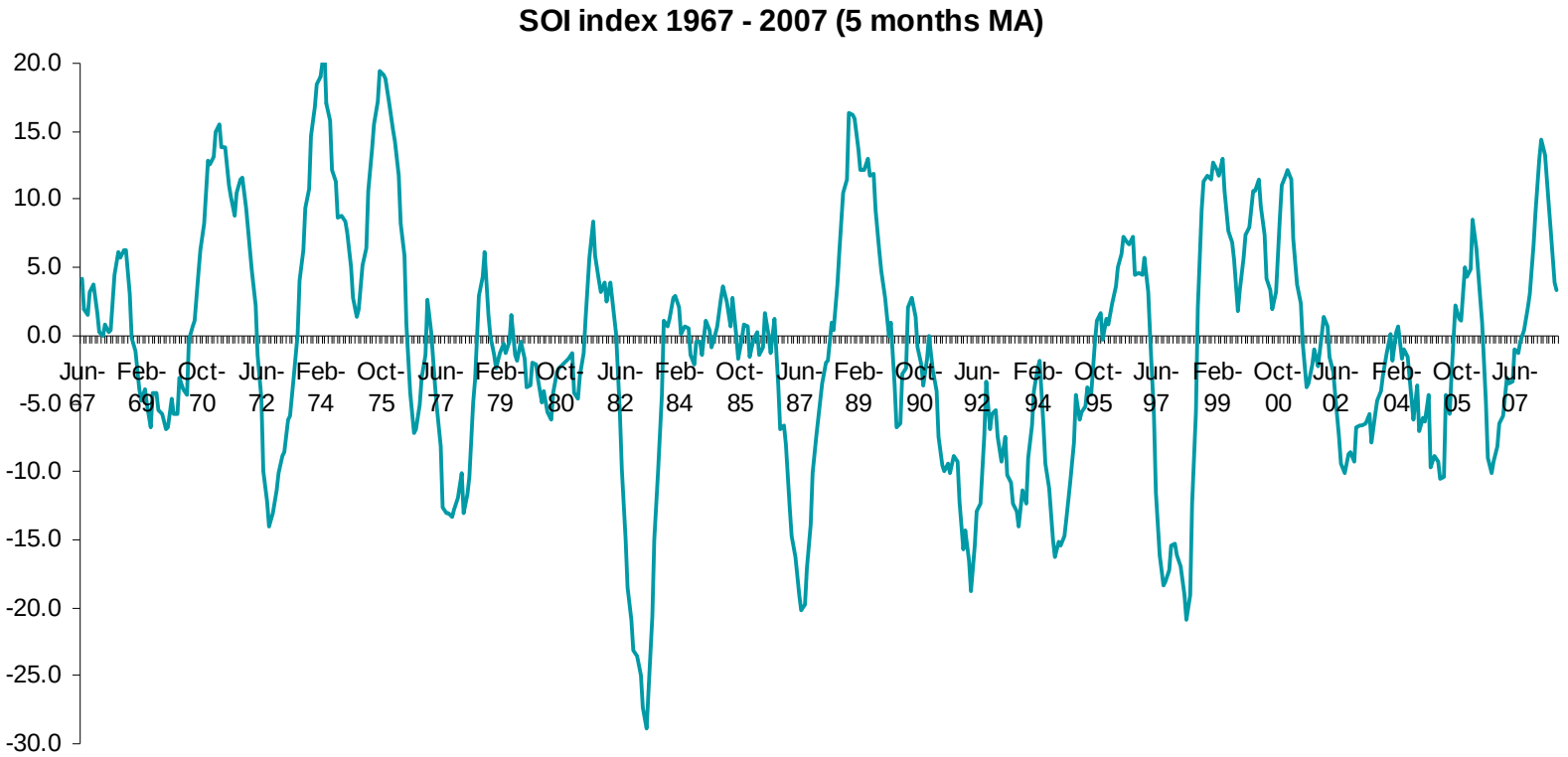
ENSO – El Niño Southern Oscillation

- **El Niño**
  - part of a natural oscillation of the ocean-atmosphere system in the tropical Pacific
  - commonly referred to as El Niño-Southern Oscillation (ENSO)

- Extreme weather associated with **El Niño**:
  - severe droughts and bushfires
  - devastating floods and landslides
  - depends on geographic location

