Icy cricket balls from above

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Losses from severe convective storms, in particular from hail, represent the most frequent and (on an annual aggregate basis) the highest losses for the insurance industry in the entire Australian nat cat business. Apart from the Sydney hailstorm of 1999, the five most expensive insured convective storm losses in Australia have all occurred within the last five years.

Severe #convective storms are the most expensive hazards with high frequencies and great values at risk. #Mitigation is key #hailstorms, #flash floods

Over the last 35 years, the accumulated losses (all in Australian CPI-adjusted values for 2014) from severe convective storms total around A$ 14.8bn for insured losses and A$ 25bn for direct economic losses. Compared to other perils in Australia, only losses from flood events reach similar dimensions. In terms of frequency, losses from severe convective storms make up about 50% of all loss-producing natural hazard events that occur in Australia. Hence, severe convective storm is the number one peril in nat cat business in Australia.

The costliest loss event in Australia to date (after adjusting for inflation) was the Sydney hailstorm of 1999. In the early evening of 14 April – untypically late in the season – a supercell storm had developed south of Sydney in the area around Kiama. It moved northwards, parallel to the coastline, via Wollongong, Bundeena, straight to central Sydney and further north to Palm Beach, up as far as Gosford – a distance of more than 200 km. The storm produced hailstones the size of cricket balls (7 cm), reaching its maximum intensity around the eastern suburbs of Sydney. On its path, it caused damage to more than 45,000 houses, 63,000 cars, 23 planes and countless boats, resulting in more than 120,000 insurance claims. The total sum of insured losses reached A$ 1.7bn, and the estimated direct economic losses were over A$ 2.3bn. Adjusted for inflation, those values today would be equivalent to A$ 2.9bn and A$ 4bn respectively. And accounting for the increase in wealth and assets since 1999 (using GDP growth as a proxy), the values could reach as much as A$ 4.6bn and A$ 6.3bn.

Brisbane hailstorm of 2014 produced the largest hailstones

In November 2014, a rather short-lived and localised but intense hailstorm battered the Brisbane area. The supercell produced hailstones even larger than those in 1999, and hit central parts of Brisbane during rush hour, causing damage to some 60,000 cars. The roofs, windows and claddings of more than 22,000 homes and commercial buildings were damaged, and about 30 people were injured. The number of insurance claims exceeded 100,000, with a total insured loss of A$ 1.35bn, and a direct economic loss estimated at A$ 1.8bn.

The Brisbane area is hit by hailstorms quite frequently. The most severe event affecting Brisbane prior to 2014 occurred in 1985. It caused insured losses of A$ 180m and about A$ 360m in direct economic losses, which compares to A$ 540m and A$ 1.1bn in CPI-adjusted values.

Two other recent prominent convective storm events with large hailstones and significant flash floods occurred in March 2010, affecting Melbourne and Perth. Each event generated insured losses of about A$ 1bn, with the Perth event becoming the most expensive natural disaster in Western Australia.

Thunderstorm damage

Most of the losses from severe convective storms in Australia arise from hail and flash floods. Large hail causes damage to the roofing, windows and claddings of buildings, as well as hull damage to automobiles, trains, planes and boats. Once a roof is damaged, the accompanying rain can cause substantial damage to the interior and the content of the damaged property. Small hailstones can be harmful to certain crops, especially during the growing stage of the agricultural cycle. Flash floods inundate cars (which usually involves a total loss of the vehicle), as well as flooding basements and ground floors, damaging both the content and the structure of an affected building.

In Australia, tornadoes – though potentially the most devastating of the perils in a severe thunderstorm – do not occur as frequently and intensely as to rival the losses from hail and flash floods. Downbursts and strong wind gusts also cause damage (in particular from flying debris).

Distribution of thunderstorms

Thunderstorms can happen throughout the year, but the season when the storms are most frequent and severe is September to April. In addition to the annual season, other external factors such as the El Niño Southern

Oscillation (ENSO) in the equatorial Pacific have a measurable influence on thunderstorm activity in Australia (although the impact on the spatial distribution of thunderstorm occurrences is greater than on intensities).

The meteorological hazard probability, i.e. the areas where severe hail and strong thunderstorms are most frequent, is shown in Map 1, together with the locations of historic hailstorm loss events from the Munich Re NatCatSERVICE database.

