West Coast ShakeOut exercise September 18th 2009: Observation of the exercise on the West Coast, South Island, New Zealand

Maureen Coomer
Tom Wilson
Caroline Orchiston
David Johnston
Julia Becker
Sara Page

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M.A. Coomer, GNS Science, PO Box 30368, Lower Hutt
D. M. Johnston, GNS Science, PO Box 30368, Lower Hutt
T. Wilson, University of Canterbury, Private Bag 4800, Christchurch
J.S. Becker, GNS Science, PO Box 30368, Lower Hutt
C. Orchiston, University of Otago, PO Box 56, Dunedin
S. Page, GNS Science, PO Box 30368, Lower Hutt

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ABSTRACT

The 2009 West Coast ShakeOut was an earthquake exercise run on Friday 18th September on the West Coast of the South Island of New Zealand. The exercise was held in conjunction with Operation Ru Whenua, an exercise to test local Civil Defence response to an 8.2 magnitude rupture of the Alpine Fault. The Alpine Fault which runs almost the length of the South Island experiences a major rupture approximately every 100 – 300 years and a major rupture is expected within the next 50 years. The West Coast ShakeOut exercise was based on the California ShakeOut exercise of 2008, and actively involved participants from schools, businesses and local communities in a 'what if' scenario to educate West Coasters about preparedness for what could be a potentially devastating earthquake event.

Observers visited West Coast schools on the day of the ShakeOut exercise, and this report records comments and questions from children at those schools.

KEYWORDS

ShakeOut, preparedness, response, recovery, earthquake, Alpine Fault

1.0 INTRODUCTION

New Zealand is a geologically active country and is susceptible to a range of natural hazards. Although flooding is our most frequently occurring natural hazard, there is a potential for major damage from earthquakes on the many active faults that exist in New Zealand.

The Alpine Fault is the longest fault line in New Zealand, and at 650 km in length is one of the longest natural straight lines visible from space (McSaveney, 2009). The fault runs from Milford Sound along the spine of the South Island into Marlborough, and forms part of the boundary between the Pacific and Australian tectonic plates (Fig. 1).

Over the last 1000 years the Alpine Fault has ruptured four times at around magnitude 8 with an average of 200 year intervals. The last rupture occurred in 1717, almost 300 years ago. The West Coast ShakeOut brochure states that "the next one could be a hundred years away, but it is more likely to be tomorrow."

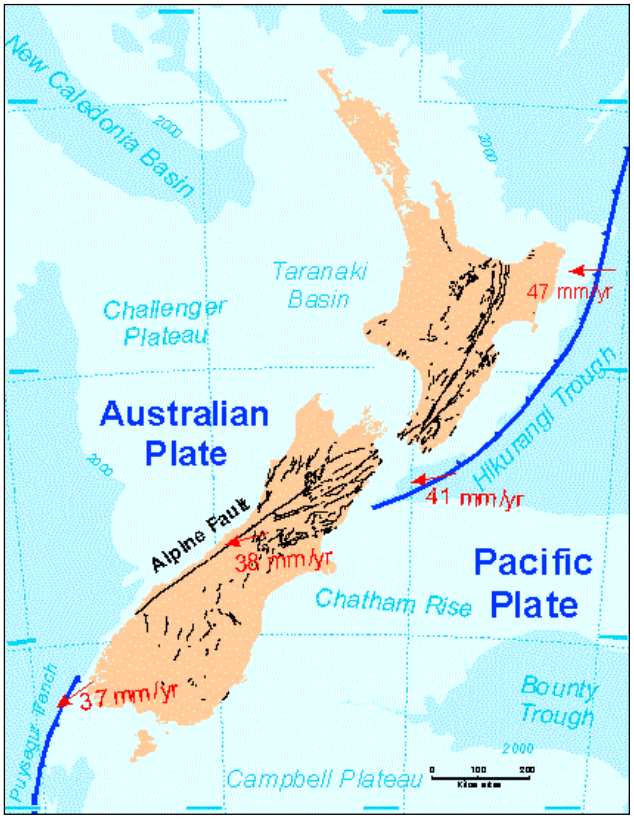

Figure 1 Tectonic Plate boundaries
Source: http://www.gns.cri.nz/what/earthact/crustal/images/plates.gif

