

# Package ‘ocedata’

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**Version** 0.1.5

**Title** Oceanographic Data Sets for 'oce' Package

**Maintainer** Dan Kelley <Dan.Kelley@Dal.Ca>

**Depends** R (>= 2.15), methods, testthat

**Suggests** oce

**BugReports** <https://github.com/dankelley/ocedata/issues>

**Description** Several important and Oceanographic data sets are provided. These are particularly useful to the 'oce' package, but can also be helpful in a general context.

**License** GPL (>= 2)

**Encoding** UTF-8

**URL** <https://dankelley.github.io/ocedata>

**LazyLoad** yes

**LazyData** no

**RoxygenNote** 6.1.1

**NeedsCompilation** no

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**Repository** CRAN

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beaufort

*Beaufort scale relationship of wind speed to wave height*


---

## Description

A data frame containing wind, the wind speed in m/s, and height, the probable wave height in m, both as suggested in the Beaufort Scale.

## Usage

```
data(beaufort)
```

## Source

The data were downloaded from <https://www.metoffice.gov.uk/weather/marine/guide/beaufortscale.html> on April 20, 2014. Many other sources are also available.

## Examples

```
data(beaufort, package="ocedata")
plot(beaufort$wind, beaufort$height)
```

**Description**

This is a data frame holding hourly observations made between March 3 and April 18 of 2014, at the Environment Canada 3-metre discus buoy situated at (44.502N 63.403W) near Halifax Harbour. The contents are as follows; other items in the original data file are ignored.

time time of observation, in POSIXct format

wind wind speed in m/s

direction direction from which the wind is blowing, measured in degrees clockwise of true North.

gust gust speed in m/s

height wave height in metres

period wave period in seconds

pa atmospheric pressure in kPa

Ta air temperature in degC

Tw water temperature in degC

About two percent of the observation times are missing.

**Usage**

```
data(buoy)
```

**Source**

The data were downloaded as a file named 44258.txt in April 2014 from <http://www.ndbc.noaa.gov/data/realtime2/>, and made into a data frame. See [1] and [2] for information on the data in such buoys, and [3] for more on this particular buoy. The code to create the dataset is given below.

```
d <- read.table("44258.txt", stringsAsFactors=FALSE, skip=2)
t <- ISOdatetime(d[,1], d[,2], d[,3], d[,4], d[,5], 0, tz="UTC")
o <- order(t)
## missing data
d[d == "MM"] <- NA
## put oldest first
t <- t[o]
d <- d[o,]
direction <- as.numeric(d[,6])
wind <- as.numeric(d[,7])
gust <- as.numeric(d[,8])[o]
height <- as.numeric(d[,9])
period <- as.numeric(d[,10])
```

```
pa <- as.numeric(d[,13])
Ta <- as.numeric(d[,14])
Tw <- as.numeric(d[,15])
```

## References

1. <http://www.ndbc.noaa.gov/NDBCHandbookofAutomatedDataQualityControl2009.pdf>
2. <http://www.ndbc.noaa.gov/measdes.shtml>
3. [http://www.ndbc.noaa.gov/station\\_page.php?station=44258](http://www.ndbc.noaa.gov/station_page.php?station=44258)

## Examples

```
## Not run:
library(oce)
data(buoy, package="ocedata")
par(mfrow=c(3,1))
oce.plot.ts(buoy$time, buoy$wind, ylab="Wind Speed [m/s]")
oce.plot.ts(buoy$time, buoy$height, ylab="Wave height [m]")
oce.plot.ts(buoy$time, buoy$period, ylab="Wave period [s]")

## End(Not run)
```

---

coastlineWorldMedium *World coastlines at medium and fine-scale resolution*

---

## Description

World coastlines at medium and fine-scale resolution

## Usage

```
data(coastlineWorldMedium)
data(coastlineWorldFine)
```

## Details

These datasets are analogous to [coastlineWorld](#) in the `Oce` package, but they are of finer resolution; a comparison table follows.

