



Te Whare Wānanga o Ōtāgo  
NEW ZEALAND

# Space Weather Research and data collection during COVID-19: the view from New Zealand

**Craig J. Rodger**<sup>1</sup>

1. Physics Department, University of Otago,  
Dunedin, New Zealand.



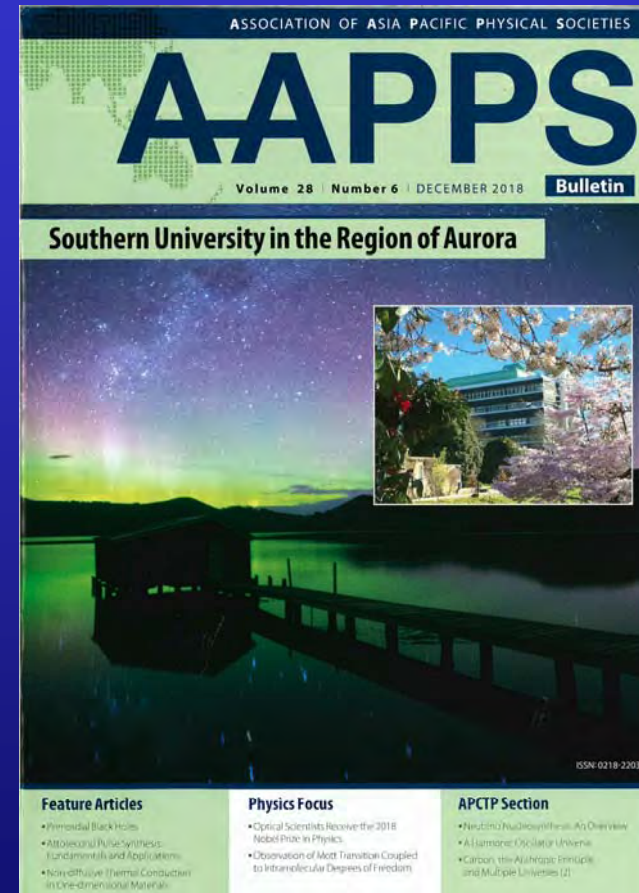
**Prof. Craig J. Rodger**

Department of Physics

University of Otago

Dunedin

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**AOSWA 2020**

Invited Online Presentation

Our activities for Space Weather R&O under COVID-19

10:25 - 10:40, Monday 24 November 2020 (Japan time)

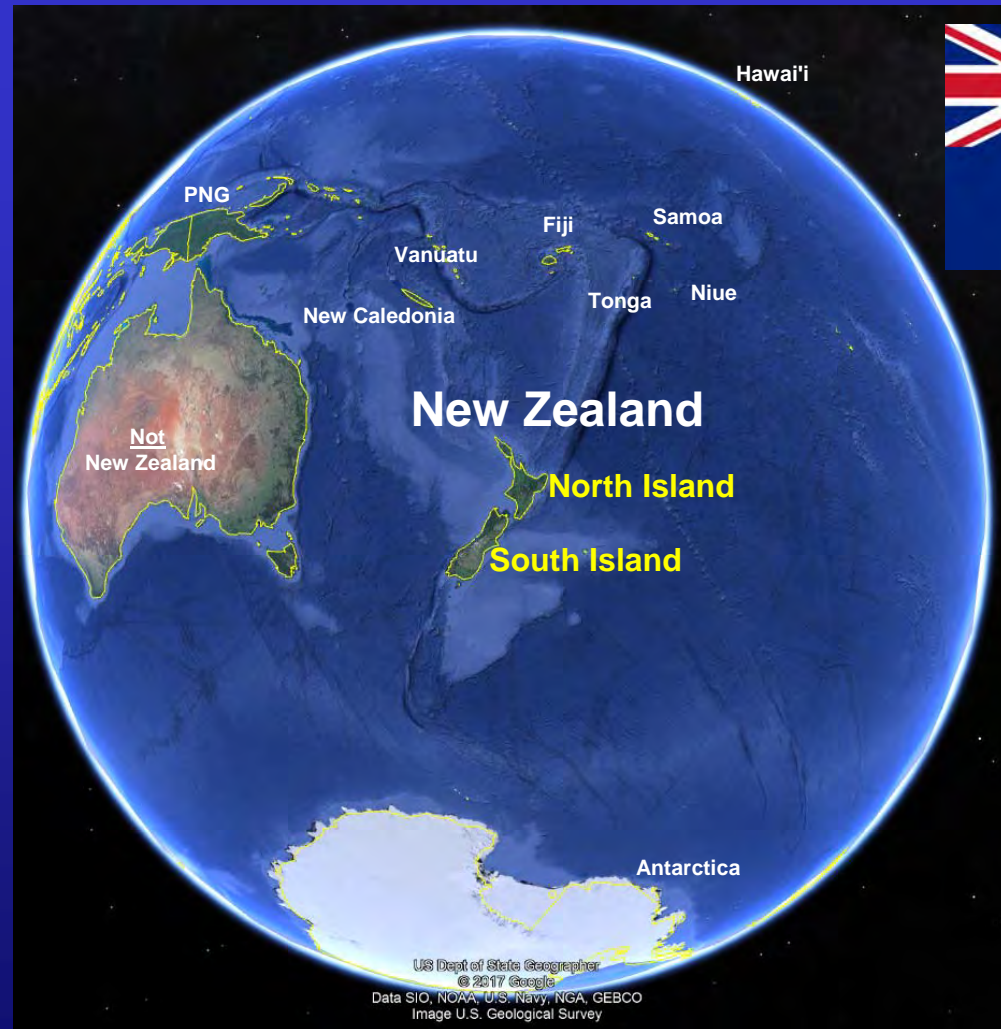
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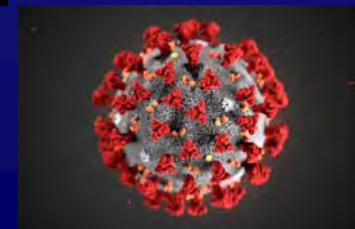
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# Today I focus on New Zealand