The next rupture on the Alpine Fault the earthquake is expected to be stronger than any experienced there in the past 100 years (Berryman, 1998), with the area between the Alps and the West Coast most severely affected. Direct effects will include landslides and liquefaction with the most damage occurring in and around the Southern Alps. Berryman reports that possible long term effects of earth movement could have serious implications for river control, bridges, and hydro-electricity generation, with roads, bridges and services severely affected and possibly not restored for several months or even years. Loss of life is not expected to be high because of the strict New Zealand building codes, but normal daily living processes will be interrupted for quite some time.

With this possible scenario in mind, Operation Ru Whenua was run to test the Civil Defence and Emergency Management response on the West Coast, with the ShakeOut exercise run concurrently to involve local schools, businesses, individuals, and communities in a simulated earthquake practice. Over 8300 participants registered on the ShakeOut website, and many others turned up at designated welfare centres to help test the Civil Defence response.

ShakeOut 09 was the creation of Chris Manuel, Deputy Principal of Westland High School, Hokitika. Manuel is the 2009 Royal Society of New Zealand Teacher Fellow jointly hosted by the University of Canterbury, West Coast Regional Council and Westland District Council. As a Fellow he is spending this year researching how prepared the community of Hokitika is for a major hazard event, such as a rupture of the Alpine Fault. With assistance from the ShakeOut team from the 2008 Great California ShakeOut exercise, Manuel set up a website where participants could find out about the ShakeOut exercise, resources, links to earthquake sites, CDEM info, and Ru Whenua, register for ShakeOut, find QuakeSafe information and an educational video, read news and events, and find out how to be prepared for an earthquake event, for example the ShakeOut poster in Figure 2.