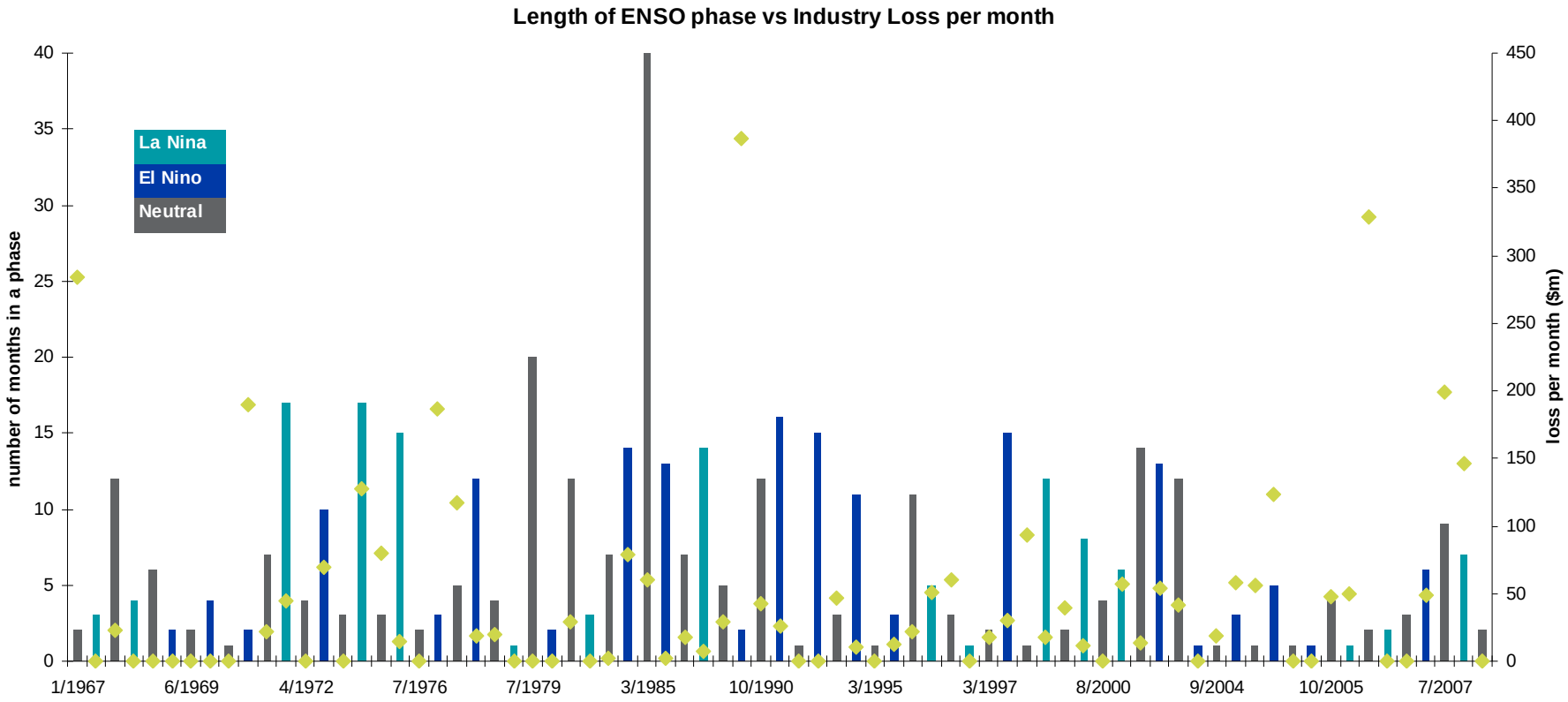
- The opposite phase to **El Niño** is known as **La Niña**
  - also linked with extreme weather
  - storms, hail and cyclones

ENSO – 1967-2007



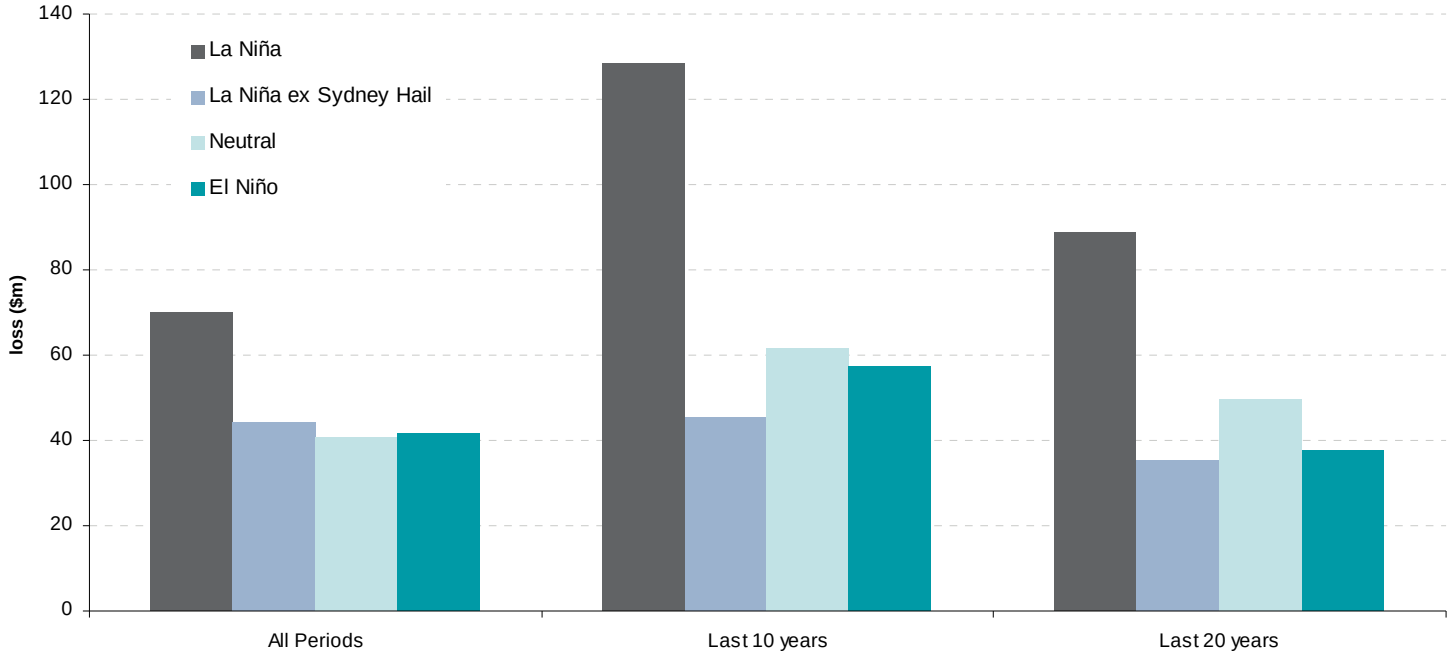
- A full ENSO cycle, which incorporates one El Niño and one La Niña event - generally takes about four years.
- Approximately a 25% chance of an El Niño (La Niña) event occurring in any one year

