

Package ‘ssNZ’

10 December 2019

Title Catalogue of NZ Earthquake Events

Date 2019-12-10

Version 3.1-15

Author David Harte (package software), GeoNet (earthquake data)

Maintainer David Harte <d.s.harte@gmail.com>

Description Contains the NZ Catalogue of earthquake events. This version of the NZ catalogue contains GeoNet data as at 2019-12-10 00:00hr (UTC), with minor exclusions of non-seismic events, see function readNZ().

Depends R (>= 3.5.0), ssBase

Imports chron

RdMacros ssBase

License GPL (>=2)

LazyData yes

ZipData no

URL <http://www.statsresearch.co.nz/dsh/sslib/>

Additional_repositories <http://www.statsresearch.co.nz/dsh/sslib/r-repo>

NeedsCompilation no

R topics documented:

ssNZ-package	2
Change Log	3
NZ	5
readNZ	6
Wellington	6
Index	8

Description

The **ssNZ** package contains an R data object, named **NZ**, of the New Zealand Earthquake Catalogue compiled by GeoNet. This is the primary purpose of this package.

Details

The NZ catalogue contains earthquake events in the New Zealand region. Most events are contained within the region 35°S–50°S and 160°E–185°E. The catalogue becomes less complete for historical events and for smaller magnitude events at greater offshore distances. Further, the density of seismic stations over NZ varies, and parts of the country were monitored historically more intensely than other parts (see [Wellington](#)). Completeness issues have been discussed by Harte & Vere-Jones (1999).

Other functions in the package are for simply reading the downloaded data from GeoNet and transforming it into the required SSlib format, see [ssBase-package](#). They will generally not be required by the user. Additional details about the data object can be found in the topic [NZ](#).

Warning

*The CUSP software was used until the end of 2011 to determine the event solutions, and since then SeisComp3 has been used. There is a **serious discrepancy** between the magnitudes determined under CUSP compared to those determined under SeisComp3. For smaller events, SeisComp3 tends to allocate a smaller estimated magnitude than that of CUSP. Hence, when using a magnitude cut-off of 3 or 4, there will tend to be much fewer events since 2012 greater than the magnitude cut-off. See, for example, <http://www.statsresearch.co.nz/dsh/sslib/examples/taupo.pdf>, and <http://www.statsresearch.co.nz/dsh/sslib/?examples?nzseismicity> for other parts of NZ. This discrepancy can have serious effects on earthquake forecasts.*

Updating the Catalogue

The data in the package are updated as follows.

1. Data are downloaded from GeoNet (<http://www.geonet.org.nz>), as follows (\ means line continuation):

```
wget --retry-connrefused --tries=0 --waitretry=10 -O geonetdump.csv \
"http://wfs.geonet.org.nz/geonet/ows?service=WFS& \
version=1.0.0&request=GetFeature& \
typeName=geonet:quake_search_v1& \
outputFormat=csv"
```

2. Then R code is executed:

```
ssNZ:::readNZ("geonetdump.csv")

# write new rda file into package 'data' directory
save(NZ, file="NZ.rda", compress="xz")
```

References

Harte, D.S. & Vere-Jones, D. (1999). Differences in coverage between the PDE and New Zealand local earthquake catalogues. *NZ Journal of Geology and Geophysics* **42**(2), 237–253.
doi: [10.1080/00288306.1999.9514843](https://doi.org/10.1080/00288306.1999.9514843)

Change Log

Changes Made to the Package

Description

This page contains a list of recent changes made to the package.