The big red dots over the cities of Brisbane, Sydney, Melbourne and Perth mark the largest loss events. The map confirms that the highest meteorological probability of significant hail coincides with the historic large losses experienced in major metropolitan areas of Australia.

Map 2 displays the annual insured loss per capita caused by severe convective storms for each state. The values were calculated on the basis of empirical insured loss data from 1980 to 2014, normalised by increase in GDP. Such a denotation of the losses helps to identify high-risk regions. These regions do not necessarily coincide with the states that experienced the largest losses in absolute terms, or were prone to the most extreme convective storms from a meteorological perspective. However, a clear correlation between the hazard/event map (1) and the risk map (2) can be found for the east coast states, where the highest value of around A$ 40 per capita and year appears in New South Wales (with a good chunk of the A$ 40 stemming from the 1999 Sydney hailstorm). The small value assigned to the Australian Capital Territory (ACT) has to be seen as an artefact derived from a lack of statistics on loss events in this small area. The true risk for ACT would not be different from the risk for the surrounding state of New South Wales.

The correlation between the most highly exposed areas and greatest values at risk is unlikely to change, given that an increasing number of people want to live close to the coast and the majority of the population is concentrated in the eastern states. A reduction in the frequency of severe convective storm events cannot be expected, and owing to the ever-increasing exposure of values at risk, focusing on risk mitigation is paramount. Investing in new technologies and using materials that perform better in severe weather is therefore key. Individual risk rating has a major influence on risk behaviour, and it is essential to charge the appropriate price for exposure, since it will take time for improved materials to flow through the housing and motor stock.

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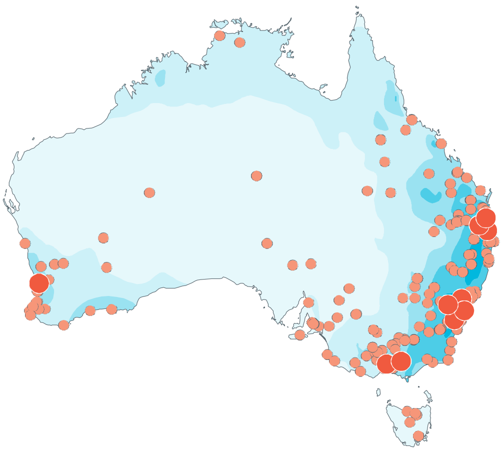
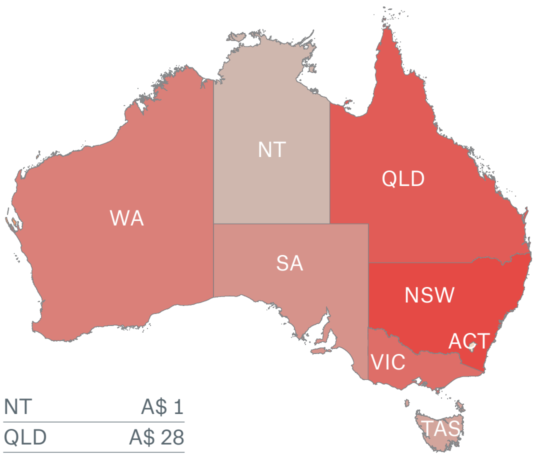
Hailstorm loss events in Australia



Map 1: NATHAN hail hazard layer and the locations of hail losses registered in the Munich Re NatCatSERVICE database (shown as dots). The large red dots indicate the locations of ten major hailstorms since 1980.

Source: Munich Re NatCatSERVICE.

Insured per-capita losses from convective storms



NT	A$ 1
QLD	A$ 28
WA	A$ 14
SA	A$ 5
NSW	A$ 40
ACT	A$ 1
VIC	A$ 17
TAS	A$ 2

Map 2: Annual average insured loss per capita from severe convective storms, broken down by state/territory. The values are colour-coded and range from <A$ 1 (Northern Territory) to about A$ 40 per year per person (New South Wales). The statistics are based on GDP-normalised insured losses per state (over the period 1980–2014).

