

## 調査団派遣までの現地状況

- ・地震翌日からのニュージーランド内での報道
- ・ニュージーランドにおける過去の液状化発生履歴
- ・地震直後における調査団派遣前の現地調査

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## 地震翌日の新聞 (Sunday Star Times, Sept.5)



Above: The Bullerston rail line provides a blunt illustration of the quake's impact.

## 地震翌々日の新聞 (The New Zealand Herald, Sept.6)



Big job: Annette Preen stands inside the garage at her destroyed home in the Christchurch suburb of Bexley.

All non-essential procedures at Christchurch Hospital have been cancelled, as have jury trials due to start today. Much of the hard-hit central city remains cordoned off, but engineers have made progress inspecting about 500 damaged buildings. Civil Defence officials are urging visitors to stay away for at least a week, unless absolutely necessary, as the city tries to come to terms with its shattered infrastructure.

One Kaiapoi resident said a constant flow of sightseers was distressing residents, and urged people to stay away. Most public buildings and schools remain off limits for at least the next two days, under the Civil Defence Act. A curfew is in place in Christchurch from 7pm to 5am, and police said the central city was still dangerous. Aftershocks from the quake are expected to be felt for several weeks. The weather seems likely to add to the misery. The MetService predicted winds of up to 130km/h would hit many parts of Canterbury. Those winds are expected to be replaced later today by a cold southerly and rain. The rain may well force further evacuations, especially of residents near the Waimakariri River, where stopbanks were badly damaged by the quake. Civil Defence Minister John Carter said safety was the most important factor for emergency staff, who were contacting elderly people to ensure they were being looked after. "We are aware that there could be significant rain up in the Alps and that the (Waimakariri) River may swell over the next couple of days."

Mr Carter said Civil Defence was working to rebuild the stopbanks and set up an evacuation plan should it be needed. If people were evacuated, they would probably go to welfare centres set up around the region to help hundreds whose homes are too damaged to stay in. About 200 people have spent the past two

Continued on A2

## When solid ground is shaken to wet mush

Quake best example of geological process that turned streets into rivers of sludge

by Helen Davidson  
Large areas of soft, low-lying land in Christchurch have been transformed into rivers of sludge, leaving streets and houses in a state of emergency. The quake, which struck at 4.35pm on Tuesday, has caused widespread damage to the city's infrastructure. The quake, which struck at 4.35pm on Tuesday, has caused widespread damage to the city's infrastructure. The quake, which struck at 4.35pm on Tuesday, has caused widespread damage to the city's infrastructure.

### SWAMPED AS THE

WHAT IS LIQUEFACTION?

When the ground shakes during an earthquake, the soil particles are rearranged and the air and water between them is squeezed out. This increases the water pressure within the soil to the point where it is equal to the weight of the soil above it.

WHAT HAPPENS?

Soil becomes or sand boils, water horizons and excessive ground surface cracking are evidence that liquefaction has occurred.

FORMATION OF WATER FOUNTAIN

Before During After  
earthquake earthquake earthquake

Before During After  
earthquake earthquake earthquake

Before During After  
earthquake earthquake earthquake

Before During After  
earthquake earthquake earthquake

Before During After  
earthquake earthquake earthquake

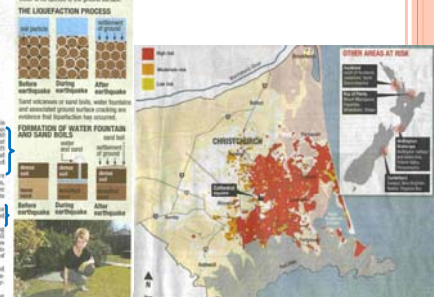
Before During After  
earthquake earthquake earthquake

Before During After  
earthquake earthquake earthquake

Before During After  
earthquake earthquake earthquake

Before During After  
earthquake earthquake earthquake

## 地震3日後の新聞 (The New Zealand Herald, Sept.7)



OTHER AREAS AT RISK  
The map shows the areas of Christchurch that are at risk of further damage from the earthquake. The areas are color-coded to show the extent of the damage, with red indicating the most severely affected areas. The map also shows the location of the earthquake epicenter and the direction of the seismic waves.

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In what's known as liquefaction, Christchurch's sandy soil was shaken violently, causing water to rise through its pores. Scientists compared it to jumping on wet sand at the beach — it soon turns to a murky soup.

Professor Michael Pender from the University of Auckland geology department said the Canterbury quake was one of the most significant cases of liquefaction in New Zealand history.

He said the process could affect any town or city near a river, estuary or coastline. Auckland's waterfront, built on reclaimed land from the Ferry Building up to Shortland St, would be very vulnerable to large tremors.

the quicksand-like effect. Much of this damage was superficial rather than structural. But in Bexley, a 5-year-old subdivision near New Brighton, at least 100 new homes were left uninhabitable after silt, sewage and grey sludge cracked the road and squeezed through floorboards.