ENSO and Eastern Seaboard insurance losses



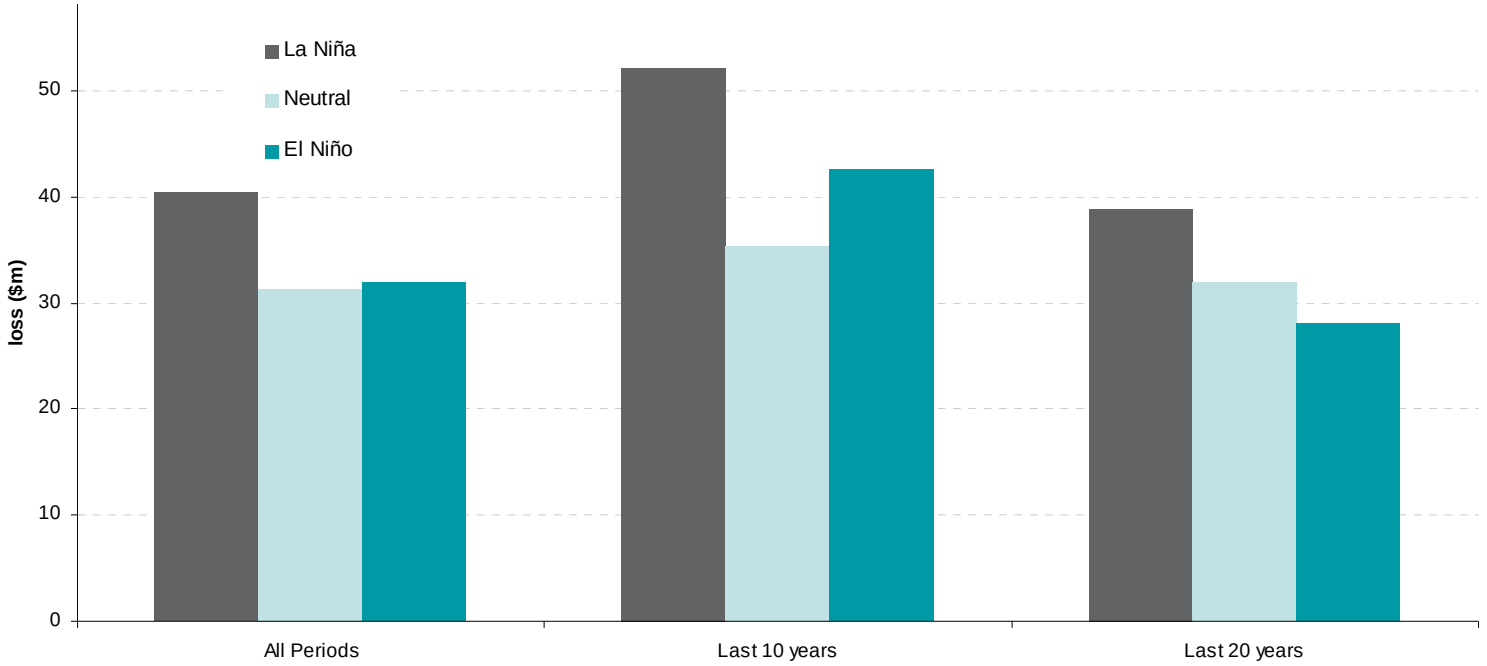
- No clear relationship between losses, type of ENSO phase or the length