## and COVID-19



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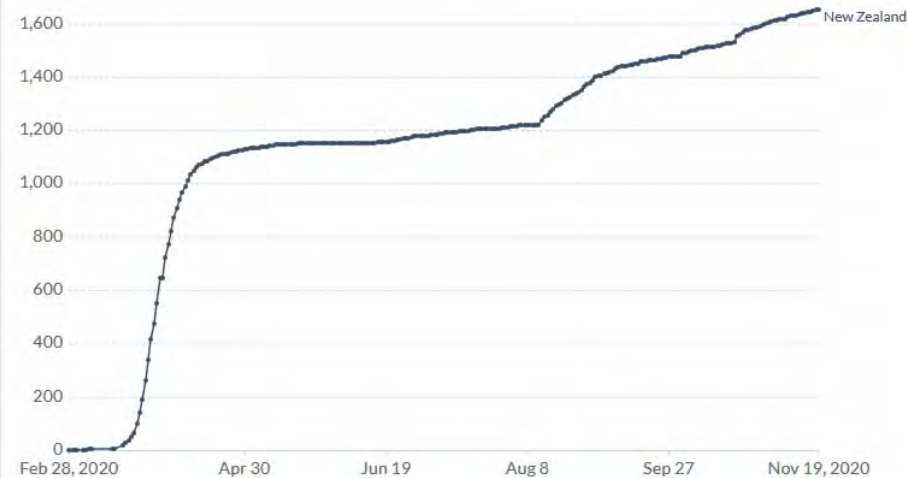
# What happened in your country/region with COVID-19: New Zealand

## New Zealand: What is the **cumulative** number of **confirmed** cases?

### Cumulative confirmed COVID-19 cases

The number of confirmed cases is lower than the number of actual cases; the main reason for that is limited testing.

LINEAR LOG + Add country



Source: European CDC - Situation Update Worldwide - Last updated 19 November, 10:06 (London time)

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Feb 28, 2020 Nov 19, 2020

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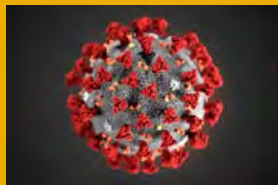
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**TOTAL 1674**

(confirmed cases only,  
also +356 probable  
cases)

Number current as of  
23 November 2020



<https://ourworldindata.org/coronavirus/country/new-zealand?country=~NZL>

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# What happened in your country/region with COVID-19: New Zealand