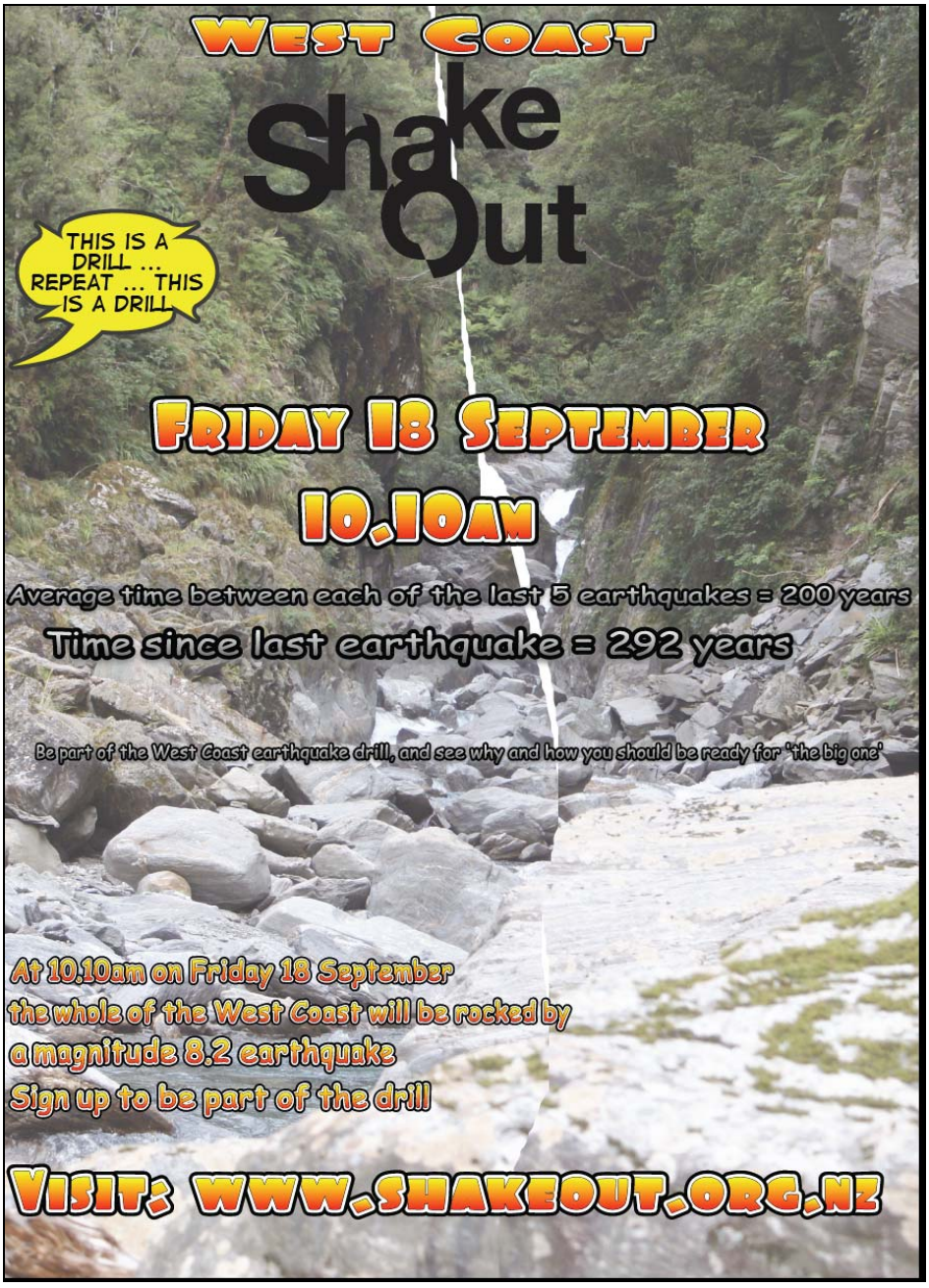

Figure 2 West Coast ShakeOut 2009 poster
Source: http://www.shakeout.org/downloads/nzshakeoutposter.pdf

Researchers from GNS Science/Massy Joint Centre, University of Canterbury, and University of Otago were invited to observe the ShakeOut exercise at Westland High School (Hokitika), and to visit Paroa Primary School (Greymouth), Westport Primary School, Greymouth Welfare Centre and Westport EOC and join group discussions regarding the exercise

The ShakeOut message was about being prepared for a large Alpine fault rupture, about being resilient in an earthquake event and about planning for a future event in the knowledge that a major earthquake is likely to occur within the next 50 years (GNS Science, 2009).

2.0 METHOD

ShakeOut was the largest ever earthquake drill in New Zealand with almost all schools and preschools on the West Coast registered for the exercise. The goal of the observers in visiting the West Coast schools was to observe the actions and behaviours of staff and children as they undertook an emergency response drill, and to converse with staff and children about their concerns and questions they may have regarding the drill, and issues around earthquakes, preparedness and recovery.

2.1 Observers

Figure 3 shows the team of observers included one staff member from the Joint Centre for Disaster Research; three staff members from GNS Science; one staff member from the University of Canterbury; and one PhD student from the University of Otago.

Figure 3 West Coast ShakeOut observers at Westland High School
Chris Manuel (ShakeOut organiser) Sara Page (GNS), Maureen Coomer (GNS), Julia Becker (GNS), Tom Wilson (Canterbury), Caroline Orchiston (Otago), Tony Guilliland (Principal), David Johnston (GNS) taking photo

For the actual ShakeOut time of 10.10am at Westland High the observers were split between 3 classes – two year 12, one year 10, and were given no guidelines other than to join in the exercise with the teachers and children and to observe the behaviours and actions undertaken by the children and staff during the exercise. After the drill, all observers joined a year 12 class for a discussion of earthquake issues and to both ask questions of the children and to answer questions from the children occurring as a result of the exercise.

Observers travelled to Paroa Primary School, Westport South School, Greymouth Welfare Centre, and Westport EOC during the day of the simulated earthquake event to speak to participants about their experience of the event and to answer earthquake related questions that they had.