Average monthly losses (ex TC Tracy)



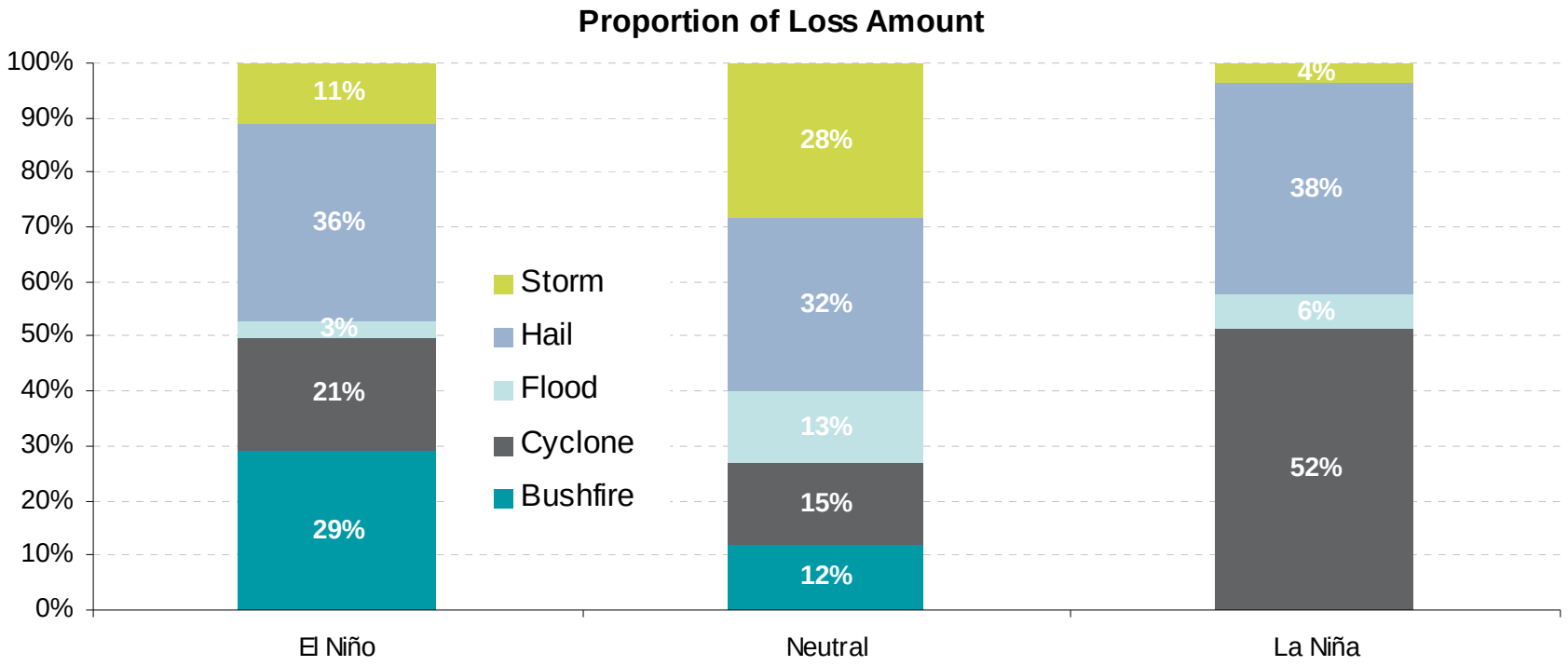
- Average monthly loss is higher in the last 10 year
- Losses are significantly higher in La Nina phase
- However…. These are mainly driven by April 1999 Sydney hail storm

