Cat Events of 2010 and 2011

Dr Milan Simic
Managing Director
AIR Worldwide Ltd

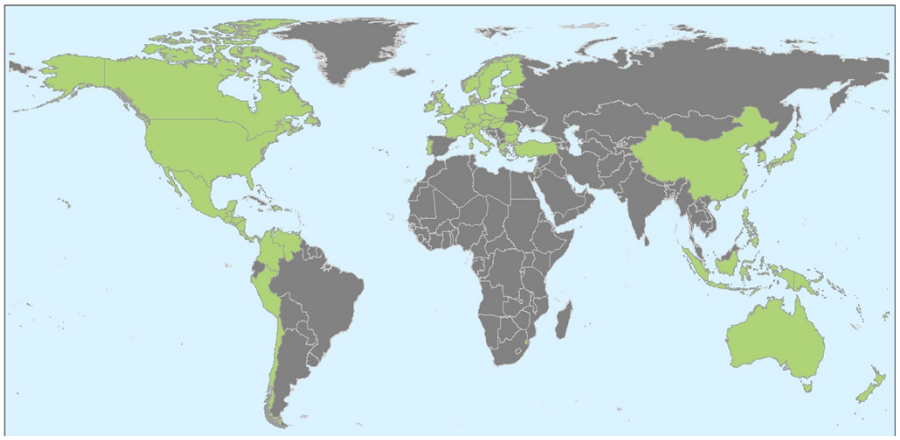
AIR History

- Founded 1987
- First cat modelling company
- Pioneered probabilistic cat loss estimation methodology
- Covers natural hazards in 90+ countries & terrorism in US
- Leading application for use by hedge funds and cat bond investors
- Extensive use in re/insurance industry and capital markets solutions
  - >90% worldwide reinsurers
  - > 400 primary insurers benefit
  - All major intermediaries
  - Research-oriented clients
- Subsidiary of Verisk Insurance Solutions
- Offices in Boston, London, Munich, San Francisco, Hyderabad, Beijing and Tokyo

AIR Offices

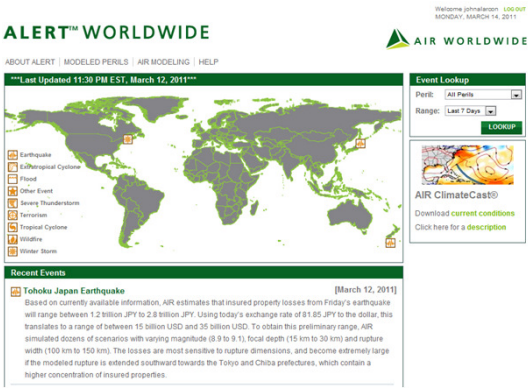
AIR Staff

AIR Catastrophe Models: Global Coverage



ALERT™ (AIR Loss Estimates in Real Time)

- Provides real-time loss estimates
- Industry losses estimated for the most likely scenarios
- Posted on ALERT website as detailed hazard and loss maps
- Files containing all scenarios can be downloaded and input directly into AIR software for further analysis of company-specific losses



Cat Events of 2010 and 2011

Timeline of Cat Events 2010 – 2011 (I)

timeline

Maule, Chile, earthquake (27th Feb 2010)

European Winterstorm Xynthia (27th Feb 2010)

Christchurch, New Zealand, earthquake (4th Sep 2010)

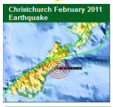
Queensland, Australia, floods (Dec 2010 – Jan 2011)

Cyclone Yasi, Australia (2nd Feb 2011)

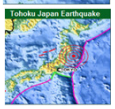
Timeline of Cat Events 2010 – 2011 (II)

timeline

Christchurch, New Zealand, earthquake (22nd Feb 2011)

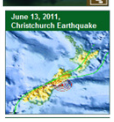


Tohoku, Japan, earthquake (11th Mar 2011)



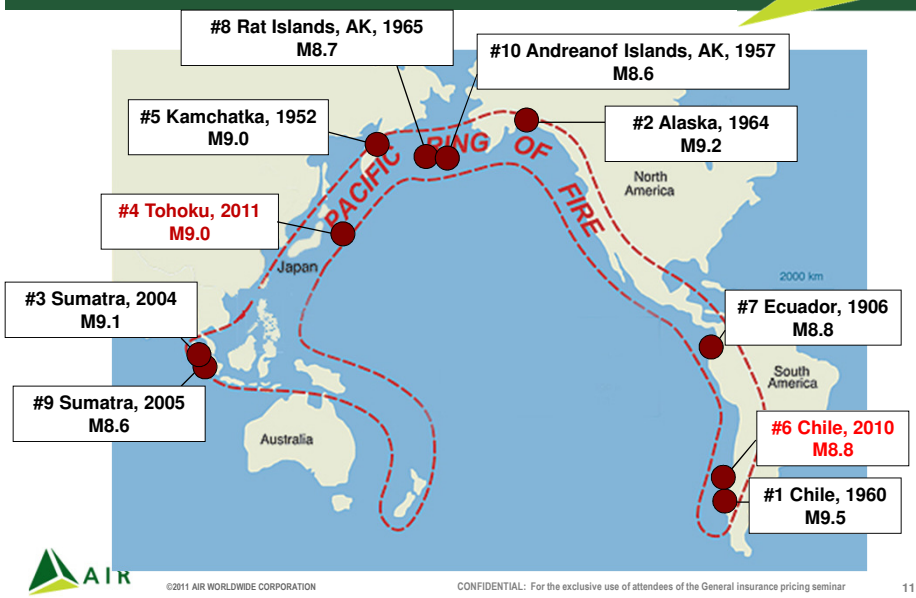
Severe Thunderstorms in the US (20 – 27th May 2011)

