#### SCIENTIFIC BASIS FOR DEFINITION OF A FAULT RUPTURE HAZARD IN FRANZ JOSEF GLACIER, WEST COAST, NEW ZEALAND, AND THE FIGHT TO SEE USE MADE OF THIS INFORMATION.

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# **ALPINE FAULT RUPTURE HAZARD**

- Alpine Fault is the main active structure in the Pacific-Australian Plate Boundary through South Island, New Zealand
- An~1.5 m high eroded scarp from the last (1717AD) event is preserved in the centre of Franz Josef township, where some 6,000 tourists / day visit in peak season. It passes through the petrol station, and beneath numerous hotels.
- There is a 30% probability it will accommodate another M~8 earthquake in the next 50 years
- Expected surface displacements are 8m horizontally and 1.5m vertically

BY



#### HOW DOES POLICY PROTECT NEW ZEALANDERS FROM NATURAL HAZARDS?

Development activities in New Zealand are controlled through the <u>Resource Management</u> <u>Act</u>

There is NO national requirement to define and regulate against Natural Hazards. This is the responsibility of regional authorities (e.g. Councils), who have to implement it in their own *District Plans* 

The regional authority (West Coast Regional Council) responsible for Franz Josef town proposed adding a Fault Avoidance Zone (FAZ) to their district plan <u>but this was not a popular</u> proposal





# Franz Josef business owners appeal fault zone

Sarah-Jane O'Connor + 16:05, Jun 29 2015

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The proposed fault avoidance zone in Franz Josef.

Franz Josef business owners are appealing a decision to allow an earthquake zone to slice through the centre of their town, limiting development.

The Westland District Council has proposed a plan change that would create

## **SURFACE DEFORMATION HAZARD**

The width, fault-perpendicular, over which surface deformation is likely was defined based on the results of rigorous previous studies, e.g.

- Field mapping and sampling of fault rocks
- Topographic maps
- Lidar

(†) RY

- Aerial photographs
- Trenching of probable fault locations
- Observations of surface deformation during other NZ EQs, such as Kaikoura in 2016

A 200 m wide zone was defined





### DATASETS

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In 2011 two shallow boreholes were drilled at Gaunt Creek, as part of the Alpine Fault Drilling Project, DFDP. In cores collected from the deeper of these boreholes (DFDP-1B), two 'principal slip zones (PSZ)' were sampled, indicating the fault is not a simple geometrical structure. Recent studies of the recovered cores have demonstrated:

- The lower of the two PSZ in DFDP-1B has particle size distributions indicating it accommodated more coseismic strain than the shallower PSZ (Ms. Risa Matsumura, PhD Thesis, University of Otago, 2020).
- The PSZs sampled in the two boreholes have authigenic clay mineralogies diagnostic of different temperatures <u>(Schuck et al. 2020)</u>

These studies, combined with other recent outcrop studies nearby, highlight that the central Alpine Fault zone is a complex structure comprising multiple PSZ in the near surface, some of which may have been simultaneously active in past earthquakes.



### COMPARABLE SURFACE DEFORMATION IN THE 2016 KAIKOURA EARTHQUAKE



(i)



Field map (above) and aerial and field (left) photographs demonstrate that sets of similar *en echelon* fault arrays affected areas >100 m on the surface around the 'fault trace'. Similar should be expected at Franz Josef.

# **TIMELINE OF PUBLIC COMMUNICATIONS**

Nov 2016; Advised that regional authority (West Coast Regional Council) had proposed adding a FAZ to the district plan but this was being challenged

Dec 2016; Composed a letter to the regional authority, co-signed by a number of University faculty (co-authors of this abstract), explaining the scientific basis of the FAZ definition, and the hazard to population if it was ignored  $\rightarrow$  No reply was ever received

Dec2016/Jan 2017; Personal contact with newspaper reps  $\rightarrow \frac{\text{articles}}{\text{in national}}$  in national <u>newspapers</u> + interview on evening news

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Feb 2018; Press release accompanying most recent paper + PhD thesis\* → Radio NZ article, and post on Otago University webpage



# CONCLUSION

Media engagement does not change legislators minds, but may raise public awareness + increase resilient behaviours

*Text comments on the newspaper article are fascinating!* 

**Ú** RY

*In future:* It may be more effective for scientists to find ways to outreach their science to Local Govt and other partners so that it can feed more effectively into policy.

#### stuff ≡

national

1232 days ago

Can anyone tell me who it is that will be culpable for negligent homicide should building on a risk assessed "high risk area" take place and a disaster with loss of lives occur - just asking, as a taxpayer I would hate to bail central government out on this one if tourists die. I will feel very let down that the government did not throw their weight behind this one. as for building - it feels a bit like sending someone down the rapids without a life jacket and shouting "she'll be right " after them - stupid. I believe corporate bullying is not acceptable and that social responsibility and risk management should be the guiding principle.

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Societal resilience may be achieved though good scenario planning by emergency management, e.g. Project AF8