Average monthly losses – capped at $500m



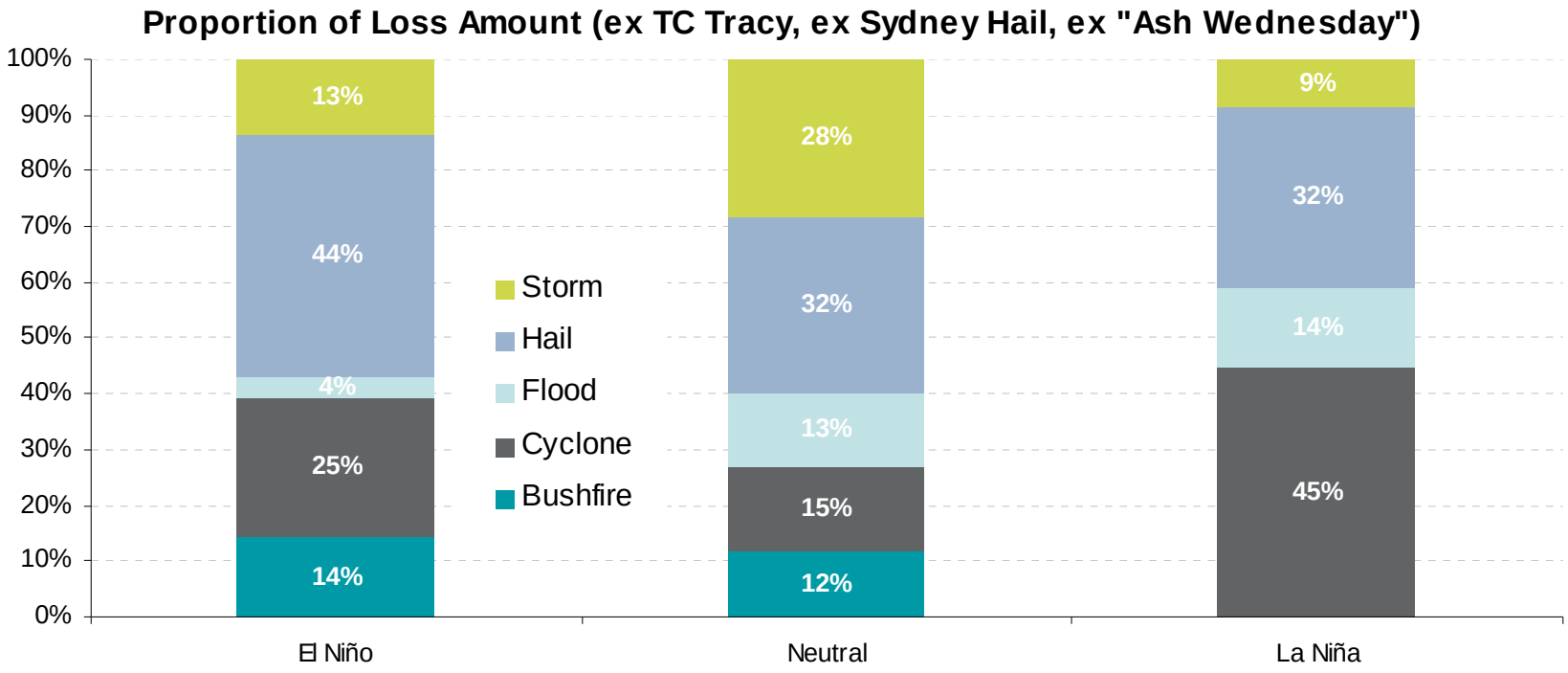
- A lot less variability when the upper limit is imposed
- Arguably a more relevant representation for the insurance industry – catastrophe reinsurance is likely to cap the industry loss

Losses by ENSO State



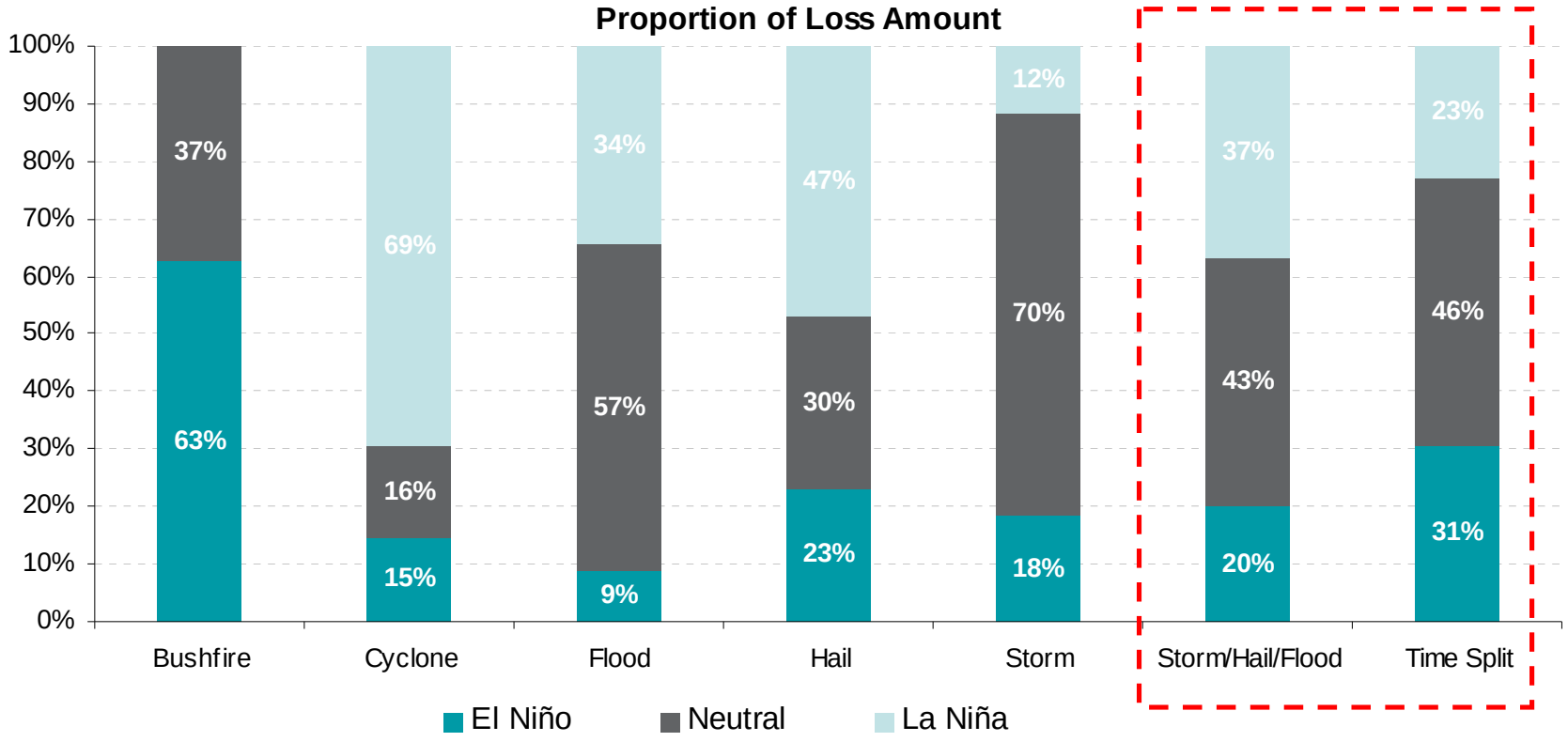
- No bushfire losses in La Nina phase
- Large proportion of Hail in La Nina phase
- Storm, Hail and Flood should potentially be combined due to the difficulty in separating these perils