Christchurch, New Zealand, earthquake (13nd June 2011)

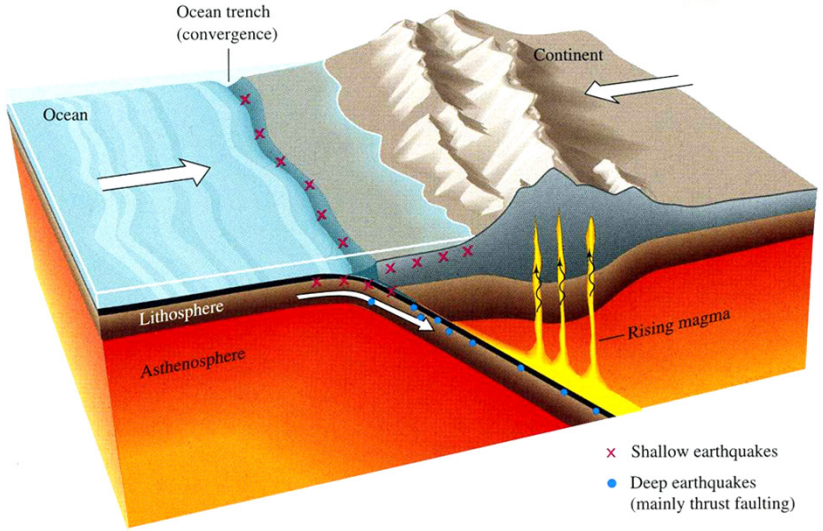


Maule, Chile, earthquake (27th Feb 2010)

The Pacific Ring of Fire Represents The Most Seismically Active Area in the World



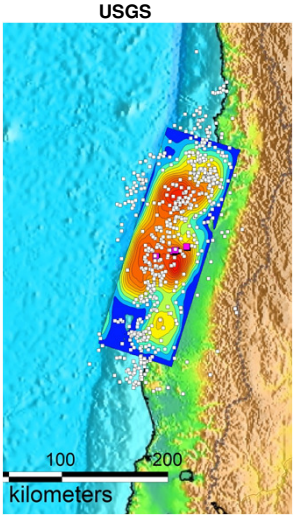
Chile Is a Mega-Thrust Convergence Zone



February 27, 2010 Mw 8.8 Maule Earthquake Affected a Very Extensive Area

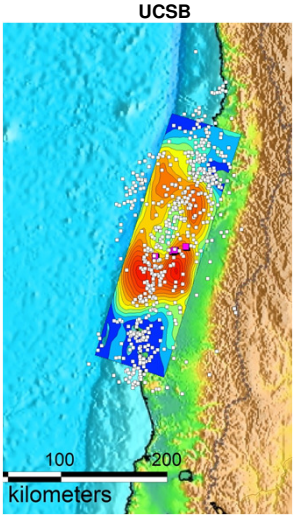
Variations in Reported Earthquake Parameters Reflect Uncertainties in Rupture Length

USGS



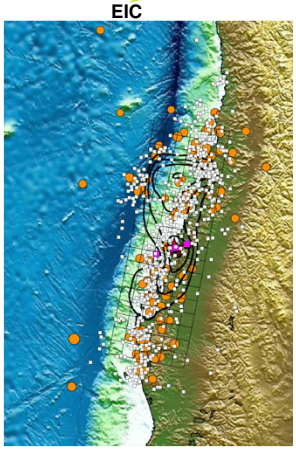
L=450 km

UCSB



L=490 km

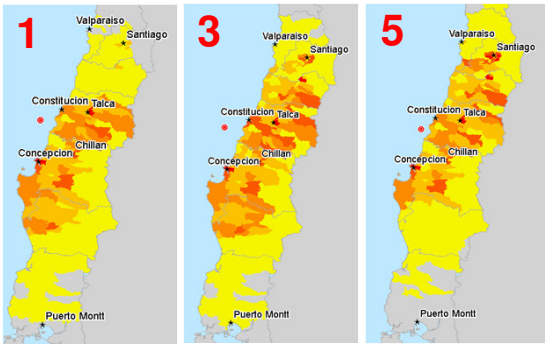
EIC



L=400 km

ALERT Provides a Set of Scenarios that Reflect the Uncertainty in Source Parameters

ALERT #	MAG	LAT	LONG	AZ	DEPTH	RUP LEN	WIDTH	DIP	DIP AZ	TYPE	SOURCE	SEGMENTS
#1	8.8	-35.64	-73.00	18	30	457	160	20	108	S	USGS	3
#2	8.8	-35.64	-73.00	18	30	457	160	18	108	S	USGS	3
#3	8.8	-35.56	-73.13	18	30	453	160	20	108	S	USGS	3
#4	8.8	-35.76	-72.77	13	30	401	152	20	103	S	EIC	1
#5	8.8	-35.67	-72.83	11	30	420	137	18	101	S	EIC	1