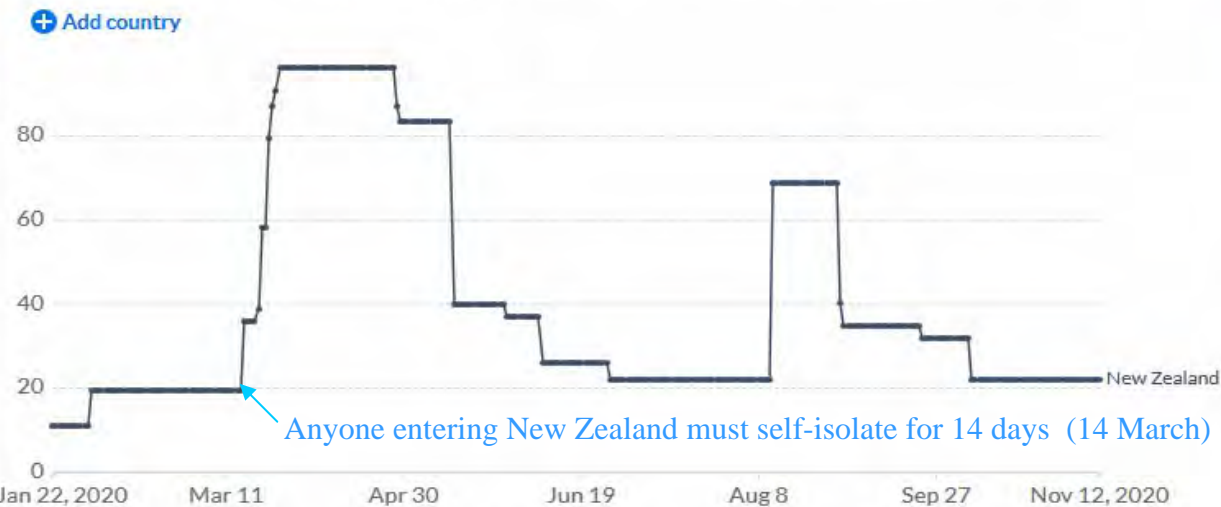


## New Zealand: Government Stringency Index

### COVID-19: Government Response Stringency Index

This is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). If policies vary at the subnational level, the index is shown as the response level of the strictest sub-region.

Our World  
in Data



Source: Hale, Webster, Petherick, Phillips, and Kira (2020). Oxford COVID-19 Government Response Tracker - Last updated 12 November, 13:31 (London time)  
Note: This index simply records the number and strictness of government policies, and should not be interpreted as 'scoring' the appropriateness or effectiveness of a country's response.  
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Jan 21, 2020 Nov 12, 2020

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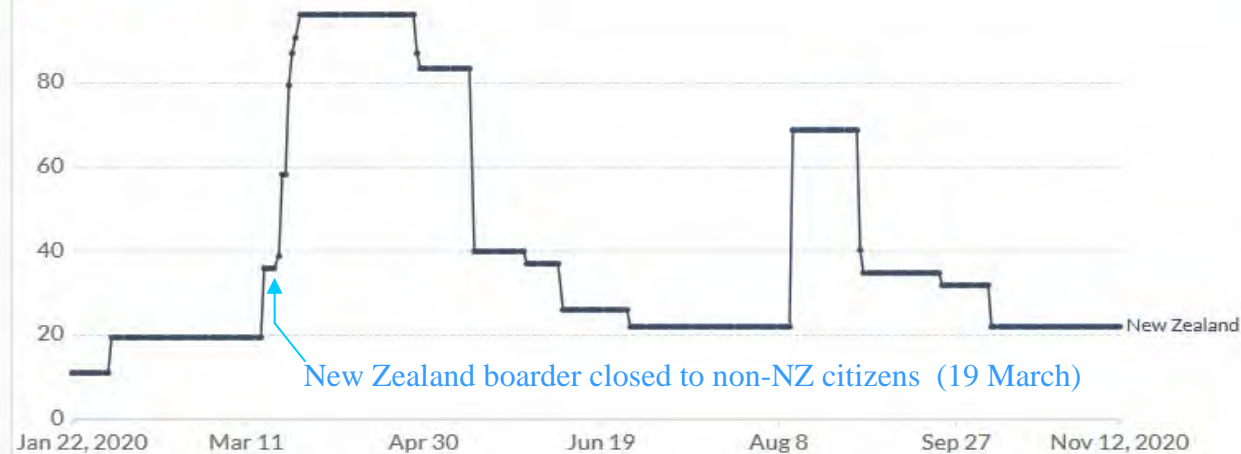
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New Zealand boarder closed to non-NZ citizens (19 March)