Losses by ENSO State – excluding 'outliers'



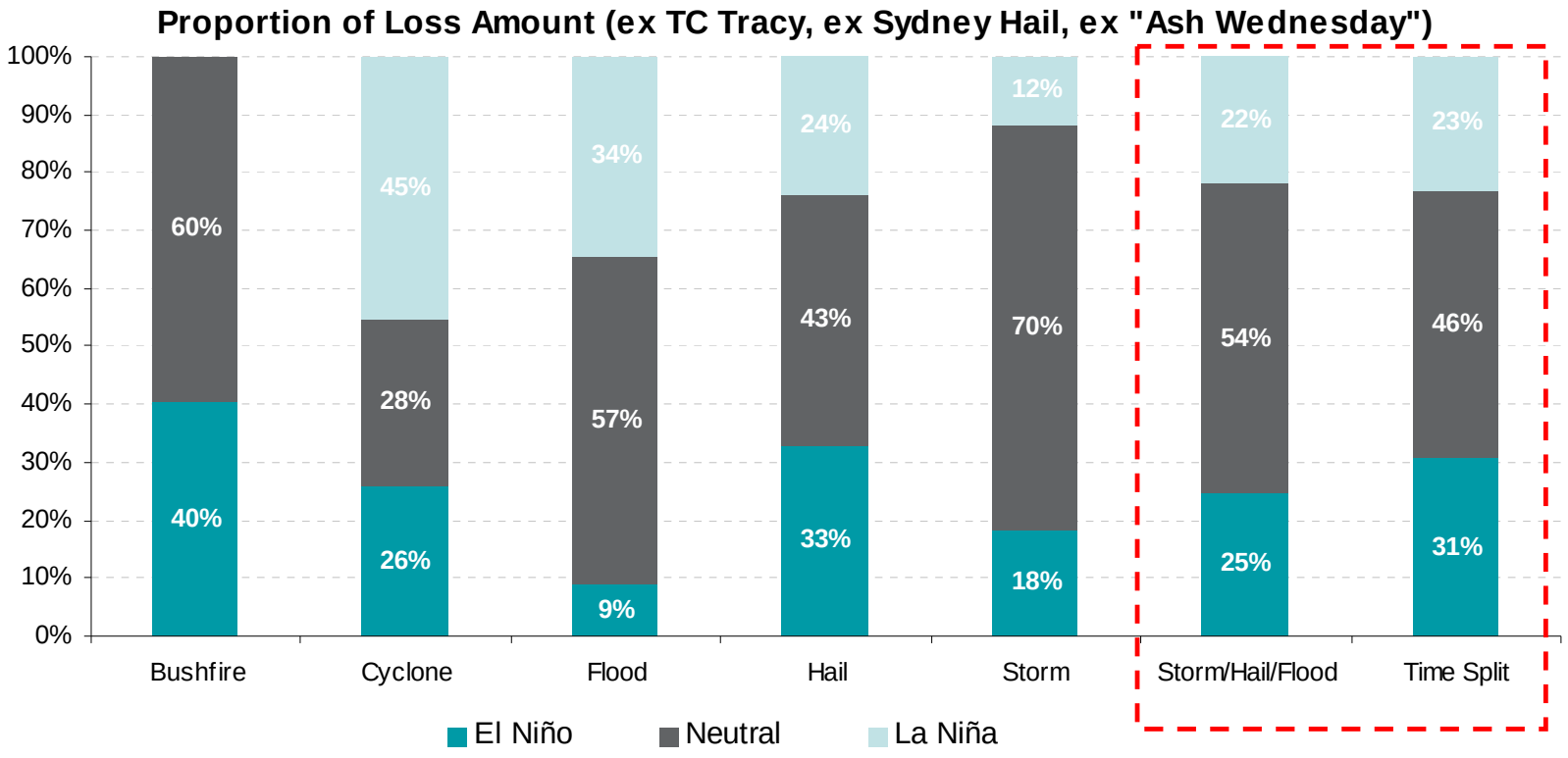
- "Outliers" change the loss distribution in ENSO phases
- Observation: approximately 45% of losses in El Nino are Hail – *counter-intuitive*