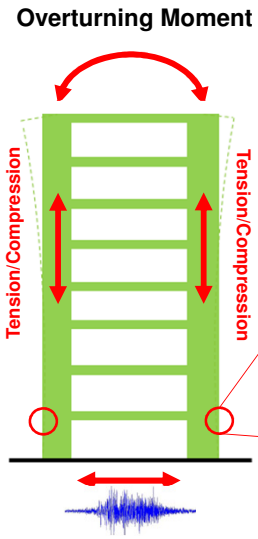


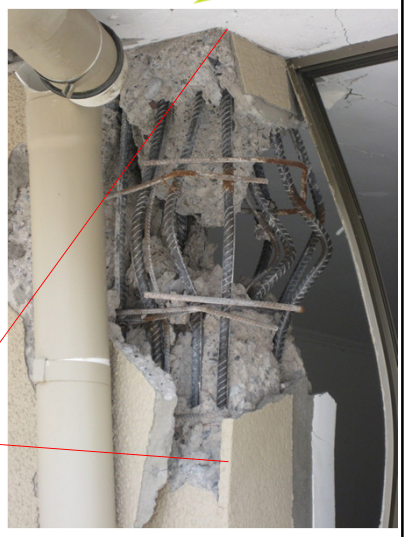
AIR

AIR Participated in the EERI Field Damage Survey

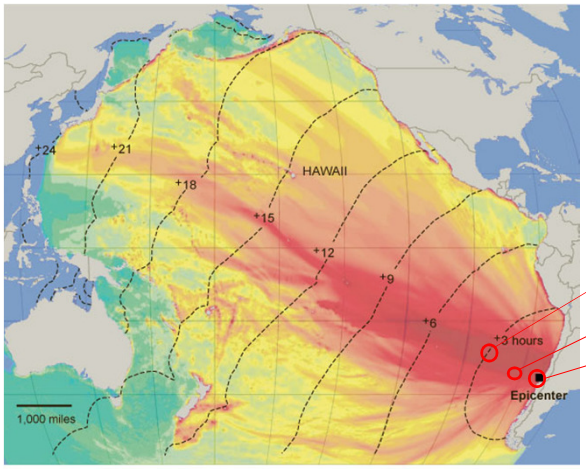
AIR

Damage in Modern Buildings Due to Flexo-Compression





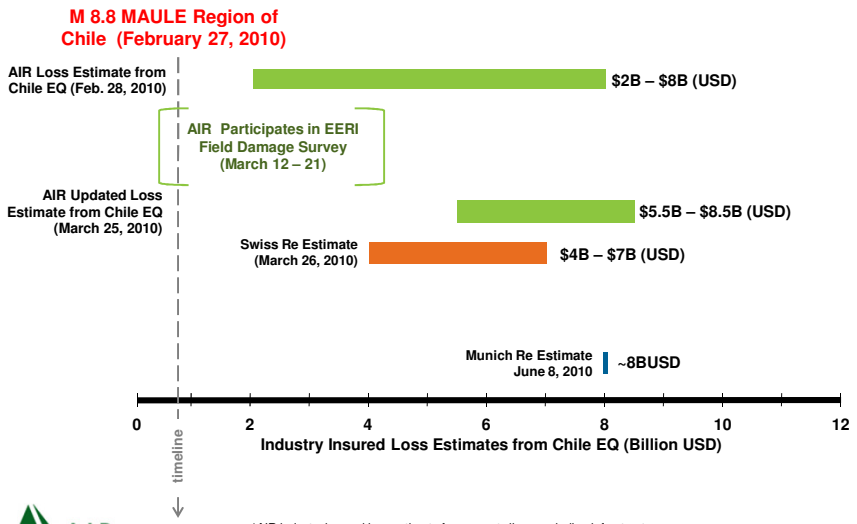
The Impact of the Tsunami Was Restricted to the Chilean Coast



ESTIMATED TSUNAMI ARRIVAL TIMES
Hours after the initial earthquake.

ESTIMATED TSUNAMI WAVE HEIGHT
0 — 1 foot+

Summary of ALERT Loss Estimates for the Chile Earthquake



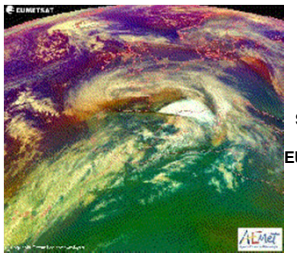
*AIR industry insured loss estimate for property lines excluding infrastructure

Xynthia (Extratropical Cyclone)

European Windstorm Xynthia – February 27th, 2010

- Gusts up to 140 km/h in areas of lower elevation across Spain, France, Germany, Belgium, and Denmark
- Torrential rains
- Caused significant travel disruption and property damage across parts of Spain, France, Belgium, and Germany
- Post-disaster survey