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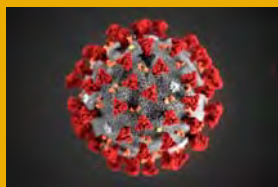
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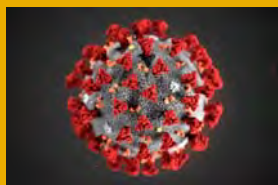
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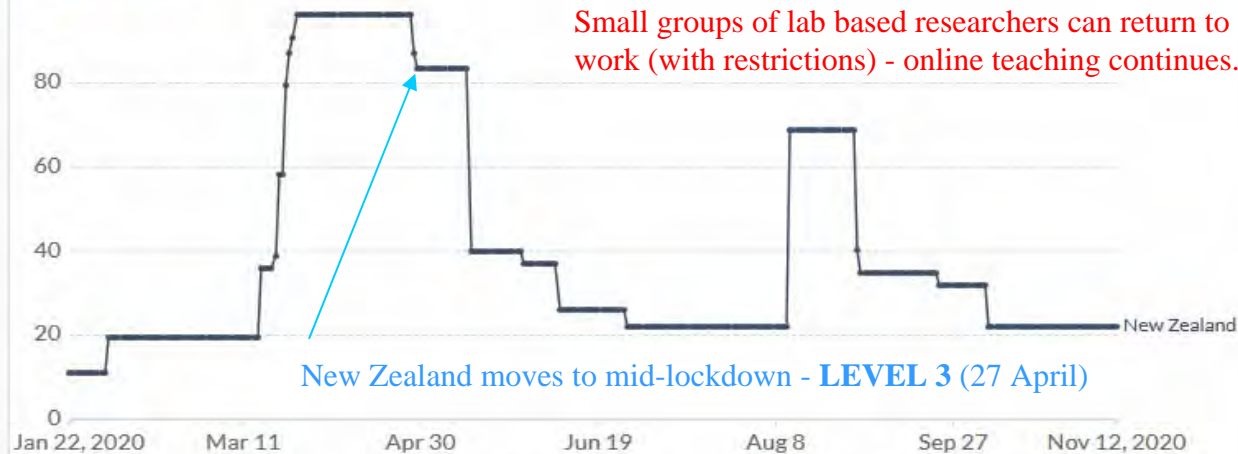
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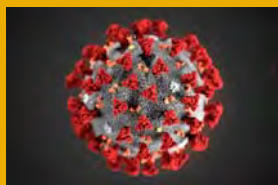
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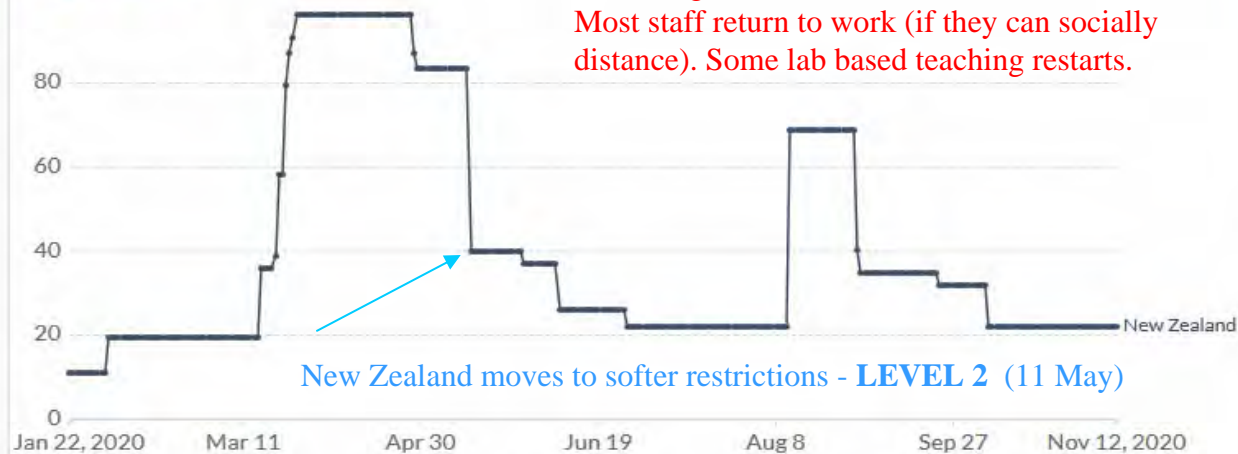
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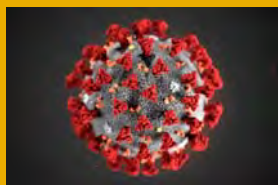
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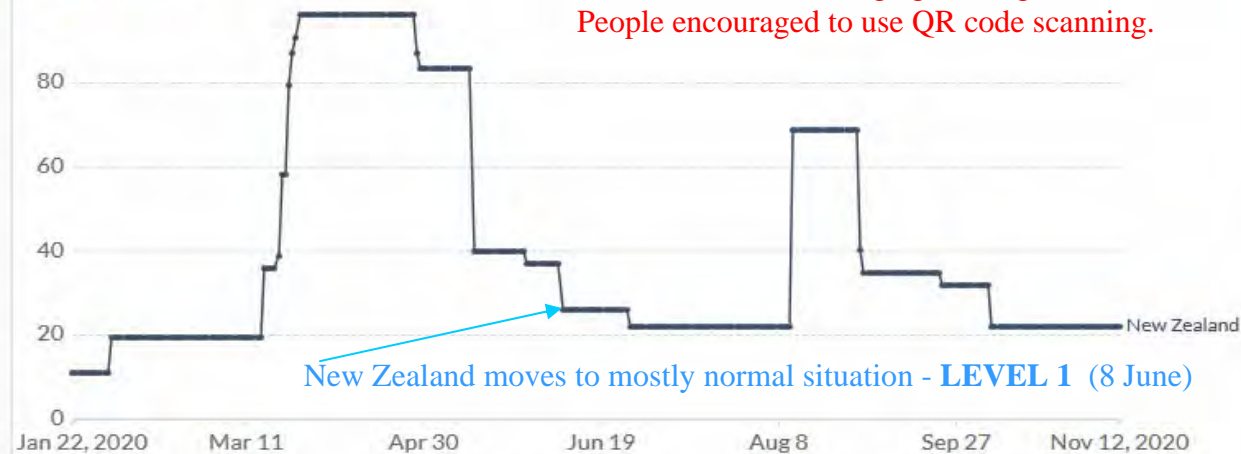
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**Level 1** = "Almost normal" situation, except for the closed boarder. Large gatherings allowed. People encouraged to use QR code scanning.