Details

1. All current data since the beginning of 2012 downloaded from GeoNet. Prior to 2012, the catalogue contains data from the CUSP system; this is more complete for the Darfield event in September 2010. Data since the beginning of 2012 come from the Earthquake Web Services system. (23 Jul 2013)
2. Partial data update using data since the beginning of 2012 from the Earthquake Web Services system. (24 Jul 2013)
3. All current data downloaded from GeoNet (CUSP too). Prior to 2012, the catalogue contains data from the CUSP system; this is more complete for the Darfield event in September 2010. Data since the beginning of 2012 come from the Earthquake Web Services system. (18 Sep 2013)
4. All current data downloaded from GeoNet (CUSP too). Prior to 2012, the catalogue contains data from the CUSP system; this is more complete for the Darfield event in September 2010. Data since the beginning of 2012 come from the Earthquake Web Services system. (13 Jan 2014)
5. Make negative longitudes for events since 2012 positive (i.e. those from SeisComp3), that is, make between 0 and 360 degrees. (13 Jan 2014)
6. All current data since 2012-01-01 downloaded from GeoNet (SeisComp3). Note that data from SeisComp3 have some serious inconsistencies with data from the older CUSP system. (13 Jan 2014)
7. All current data since 2012-01-01 downloaded from GeoNet (SeisComp3). Note that data from SeisComp3 have some serious inconsistencies with data from the older CUSP system. (27 Feb 2014)
8. All current data since 2012-01-01 downloaded from GeoNet (SeisComp3). Note that data from SeisComp3 have some serious inconsistencies with data from the older CUSP system. (21 Mar 2014)
9. All current data since 2012-01-01 downloaded from GeoNet (SeisComp3). Note that data from SeisComp3 have some serious inconsistencies with data from the older CUSP system. Data up until 2012-01-01 come from the original CUSP system. (09 Jan 2015)

10. Catalogue updated. Data up until 2012-01-01 come from the original CUSP system. Due problems with the new SeisComp3 system, data from 2012-01-01 are as follows (\ means line continuation):

```
# download "reviewed" data for Jan - Apr 2012
wget --retry-connrefused --tries=0 --waitretry=10 -O geonetdump.csv \
    "http://wfs.geonet.org.nz/geonet/ows?
    service=WFS&version=1.0.0&request=GetFeature
    &typeName=geonet:quake_search_v1&outputFormat=csv
    &cql_filter=origintime>='2012-01-01'+AND+origintime<'2012-05-01'"

# download "beta" data for May 2012 - Apr 2013
wget --retry-connrefused --tries=0 --waitretry=10 -O geonetdump1.csv \
    "http://wfs-beta.geonet.org.nz/geoserver/geonet/ows?
    service=WFS&version=1.0.0&request=GetFeature
    &typeName=geonet:quake&outputFormat=csv
    &cql_filter=origintime>='2012-05-01'+AND+origintime<'2013-05-01'"

# download "reviewed" data from May 2013
wget --retry-connrefused --tries=0 --waitretry=10 -O geonetdump2.csv \
    "http://wfs.geonet.org.nz/geonet/ows?
    service=WFS&version=1.0.0&request=GetFeature
    &typeName=geonet:quake_search_v1&outputFormat=csv
    &cql_filter=origintime>='2013-05-01'"
```

(12 Jan 2015)

11. Catalogue updated. All data now in SeisComp3, downloaded as follows (\ means line continuation):

```
wget --retry-connrefused --tries=0 --waitretry=10 -O geonetdump.csv \
    "http://wfs.geonet.org.nz/geonet/ows?service=WFS& \
    version=1.0.0&request=GetFeature& \
    typeName=geonet:quake_search_v1& \
    outputFormat=csv"
```

(16 Nov 2015)

12. Change to format in GeoNet csv file. "Z" is appended to origintime to indicate that times are UTC. (30 Aug 2016)
13. joinNZ: function deleted, no longer required. (30 Aug 2017)
14. Updates to manual pages. (Aug & Sep 2017)
15. readNZ: changed to:

```
x <- x[(x$eventtype=="earthquake" | x$eventtype==" " |
        x$eventtype=="outside of network interest"),]
```

(26 Jul 2019)

Description

This page contains format details about the R dataset NZ. See [ssNZ-package](#) for background information.