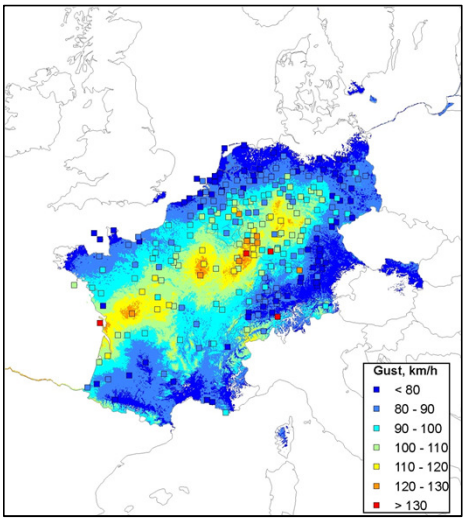
Source: BBC News Website



Source: EUMETSAT

Xynthia from 17:00 on the 27th to 16:00 on the 28

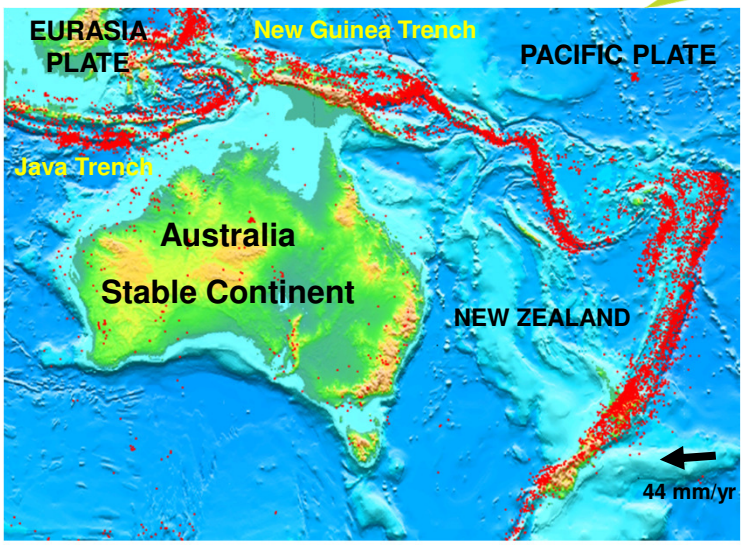
Insured Loss was Estimated at Around €2 Billion



Christchurch, New Zealand Earthquakes (Sep 2010, Feb 2011)

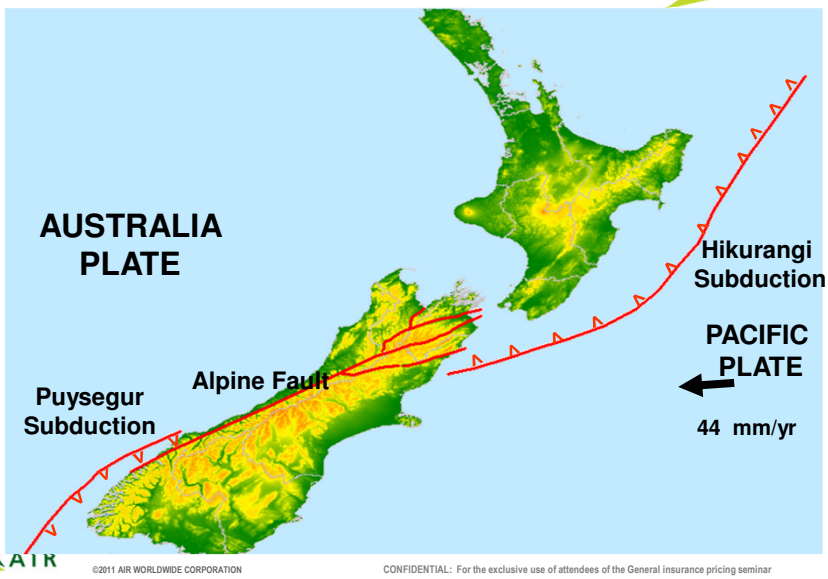
AIR

New Zealand is Located in a Very Seismically Active Region

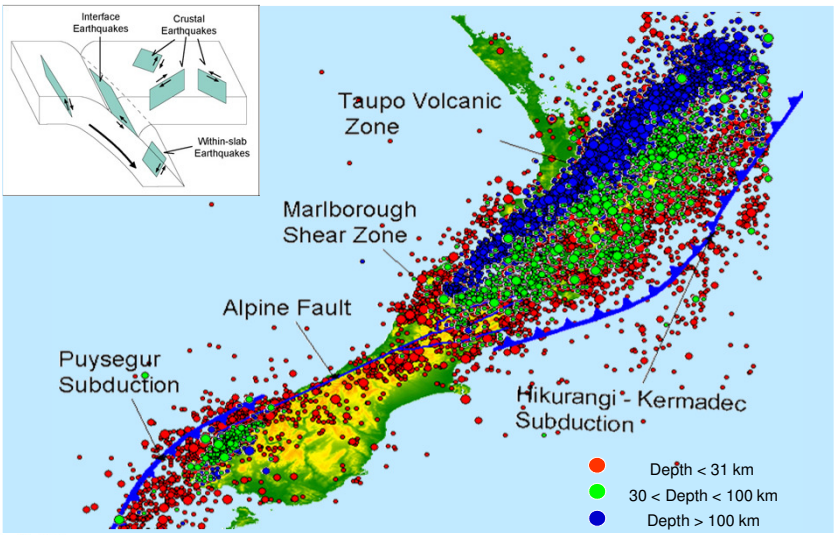


AIR

Seismicity of New Zealand is Dominated by the Tectonic Interaction between the Pacific and Australian Plates