3.0 SETTING AND PARTICIPANTS

Figure 4 Map showing towns visited in West Coast, South Island, New Zealand
Source: www.nzstays.co.nz/region.aspx?p=118

Westland High School is a decile 6, co-educational Intermediate and secondary school (Year 7-15) in Hokitika, West Coast, New Zealand with a school roll of 449 children (MoE, 2009).

Paroa Primary School is a decile 6, co-educational full primary school (Year1 – 8) in Greymouth, West Coast, New Zealand, with a school roll of 152 children.

Westport South School is a decile 4, co-educational full primary school (Year1 – 8) in Westport, West Coast, New Zealand, with a school roll of 177 children.

Greymouth Welfare Centre – hall behind the Greymouth Civic Centre buildings designated as Welfare Centre for the duration of the exercise – provided registration for displaced/injured persons and base for support groups such as WINZ, CYFS, SPCA, Red Cross, Victim Support, St Johns.

Westport EOC (Emergency Operations Centre) based in the sports pavilion – staffed from 6am till midnight on 18 September with information coming in minute by minute to the staff from a prepared script. Staff on duty were unaware of what scenario was coming their way during the exercise so as to test the communication and response networks.

3.1 School Preparedness

Through the ShakeOut website schools were encouraged to participate by:

- Planning their drill
- Getting prepared
- Sharing the ShakeOut with parents, caregivers, school families, community, visitors, staff.

4.0 RESULTS

4.1 Westland High School

Pupils were excited about taking part in the exercise and there was quite a bit of hilarity during the 2-3 minute period underneath the desks. ‘Drop, cover, hold’ was written on blackboards – students knew that exercise was going to happen – as can be seen in Fig 5, all students and staff knew to get under the desks and hold on. After the exercise students were given a question sheet including some questions to answer at home as a family.

Figure 5 Teacher and pupils under a table and holding on at Westland High School
Source: D. Johnston

Comments and questions from Year 12 students after the exercise:

- Students showed some interest in the geomorphic response – fault trace rupture, sediment coming down
- Isolation and transport discussed – may need to be at school for several days
- Welfare Centre will be established at school – CYPS, Victim Support, Red Cross exercise happening in school that afternoon with 40 children practicing injuries and difficulties to deal with
- Wanted to know why couldn't Welfare centre coordinate info – observers perception was that children didn't quite pick up the overwhelming nature of the information flow
- Will buildings collapse like they do overseas?
- They were surprised that the local New World supermarket would be closed – didn't think it was fair that there would be armed guards at the supermarkets – "It will be like WWII with the rationing"
- Some students were worried about not being able to get to/go to work – will they be laid off…
- Wanted to know what happens to people at work/school, or if you don't live in Hokitika and are maybe trapped in town
- Would farmers stock (animals) and equipment be taken by authorities? – rural kids initially said "NO" until they heard that equipment and livestock used would be reimbursed
- What if we have no communication at all on the West Coast?
- Only a few students said they had prepared emergency supplies at home
- When will the earthquake occur next?
- Will there be warning? 'dogs' etc?
- Will the town be unrecognisable? (reassured to hear that things will still be largely there)
- How large will the earthquake be? – Understand that this earthquake would be significantly more deadly and damaging in a high population, poorly engineered area e.g. Asia
- Will tsunami be a threat? – understood tsunami more worrying for Australia rather than local NZ inundation
- Why do they have to stay at school after a major earthquake?
- How do we re-establish contact
- Why can't someone be sent out to rural settlements to see if their families are OK?
- Does the school have food and water? – The Principal said yes there is a water tank but not a food supply
- Students wanted to know where help would come from – local, overseas, land, air, water
- Students wanted to know about communication – will phones, cell phones work? If landlines are down but cell phones are still working, then the networks will probably be overloaded anyway and how will you recharge your cell phones if the power is out?
- What do you do if you can't fit under the desk? – 'drop, cover, hold'
- Had discussed tectonic plates in lesson time and knew what caused earth movement – knew about 'Ring of Fire'
- Knew that a large earthquake on the Alpine Fault was imminent but when – within the next 50 years but probably sooner rather than later

Some students wanted to appear too 'cool' to be involved but from their comments it was fairly obvious that they had some knowledge of the subject and of what to do during an event. Some students were fatalistic about the Alpine fault earthquake happening, whereas a minority did not think it would happen in their lifetime.