Usage

NZ

Format

The catalogue is stored as a list object and has classes "catalogue" and "data.frame". It contains the catalogue required variables time, longitude, latitude, magnitude and depth; plus missing.time, see [ssBase-package](#) for further details. The NZ catalogue also contains the following additional variables.

publicid: GeoNet event ID.

magnitudetype: factor, type of magnitude for each event.

depthtype: factor, how depth was determined for each event.

evaluationstatus: factor, giving the solution status. It takes values NULL, "confirmed", "preliminary" and "reviewed".

Source

Data have been downloaded from the GeoNet website (<http://www.geonet.org.nz>), see [ssNZ-package](#) for further details.

See Also

[subsetcircle](#), [subsetpolygon](#), [subsetrect](#), [subsetsphere](#), [summary.catalogue](#)

Examples

```
# catalogue summary including events with missing date components
summary(NZ)
table(years1(NZ$time), months1(NZ$time))

# table of annual counts
table(years1(NZ$time))

# solution status by year
table(years1(NZ$time), NZ$evaluationstatus)
```

readNZ	<i>Read Catalogue CSV File</i>
--------	--------------------------------

Description

Reads the CSV file downloaded from GeoNet and creates a catalogue object called [NZ](#).

Usage

readNZ(filename)

Arguments

filename name of CSV file.

Value

catalogue object as in [NZ](#).

Wellington	<i>Wellington Catalogue</i>
------------	-----------------------------

Description

This page is of a historical nature and describes what was known as the Wellington Catalogue 20–30yrs ago.

Details

The New Zealand catalogue now contains all data from the Wellington local area network, which were previously contained in the Wellington Catalogue. See Examples below.

For 1978–1986, the events from this network were based on readings from film records, with a distance cut-off of 12 sec S-P time (i.e., a half sphere of about radius 108 km). For 1978–1982 all locatable events are included. For 1983–1986 a rough magnitude criterion was applied, so events of magnitude less than 2.3 were never analysed.

For 1987–1996 the events are from the CUSP analysis. All locatable events with epicentres within the box defined by 40.5°S–42.2°S and 173.6°E–176.0°E are included, irrespective of depth. Note that the magnitudes of the film events (1978–1986) have been adjusted to conform with the CUSP magnitudes.

If you want a more-or-less homogeneous and complete catalogue for the whole time period, you should reject events with a radial distance (i.e., including depth) of more than 100 km from the point (174.768°E, 41.286°S, 0.0 depth) or with a magnitude less than 2.3.

When the Wellington local area network began in 1975, there were 5 stations recording. The network was then expanded as follows:

1976: 7 stations (2 stations installed)
1977: 7 stations (1 new, 1 removed)
1978: 9 stations (2 new)
1979: 11 stations (2 new)
1980: 10 stations (1 removed)
1981-1985: 11 stations (1 new in 1981)
1986: 12 stations (Quartz Hill installed, but removed in 1987)
1987: 11 stations

Examples

```
# make the Wellington Catalogue
as.catalogue(subsetrect(NZ, minlat=-42.2, maxlat=-40.5,
                        minlong=173.6, maxlong=176.0, minday=julian(1,1,1978)),
             catname="Wellington")

summary(Wellington)
```

Index

*Topic **datasets**

NZ, [5](#)

*Topic **documentation**

Change Log, [3](#)

ssNZ-package, [2](#)

Wellington, [6](#)

*Topic **manip**

readNZ, [6](#)

Change Log, [3](#)

Changes (Change Log), [3](#)

NZ, [2](#), [5](#), [6](#)

readNZ, [6](#)

ssBase-package, [2](#), [5](#)

ssNZ-package, [2](#), [5](#)

subsetcircle, [5](#)

subsetpolygon, [5](#)

subsetrect, [5](#)

subsetsphere, [5](#)

summary.catalogue, [5](#)

Wellington, [2](#), [6](#)