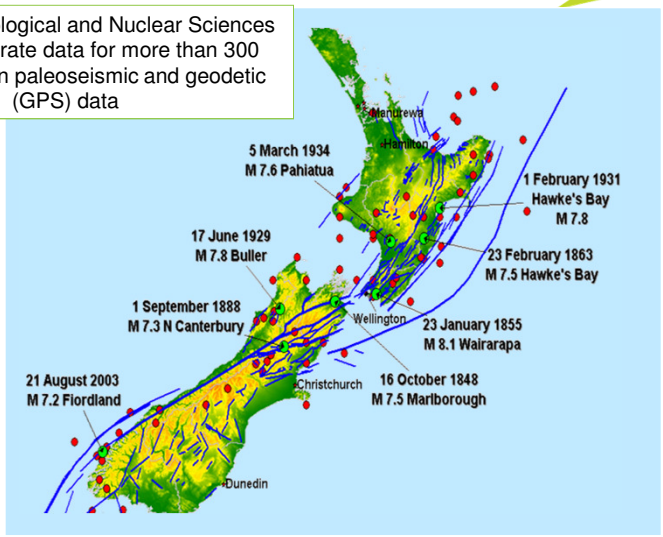


Historical Summary of the Epicentral Distribution of M > 4 Earthquakes: 1840 - 2002

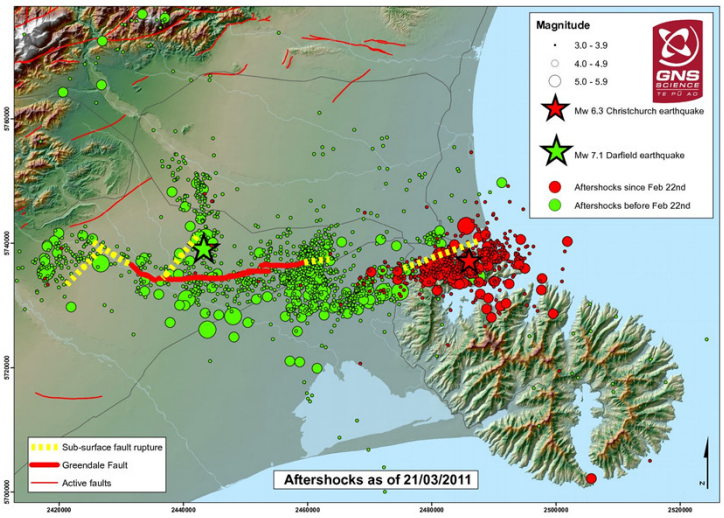


Large Historical Earthquakes (M > 6.5) Correspond to Active Crustal Faults

Institute of Geological and Nuclear Sciences compiled slip rate data for more than 300 faults based on paleoseismic and geodetic (GPS) data

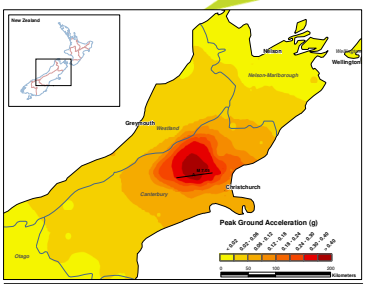


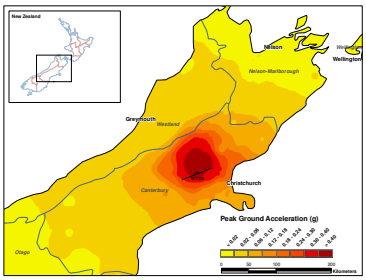
Summary of the Mw 7.1 (4 September 2010) and Mw 6.3 (22 February 2011) Christchurch Earthquakes



The Event Occurred on an Unknown Fault, Yet AIR's Stochastic Catalogue Contained Similar Events

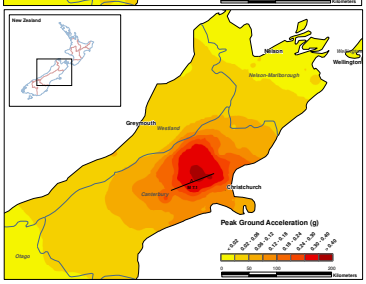
Event # 115087





Event # 117749

Event # 60823



AIR

AIR Participated in the EERI Field Survey of Damage from the Christchurch Earthquake

EERI

EERI Reconnaissance Team at Port of Lyttelton

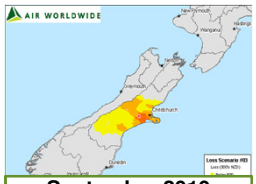
EERI Team Leader and Tao Interview EQC Associates

AIR

How Easy It Is to Estimate New Zealand AAL from Historical Events?

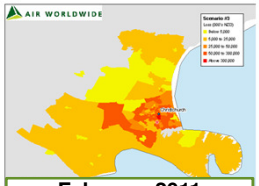
Historical AALs:

- 1900 – August 2010: 409m NZD
- 1900 – October 2010: 454m NZD
- 1900 – March 2011: 545m NZD



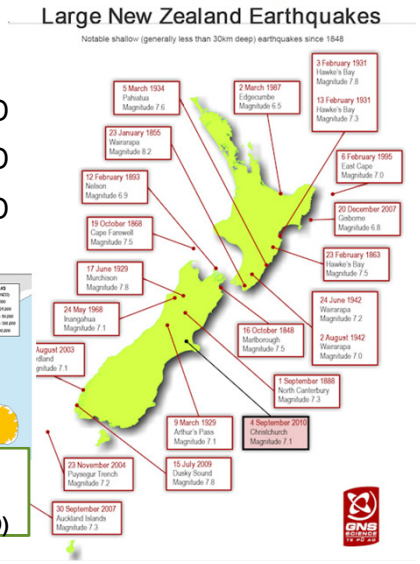
September 2010 earthquake

$2.7B - $6.0B (NZD)