Source: Hale, Webster, Petherick, Phillips, and Kira (2020). Oxford COVID-19 Government Response Tracker - Last updated 12 November, 13:31 (London time)  
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COVID-19  
Taumata  
Whakatūpato  
1



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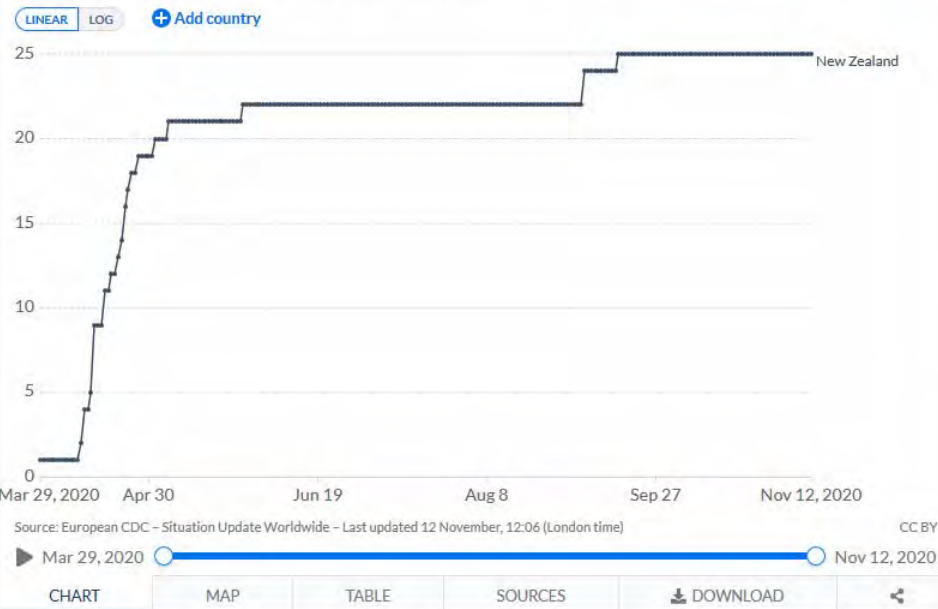
# What happened in your country/region with COVID-19: New Zealand

## New Zealand: What is the **cumulative** number of **confirmed deaths**?

### Cumulative confirmed COVID-19 deaths

Limited testing and challenges in the attribution of the cause of death means that the number of confirmed deaths may not be an accurate count of the true number of deaths from COVID-19.

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in Data



**TOTAL 25**

Unlikely to be many  
“missing deaths” due to  
the comparatively small  
number overall, high  
testing rates, etc.