4.2 Paroa Primary School

Students had discussed preparedness, fixing of items to walls, 'drop, cover, hold', safety at home. Some of the children were clearly quite anxious about what to do during a big shake, and questioned whether the school building would remain standing. We reinforced the right protective measures to take, however, there were still concerns about items falling during a quake. After the exercise students were given a question sheet including some questions to answer at home as a family.

Comments and questions from students after the exercise (18 children from yrs 6, 7, 8)

- All children and staff were under the desks holding on tight
- Children talked about earthquake/fires/escape plans at home
- Some talked about earthquake information in the school newsletter
- Some had previous experience of earthquakes – they stood in the door frames
- All feel less scared and more confident about earthquakes now that they know what to expect and what to do
- "Shouldn't be beside the windows"
- "Pull over to the side of the road and put the handbrake on"
- Hide under the tables"
- Some children had seen cars and roads slipping away on TV
- Some knew that dead bodies are put in black bags and that families are informed – they seemed pretty relaxed about it
- Several were quite concerned about tsunamis and had been doing work in class about it
- Asked "How deadly could tsunami be" etc
- They were very aware that things/objects would be secured to walls and floors and they analysed their classrooms and homes to find what is safe and what is unsafe
- They asked "When is the next earthquake going to be?" and looked worried
- Asked if the big 2009 earthquake down south was the one we were worried about (Alpine Fault) – we said no
- In 2007 an earthquake was experienced at school and some remember things falling off desks and shelves
- Seemed very intent to get under a table or something else for protection
- Spent some time talking about getting into the turtle position if they couldn't get under furniture or in a doorway
- Some were concerned about sandy soils and whether buildings on piles would sink into the soil – we talked about liquefaction and explained that it might mean that their school buildings or home might end up on an angle but that they wouldn't completely sink into the ground
- Interested in building and foundation pile design so that the buildings were safe in an earthquake – assured them of NZ building code and safety standards
- Knew about sinuous waves and were interested in hearing more about how they move
- Around 6 children said they had an emergency kit at home with water, food, toilet paper/buckets, first aid kits
- Some asked why you need buckets in a survival kit – lots of giggles when it was explained
- One child brought up the risk of fire
- There was some concern about isolation because of road damage
- They were interested in which part of the building would be safest
- Asked about upper stories of buildings in an earthquake e.g. Sky Tower – would move a lot but not break
- The children were urged to talk about earthquake preparedness with their parents

4.3 Greymouth Welfare Centre

The West Coast ShakeOut 09 exercise took place alongside Operation Ru Whenua (Civil Defence exercise). When we arrived at the Welfare Centre there were approximately 50 people including Red Cross, CDEM representatives, CYFS, Victim Support, SPCA, WINZ, Search and Rescue, local residents who had come to take part in the exercise. School children had presented with a range of 'injuries' which were handled by Red Cross volunteers. New arrivals were being assessed and details registered (see Fig 6) as in an actual event.

Figure 6 Registration desk at Greymouth Welfare Centre
Source: D. Johnston

The coordination team commented that they can cope with registering people and coping with their various immediate needs but after that there is nowhere for them to go to – no place of shelter for them to stay if they have been evacuated from their homes or are stuck in town.

4.4 Westport South School

Students had discussed preparedness, and what to do during an earthquake event. Students were given a question sheet including some questions to answer at home as a family.

Comments/questions from students after the exercise (~40 children from the senior school 9 – 11 year olds)

- Whole school under desks for 3 minutes during exercise then evacuated to playing field for a roll call
- When back in classrooms after roll call classes discussed earthquakes and preparedness issues
- In the past the school had evacuated to under a large tree on the field but had reviewed that and now have the roll call area away from the tree
- One third had talked about earthquakes pre-event
- One half said they were likely to go home and talk about things to parents and family
- One half said they had an emergency kit at home with batteries, water, food, can opener, first aid kit, toilet paper, blankets, radio, gas cooker
- Wanted to know about the biggest earthquake, longest shaking etc that has occurred

4.5 Westport EOC

Westport EOC, Civil Defence operations centre for Operation Ru Whenua, was located in a room above the local sports stadium. While there we met a Buller High School teacher reporting to the EOC after her school evacuation exercise.