February 2011 earthquake

$5.0B - $11.5B (NZD)



AIR

Queensland, Australia, floods (Dec 2010)

AIR

ALERT Posting for Queensland Floods

Welcome johnalarcon LOG OUT
MONDAY, JUNE 20, 2011

ALERT™ WORLDWIDE

AIR WORLDWIDE

ABOUT ALERT | MODELED PERILS | AIR MODELING | HELP

Queensland Flood 12/29/2010 4:45:00 PM

Type of posting	Posting date:time EST	Summary	Scenarios	Downloads
First Posting	12/29/2010 4:45:00 PM	✓		

Summary

Posting Date: 12/29/2010 4:45:00 PM

A week and a half of torrential rainfall, exacerbated by the arrival of Cyclone Tasha last Saturday, has inundated large portions of Queensland, forcing the evacuation of more than 1,000 residents in some 20 communities. The worst flood in decades and the second significant one since 2008, eight areas in southern and central Queensland (Dalby, Chinchilla, Theodore, Bundaberg, Burnett, Rockhampton, Woorabinda and Emerald) have been declared disaster zones. While rains are subsiding over parts of the state, an immense amount of upstream water is slowly making its way to the coast, meaning that the worst of the flooding is yet to come for some towns.

Australia's Bureau of Meteorology (BOM) has stated that this past spring (September to November) was the wettest on record, and December is looking to join these ranks as well. In the past week, eastern Queensland has received more than 100 mm of precipitation, with parts receiving as much as 300 to 400 mm. Flood warnings are in effect for more than a dozen rivers, with major flooding concentrated in the southeast of the state along the rivers of Burnett, Dawson, Mackenzie, Codamine, Balonne, and Weir.

Queensland Flood

Event Lookup

Peril: All Perils

Range: 2010

LOOKUP

2010 All Perils

Queensland Flood
U.S. Christmas Blizzard
Europe December Storms

Insured Losses: 2.6 – 3 billion AUD

AIR

Cyclone Yasi, Australia (2nd Feb 2011)

AIR

Damage Survey: Tropical Cyclone Yasi (Feb 3, 2011)

- Made landfall in Northern Queensland (between Cairns and Townsville)
- Damage survey
  - AIR crew sent within days
  - Large cities spared from strongest winds, minimal damage
  - Newer residences (built post-1980) highlight strength of building code
  - Damage to older homes primarily to roof coverings and structures
  - Damage to roller doors of garages and light metal buildings/sheds
  - Significant damage to area crops

ALERT Loss Estimates for Yasi

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MONDAY, JUNE 20, 2011

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Yasi Cyclone 2/3/2011 6:00:00 PM

Type of posting	Posting date:time EST	Summary	Scenarios	Downloads
Post Landfall 1	2/3/2011 6:00:00 PM	✓	✓	✓
Landfall	2/2/2011 3:00:00 PM	✓		
Pre-Landfall 1	1/31/2011 5:00:00 PM	✓		

Summary | Scenarios | Downloads

Posting Date: 2/3/2011 6:00:00 PM

AIR Worldwide estimates that insured losses to onshore residential and commercial properties and contents from the Category 5 (Australia Bureau of Meteorology intensity scale) cyclone Yasi that struck Australia at midnight local time, Wednesday, February 2, will be between AUD 350 million (USD 354 million) and AUD 1.5 billion (USD 1.5 billion).

In the aftermath of the most powerful cyclone to strike Australia's east coast since 1918, many residents are expressing relief; while the storm was indeed damaging, its impact on heavily populated areas along the country's northeast coast was less than expected.

A picture is slowly beginning to emerge of the scale of destruction wreaked by the severe cyclone. Throughout Queensland and affected areas, newer commercial buildings sustained only minor structural damage, illustrating the effectiveness of Australia's building code even in the face of such a major storm. Non-engineered residential structures performed less well, with some sustaining major structural damage, mostly to roofs. The towns of Tully and Cardwell were particularly hard hit, with many buildings sustaining significant structural damage, particularly caravans which are quite vulnerable to high wind-speeds. Meanwhile, flooding is a major concern in Townsville, Ingham and Giru. Cairns, with a population of over 160,000, was spared major damage, though more than 65 per cent of homes there are without power. The storm also cut off communications, leaving 25 mobile phone towers out of commission and over 10,000 landlines disconnected. Ergon Energy is working to restore power to some 180,700 customers still without it in north Queensland.

Yasi Cyclone

Event Lookup
Peril: Tropical Cyclone
Range: 2011
LOOKUP

2011 Tropical Cyclone
Yasi Cyclone

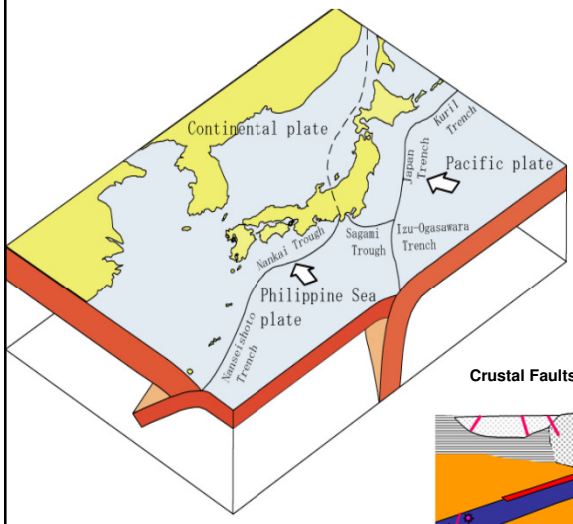
AIR ClimateCast®
Download current conditions
Click here for a description