<https://ourworldindata.org/coronavirus/country/new-zealand?country=~NZL>

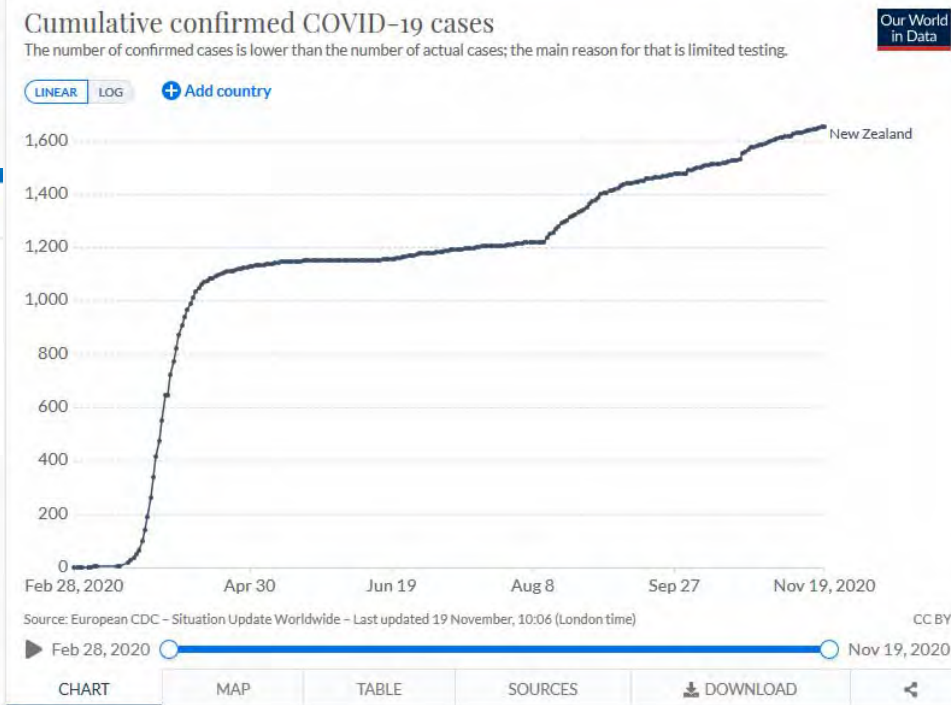
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# What happened in your country/region with COVID-19: New Zealand

New Zealand: What is the **cumulative** number of **confirmed cases**?



**TOTAL 1674**  
(confirmed cases only  
+356 probable)

As of  
23 Nov 2020 the  
number of **active**  
**cases** in New  
Zealand is **52**.

Of these 48 were  
"caught" at the  
boarder, and 4 are  
due to community  
transmission.

<https://ourworldindata.org/coronavirus/country/new-zealand?country=~NZL>

In New Zealand things seem "good", but of course not perfect. Still a lot of worry, and a lot of fear. Larger economic impact unclear, as is the ability to maintain elimination of COVID-19 in our community.





# COVID impact on Space Weather Operations

At this time New Zealand does not have any operational Space Weather services occurring - no forecast centre or prediction activities are led from NZ.

There are some measurements systems which are used for space weather context, and some users in New Zealand who are space weather aware.

Most of the Space Weather activity in New Zealand at the current time is basic research, slowly working towards R2O activities.