Sources: ICA, Munich Re NatCatSERVICE

Exclusive online content

More facts and the physics of hailstorms: www.munichre.com/ausnz/hailstorms

Table 1: Most expensive (CPI-adjusted) convective storm losses in Australia since 1980, ranked by insured losses in A$ m of 2014

Date	Affected area	Losses (CPI-adjusted in A$ m)	
		Overall losses	Insured losses
14.4.1999	Wollongong, Sydney, Central Coast	3,800	2,800
27.11.2014	Brisbane	1,750	1,300
22.3.2010	Perth	1,800	1,200
6–7.3.2010	Melbourne, Mangalore, Shepparton	1,700	1,150
25.12.2011	Melbourne, Yarra Valley	1,100	810
9.12.2007	Illawarra, Sydney, Penrith	1,050	790
18–19.3.1990	Sydney	990	620
4–6.2.2011	Melbourne, Gippsland	730	540
18.1.1985	Brisbane	1,010	510
1–3.2.2005	Melbourne, Sydney, Newcastle, Brisbane	520	300

After accounting for loss normalisation, the 1999 Sydney hailstorm could generate an estimated insured loss of about A$ 4.6bn and reach an overall loss dimension of up to A$ 6.3bn.

Source: Munich Re NatCatSERVICE

Fig. 1: Number of convective storm events, split by perils as the dominant loss cause of each event

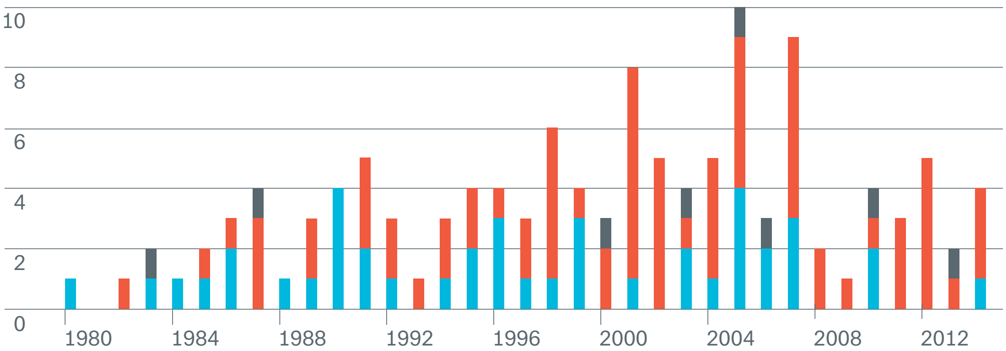


Fig. 1: Number of loss events from convective storms in Australia exceeding A$ 5m in normalised economic loss values. Part of the increase since the 1980s is driven by improved reporting of loss events (particularly smaller loss events).

Source: Munich Re NatCatSERVICE

Tornadoes
Tempests
Hail

Fig. 2: Annually aggregated insured losses from convective storms in Australia (in A$ m)

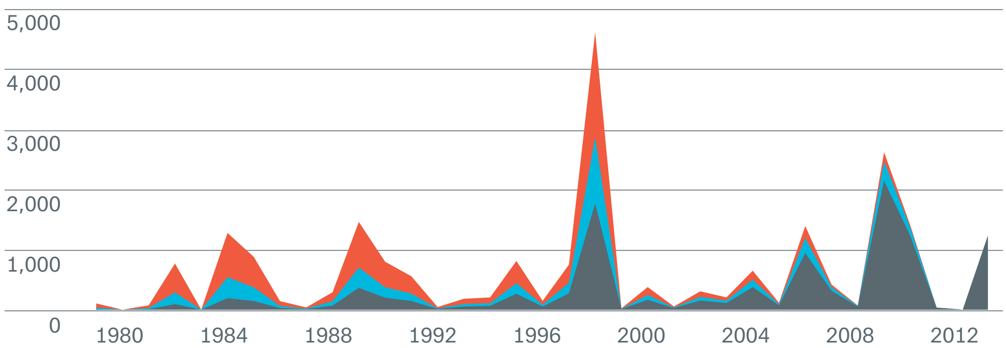


Fig. 2: The grey curve displays the nominal losses as occurred in the year of each event. The blue curve shows the same chart, adjusted for inflation (Australian consumer price index or CPI). The red curve shows the same losses normalised to today's distribution of wealth and assets, using Australian GDP growth as a proxy for the development of wealth. The normalised losses reflect the loss potential if past events occurred today.

Source: Munich Re NatCatSERVICE

Original losses (nominal values)
Inflation-adjusted losses (2014 values)
GDP-normalised losses (2014 values)