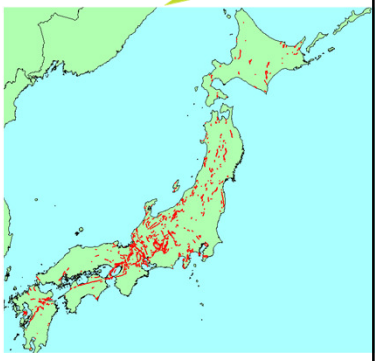
Insured Losses: 350 to 1,500 million AUD

Tohoku, Japan, Earthquake (11th March 2011)

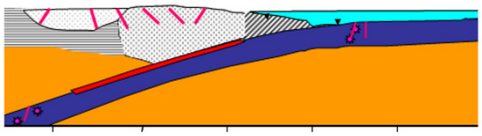
AIR

Japan Seismicity Is Dominated by the Subduction of the Pacific and Philippine Sea Plates





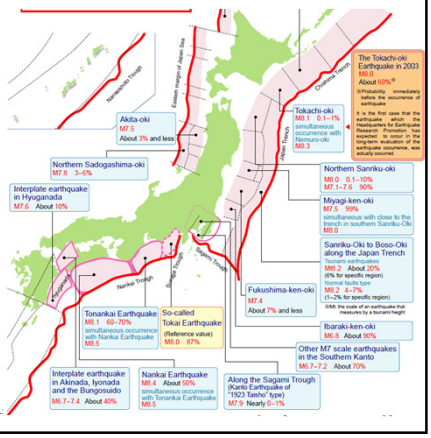
Crustal Faults



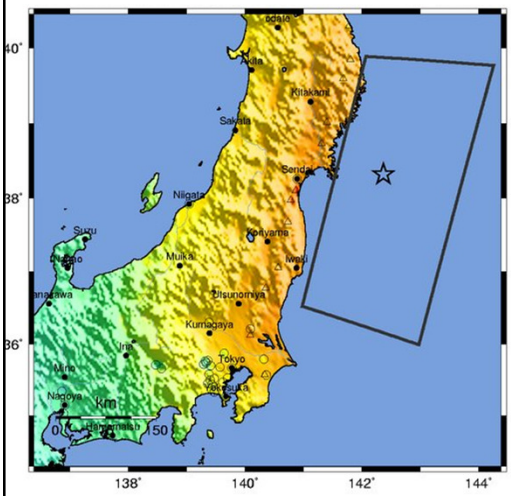
AIR

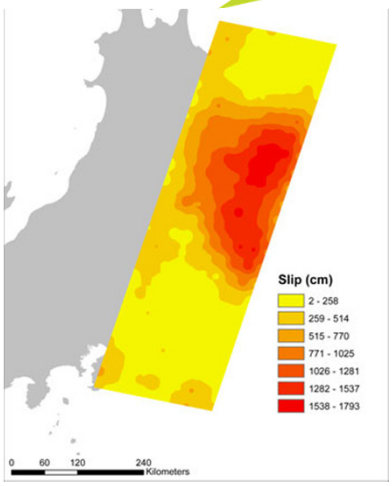
HERP Hazard Work Did Not Include This Level of Seismicity in the Region

- HERP (Headquarters for Research Promotion) was established after the 1995 Kobe earthquake
- The 2005 regional seismicity model has gone though incremental updates in 2006 and 2007
- HERP report includes information on
  - 98 well studied faults
  - 178 other faults
  - about 26 subduction zone segments

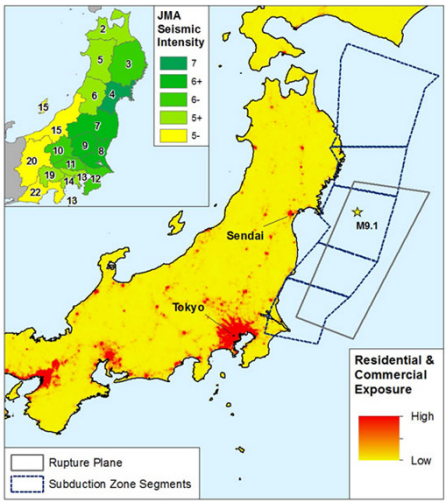


ALERT Posting of 12 March 2011 Was Based on Event Parameters and Fault Slip Distribution



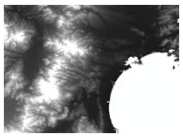


Reported JMA Macroseismic Intensity for Different Prefectures and Distribution of TIV



JMA Seismic Intensity	Prefecture	Total Insured Replacement Values, All Lines (JPY trillions)
7	Miyagi (04)	7.90
6+	Fukushima (07)	6.19
	Ibaraki (08)	6.79
	Tochigi (09)	5.12
6-	Chiba (12)	18.24
	Gumma (10)	4.59
	Iwate (03)	3.85
	Saitama (11)	20.78
5+	Akita (05)	3.22
	Aomori (02	3.76
	Kanagawa (14)	32.26
	Tokyo Metropolis (13)	55.06
	Yamagata (06)	3.42
	Yamanashi (19)	3.51
5-	Nagano (20)	8.08
	Niigata (15)	7.76
	Shizuoka (22)	16.56