ENSO by Peril



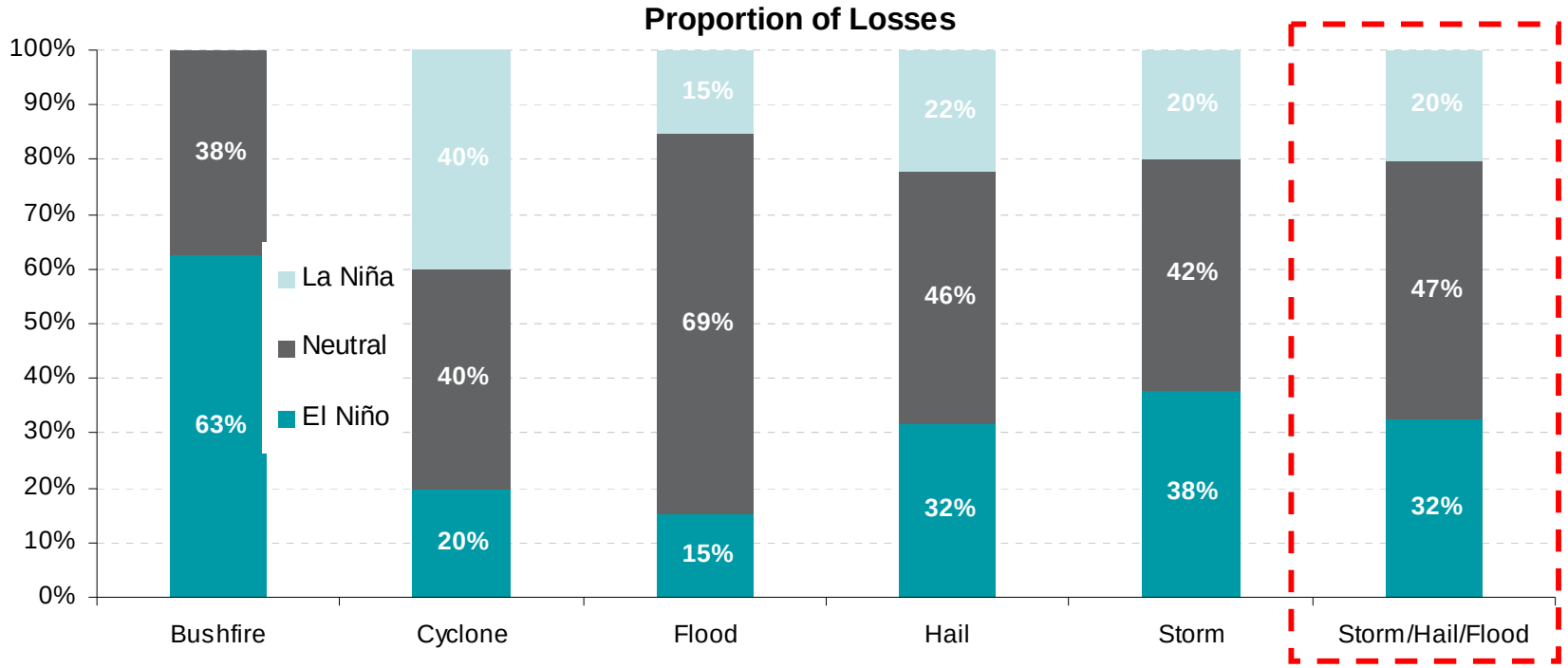
- Vast majority of bushfires occur in El Nino phase
- Cyclones occur in La Nina phase
- Rest is not very clear – similar split to time spent in each phase – slight bias towards La Nina phase

ENSO by Peril – excluding "outliers"



- Similar observations when the "outliers" are removed
- Even more similarity between storm/hail/flood losses and the time spent in each phase

ENSO by Peril – Event Counts



- Size of the event can skew the representation of losses over time
- Frequency of losses shows that:
  - Bushfires tend to occur during the El Nino Phase
  - Cyclones during Neutral and La Nina
  - Storm/Hail Flood during Neutral and El Nino phases