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INTERMAGNET



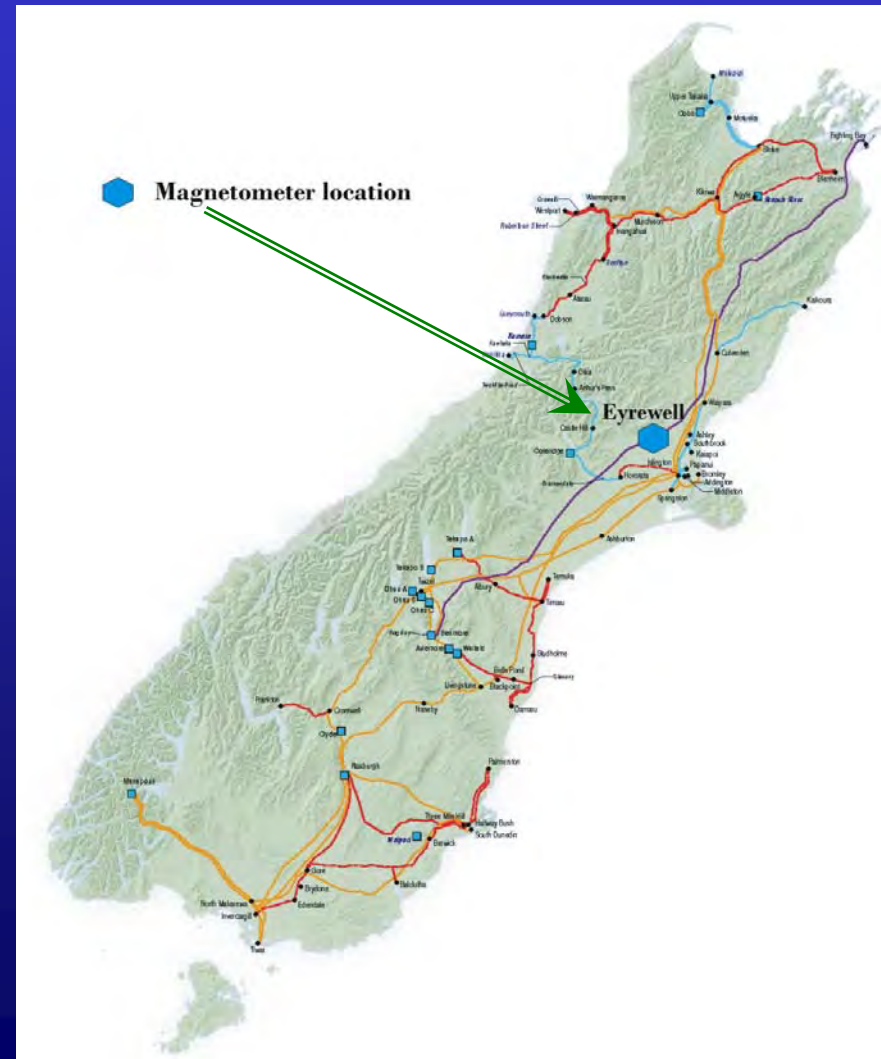
Tanja  
Petersen



# Eyrewell magnetometer

The Eyrewell (EYR) geomagnetic observatory is part of INTERMAGNET and is operated by GNS Science, New Zealand. This is the only "proper" magnetometer in New Zealand. This site has been used since 1978.

Note EYR is located very near the HVDC cable - GNS corrects the dataset for the impact of HVDC operation [we have checked at times of large changes and not been able to see any problems]



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Tanja  
Petersen



# COVID impact on Space Weather Operations

COVID-19 impact on EYR - COVID had no impacts on the continuous (1 sample every second) part of the EYR data collection. All equipment and automated processing ran well and Tanja was able to perform data quality control from her home office even during the NZ wide lockdown in March-April-May.

EYR k-indices that contribute to the global Kp index product were submitted, so no impact there either.

The weekly absolute measurements needed for the annual production of definitive EYR data were paused during the NZ lockdown.

The international IAGA Workshop on Geomagnetic Observatory Instruments, Data Acquisition and Processing, which provides ideas on how to improve observatory data collection and processing was cancelled.



# COVID impact on Space Weather Operations

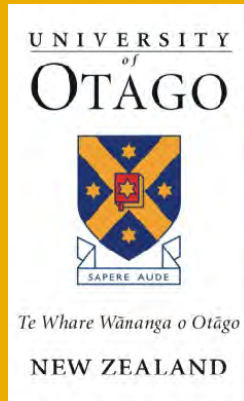


Experimental data collection at Scott Base Antarctica continued as normal - COVID has not entered the Antarctic continent at this time.

Scott Base supports magnetometer, ionosonde, radar, LIDAR, and VLF narrow/wide band observations. [plus non space weather related science]

COVID impact minimal for most of the winter season, but now restrictions on people going to/from Antarctica which is impacting summer operations.





# COVID impact on Space Operations from New Zealand

**Rocket Lab** is a US-New Zealand private launch company. Their main launch site is located in New Zealand, and they provide small satellite launches (i.e., cubesats). Ninety Five satellites have been launched from LC-1 in New Zealand so far (as of 20 Nov 2020).

During our hard lock down all Rocket Lab launches stopped. Attempts to get the company declared an essential business was turned down by the NZ government.

The launch of this rocket went ahead on 13 June (Level 1 restrictions) successfully carrying payloads from NASA, Univ. NSW & the US government NRO.



# COVID impact on Space Weather R20

Meetings in Wellington and Auckland in the aviation sector were cancelled/postponed to an unknown future date. These meetings included space weather talks, designed to better inform the aviation community of Space Weather impacts.



New Southern Sky (NSS) programme is a ten-year programme to modernise the New Zealand aviation system by implementing the National Airspace and Air Navigation Plan.

**12-13 May 2020**  
**Auckland**



Approach 20 was the Australasian Performance-Based Navigation (PBN) forum/conference, as part of the NSS programme.

**17-18 March 2020**  
**Wellington**



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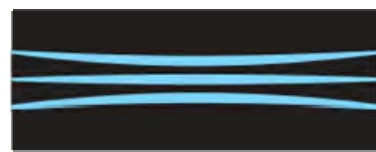
# COVID impact on Space Weather R2O

In the last year or two the New Zealand electrical grid operator has starting discussing R2O questions - how to understand the impact of Space Weather on their network. And what mitigation routes to take?