Overview of Tsunami Footprint Modelling



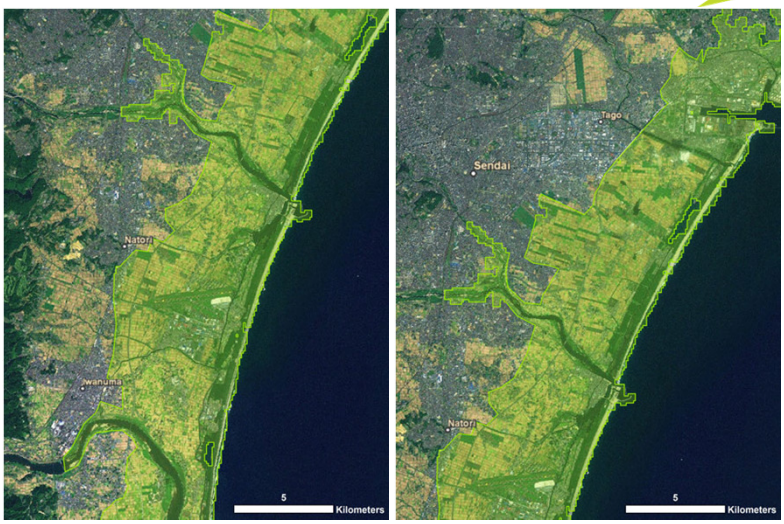
SRTM Elevation

POM Results

Satellite Imagery

JMA Data

AIR's Modelled Inland Tsunami Penetration in Natori and Sendai



ALERT Coverage and Loss Estimates for Tohoku Earthquake

MAIN SHOCK – M9.0 Tohoku Region (Mar. 11, 2011)

EARLY OBSERVATIONS (March 11th and 12th)

15B to 35B USD INSURED LOSS*
(March 12)

K-NET Ground Motion Data Becomes Available

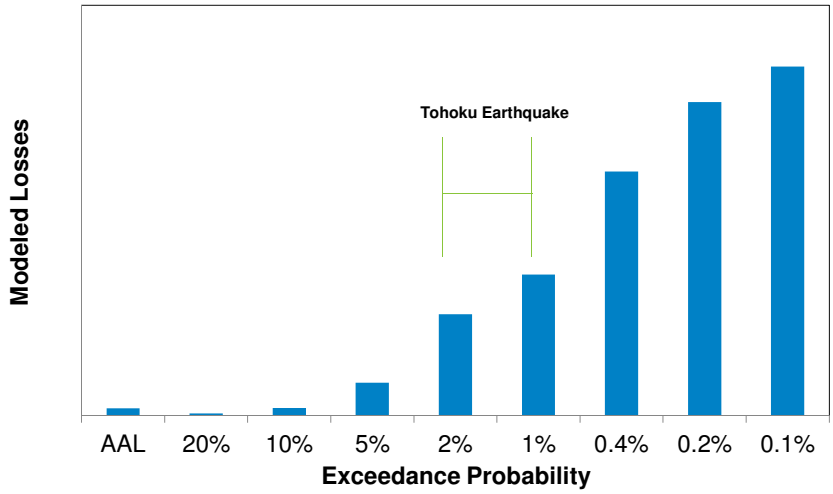
(Mar 12-24)

* The loss estimates do not reflect:
- Losses to uninsured properties
- Losses to infrastructure
- Indirect business interruption losses
- Loss adjustment expenses
- Losses from non-modelled perils, including tsunami and fire-following

USING UPDATED GROUND MOTION DATA AND ACCOUNTING FOR TSUNAMI LOSSES

20B to 30B USD INSURED LOSS*
(March 24)

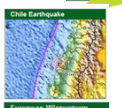
AIR's Loss Estimate with Tsunami is $20 Billion - $30 Billion (1.5-2.5 Trillion JPY) (~40 year to ~80 year loss)



Timeline of Cat Events 2010 – 2011 (I)

timeline

Maule, Chile, earthquake (27th Feb 2010) - $8bn

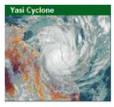


European Winterstorm Xynthia (27th Feb 2010) - $2bn

Christchurch, New Zealand, quake (4th Sep 2010) - $5bn

Queensland, Australia, floods (Dec 2010) - $3bn

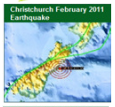
Cyclone Yasi, Australia (2nd Feb 2011) - $1bn



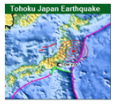
Timeline of Cat Events 2010 – 2011 (II)

timeline

Christchurch, New Zealand, quake (22nd Feb 2011) - $10bn



Tohoku, Japan, earthquake (11th Mar 2011) - $30bn



Severe US Thunderstorms (20 – 27th May 2011) - $7bn

Summary

- Major cat events of 2010 and 2011 so far have caused insurance losses in excess of $60 billion
- Of this, nearly $50 billion were recorded in just three countries - Japan, New Zealand and Australia
- The largest single insured cat event of 2010 and 2011 so far was the Tohoku earthquake
- AIR aims to produce ALERT postings for all major cat events
- ALERT postings can be interpreted as live stress-tests of the underlying models and industry exposures
- ALERT postings have proved invaluable for many companies