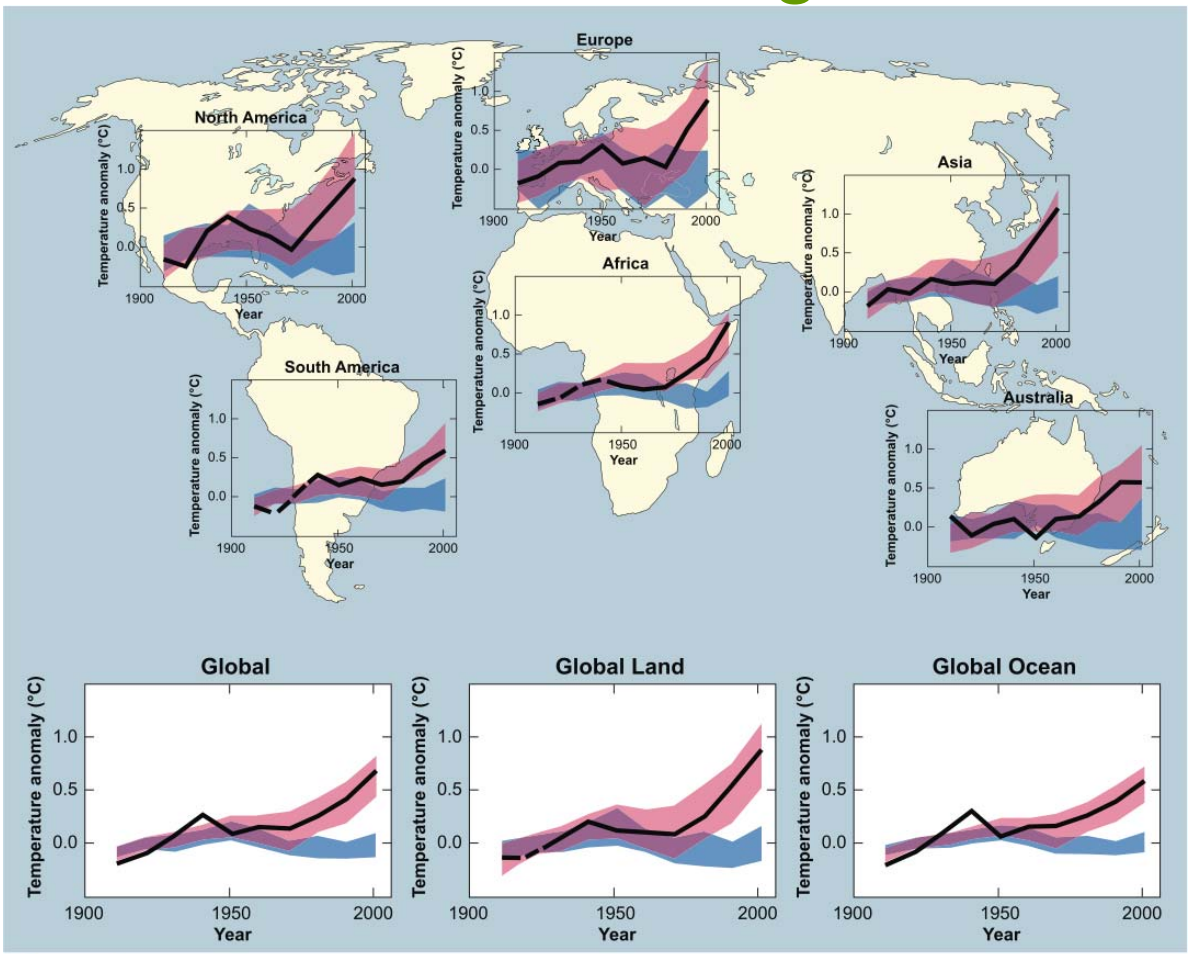
Summary of results

	El Niño	Neutral	La Niña
Probability of a loss in a month			
Bushfire	7%	3%	0%
Cyclone	3%	3%	7%
Storm/Hail/Flood	21%	31%	13%
Average Monthly Loss ($m)			
Last 10 years	57	62	45
Last 20 year	38	50	36
Average Number of Months in a phase	7	6	7

Analysis of extreme events - Scientific view

Peril	La Niña	Neutral	El Niño	5 year Forecast
N. of Tropic of Capricorn				
Cyclones	↑	NA	↓	Stability in occurrence
Floods	↑	NA	↓	Below Average
S. of Tropic of Capricorn				
Thunderstorms – Sydney	NA	↑	↓	Below Average
Thunderstorms – Brisbane	↓	NA	↑	Above Average
Cyclones	↑	NA	↓	Below Average
East Coast Lows	↓	↑	NA	Stability
Floods	↑	NA	↓	Below Average
Bushfire	↓	NA	↑	Above Average
South Pacific Basin				
Cyclones West 170º	NA	NA	NA	Stability
Cyclones East	↓	NA	↑	Above Average
Floods	↓	NA	↑	Above Average

Climate Change



Conclusions

- Weather has been the primary cause of Australia's historic catastrophe losses
- Framework for considering losses from weather perils
  - Not a definitive study
  - Some relationships are clear
  - Others may need more investigation
- Climate Change will make prediction even more difficult