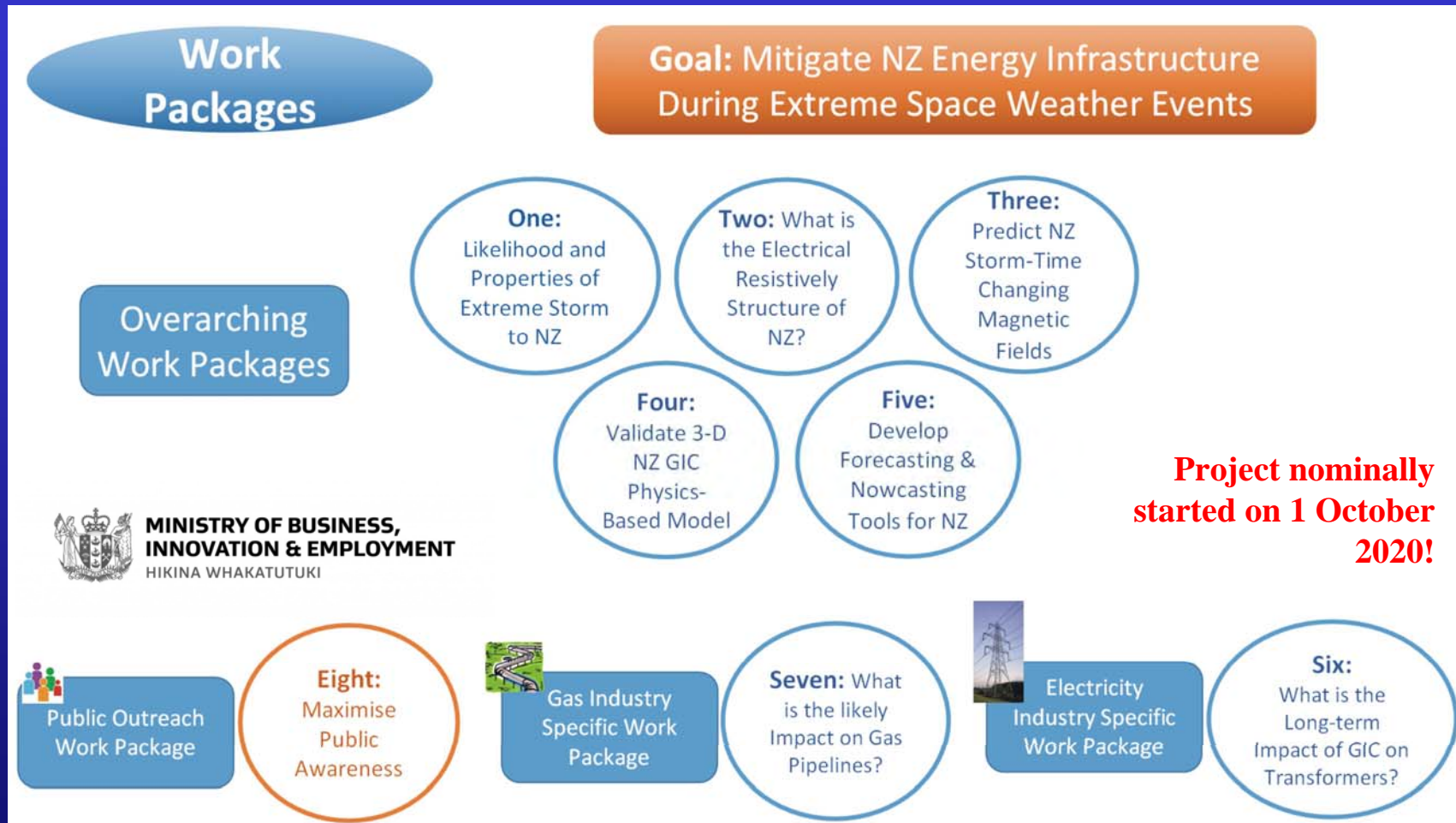
Some discussions did take place by zoom and email, rather than in person meetings. Some in person meetings took place in August once lockdown was lifted.

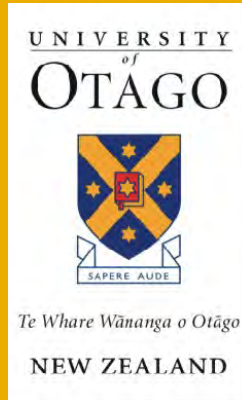


**TRANSPOWER**



# Solar Tsunamis New MBIE Endeavour Research Programme





# COVID impact on Space Weather Research



Daniel Mac Manus - validating GIC modelling in the New Zealand power grid. Looking at extreme storms (and mitigation).



Emily Gordon - looking at Antarctic atmospheric impacts (particularly upper stratospheric and mesospheric ozone) from radiation belt precipitation.



Sam Belcher - working with ground based VLF observations from Arctic location to test ground-based solar flare nowcasting and magnitude estimations.

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Craig Rodger gives a talk on Space Weather at "The Sunroom", a public art installation [20 June 2017].

*Thank you for listening*

*Can we do questions? Is there time?*