Conversation with teacher from **Buller High School Westport** – Roll 357, Co-ed, Years 9 – 15, Decile 3

- All students and staff got under desks during the exercise
- Plan was to take children not collected by their parents after an earthquake event up to Westport North School (Primary School) to keep all children together to be cared for
- Health and Safety Representative from the school is meant to come down to CDEM and advise EOC of school info and be told what to do with the school children

Westport EOC

- Operation Ru Whenua ran from 6am till midnight on 18th September with both volunteers and paid council staff operating in 6 hour shifts throughout the day
- Staff were unaware of the scripted scenario and were fed minute by minute information dealing with situations as they arose
- The controller spoke to us and talked about how a problem or lack of resources in one area had highlighted problems in other areas and that a positive result of the exercise was that inadequacies were being recognised e.g. the EOC were finding it more efficient to use computers to compile incoming disaster information than manually as they had done it in the past, but did they have enough generator power to run the computers needed to do this? They had fuel supplies for generators in town but now would need even more secure storage facilities for fuel to run the generators to power the computers – all this is involves extra cost and planning

  The controller said that a debrief following the exercise would address the problems/issues raised during the exercise and lessons would be learnt from them.

5.0 CONCLUSION

The ShakeOut exercise and Operation Ru Whenua generated considerable interest within the community and large numbers of local people were involved in some way, either just by listening to radio broadcasts, or by participating in other ways such as the 10.10am simulation, or by visiting a civil defence post, or just by visiting the ShakeOut website. The publicity generated by the event was invaluable in terms of getting people thinking about the potential for a substantial earthquake to occur on the Alpine Fault within their lifetime, and about their levels of preparedness and what they needed to do to become more prepared.

The schools we visited had taken the event very seriously and used ShakeOut as a way to reinforce key issues about earthquake safety and preparedness. Some schools had developed a series of lessons about earthquakes in the days preceding the ShakeOut event, while others had just used the ShakeOut exercise as a way to raise awareness in their staff and students. With the children urged to pass on their new earthquake knowledge to family at home, the participation of schools in ShakeOut was a valuable means for disseminating key earthquake messages into the community.

The South Island's Alpine Fault has a high probability of rupture within the next 50 years (GNS Science, 2009). The West Coast ShakeOut 09 exercise brought West Coasters together in a simulation exercise designed to test their response to what could potentially be a major disaster for the whole of the South Island. Involving school communities in an exercise such as this is essential, as disaster education can prepare children both physically and psychologically (Ronan and Johnston, 2005) for future disaster events.

There is an immediate need for the population if the West Coast to be prepared for major disruption to their everyday lives for what could be an extended period of time, and this exercise was a valuable learning tool highlighting the need for preparedness and resilience planning by individuals, and local communities and businesses.

6.0 ACKNOWLEDGEMENTS

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West Coast, South Island, New Zealand Map
www.nzstays.co.nz/region.aspx?p=118

West Coast ShakeOut 2009
http://www.shakeout.org/downloads/nzshakeoutposter.pdf

www.gns.cri.nz

Principal Location

1 Fairway Drive
Avalon
PO Box 30368
Lower Hutt
New Zealand
T +64-4-570 1444
F +64-4-570 4600

Other Locations

Dunedin Research Centre
764 Cumberland Street
Private Bag 1930
Dunedin
New Zealand
T +64-3-477 4050
F +64-3-477 5232

Wairakei Research Centre
114 Karetoto Road
Wairakei
Private Bag 2000, Taupo
New Zealand
T +64-7-374 8211
F +64-7-374 8199

National Isotope Centre
30 Gracefield Road
PO Box 31312
Lower Hutt
New Zealand
T +64-4-570 1444
F +64-4-570 4657