Homes in Kaiapoi, near the Waimakariri River, were also reported to have sunk into the soil.

(The New Zealand Herald, Sept.7)



(The New Zealand Herald, Sept.7)

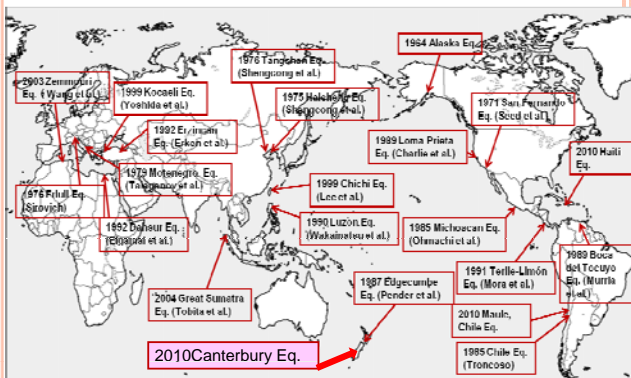
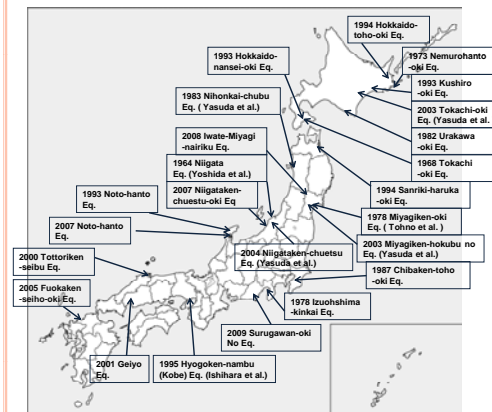


Figure 1. Recent earthquakes that caused liquefaction from 1964 (excluding Japan)



Liquefaction occurred during 24 earthquakes in 45 years in Japan.

Figure 2. Recent earthquakes that caused liquefaction in Japan from 1964



ニュージーランドで液状化が発生した最も新しい地震

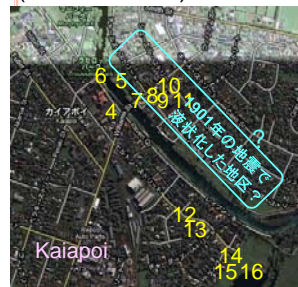
1987 Edgecumbe earthquake  
(エッジカム地震)  
(2 March 1987, M=6.3)

地表に現れた断層  
(V=2.2m, H=1.2m,  
Normal fault)

Whakatane Riverで発生した液状化 (Berrillによる)



今回液状化が発生した地域において過去に液状化が発生した最も新しい地震は1901年Cheviot地震 (Berrillらによる)



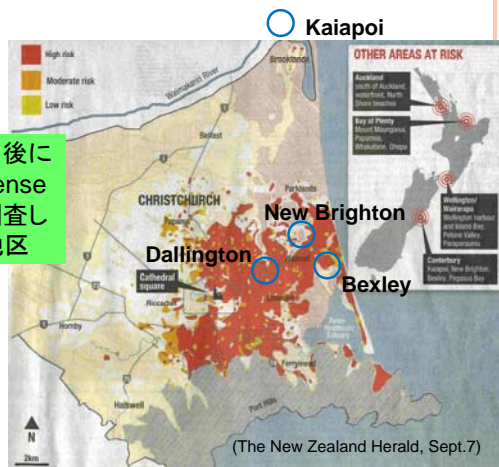
黄色の数字は今回液状化して安田が写真を撮影した箇所



FIGURE 1 The North Canterbury region of the South Island of New Zealand, showing the location of Kaiapoi and estimated 1901 earthquake epicenters.



地震の4日後に  
安田がOrense  
博士と調査し  
て回った地区



Kaiapoi



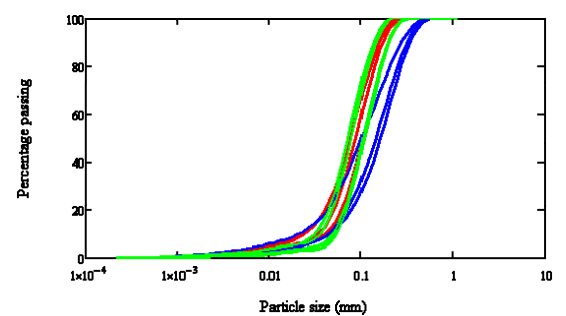
Bexley



New Brighton



Dallington



Pender教授によって採取された噴砂の  
粒度試験結果