- `coastlineWorld` is a coarse resolution 1:110M (with 10,696 points), suitable for world-scale plots plotted at a small size, e.g. inset diagrams
- `coastlineWorldMedium` resolution 1:50M (with 100,954 points), suitable for world- or basin-scale plots
- `coastlineWorldFine` resolution 1:10M (with 552,670 points), suitable for shelf-scale plots

## Author(s)

Dan Kelley

## Source

Downloaded from <http://www.naturalearthdata.com>, in files `ne_50m_admin_0_countries.shp` for `coastlineWorldMedium`, and `ne_10m_admin_0_countries.shp` for `coastlineWorldFine`.

## See Also

The documentation for `coastline`-class in the `Oce` package explains the structure of coastline objects and discusses functions that deal with them.

The `maps` package provides a database named `world` that has 27221 points, putting it intermediate between the `Oce` default and coarse versions.

---

conveyor

*Conveyor-belt path*

---

## Description

Locations that yield a spline that roughly matches Broecker's conveyor-belt path.

## Usage

```
data(conveyor)
```

## Source

The data were digitized from Figure 1 of Broecker (1991), by a multistep process. First, a world map was drawn with `mapPlot` from the `oce` package, using a projection (Mercator) that seemed similar to Broecker's. Second, `locator` was used to digitize points along his conveyor-belt pathlines. No projection information being provided by Broecker, this had to be done by coastline reference. Third, the x-y data were converted to lon-lat space using `map2lonlat()` in the `oce` package. When this was done, splines were fitted to the data and the resultant paths were drawn on the map (using code like that given in the example). Then, some adjustments were made to the data files, to get the splines to more faithfully represent the paths on Broecker's diagram.

## References

Broecker, W. S., 1991. The great ocean conveyor. *Oceanography*, 4: 79-89.

## Examples

```
## Not run:
library(oce)
data(coastlineWorld)
par(mar=rep(1,4))
mapPlot(coastlineCut(coastlineWorld,70), projection="+proj=wintri +lon_0=70")
data(conveyor, package="ocedata")
## Main path
lon <- subset(conveyor, path==1)$longitude
lat <- subset(conveyor, path==1)$latitude
```

```

mapLines(lon, lat, col="blue", lwd=3)
## Secondary path (in Indian Ocean)
lon <- subset(conveyor, path==2)$longitude
lat <- subset(conveyor, path==2)$latitude
mapLines(lon, lat, col="darkgreen", lwd=3)

## End(Not run)

```

---

drag

*Wind drag coefficient*


---

### Description

Wind drag coefficients for wind-profile and eddy-covariance methods, summarized in Figure 3 of Garratt (1977). The data are stored in a data frame with four columns: U is wind speed in m/s; Cd is for (neutral) drag coefficient; n is the number of data measurements represented by the value; and method is a factor with two levels: profile and eddy, for two methods of inferring Cd.

### Usage

```
data(drag)
```

### Source

Data digitized from Figure 3 of Garratt (1977) by Dan Kelley.

### References

J. R. Garratt, 1977. Review of drag coefficients over oceans and continents. *Monthly Weather Review*, 105:915-927.

### Examples

```

## Not run:
library(ocedata)
data(drag)
par(mar=c(3,3,1,1), mgp=c(2, 0.7, 0))
plot(drag$U, drag$Cd, pch=ifelse(drag$method == "profile", 1, 19),
     xlab="U [m/s]", ylab=expression(C[D]),
     xlim=c(0, 22), ylim=c(0, 3e-3))
legend("topleft", pch=c(1,19), legend=c("profile method", "eddy covariance method"))

## End(Not run)

```

---

`endeavour`*Cook's Endeavour cruise track*

---

**Description**

Time, longitude, and latitude for the H.M.S. Endeavour cruise, 1768-1771

**Usage**

```
data(endeavour)
```

**Source**

The data were extracted from an XML file contained within a zipfile provided at the Australian government website <https://www.data.gov.au/dataset/7f03ac78-7210-4702-8cd5-f3e373f4097b>, last checked 2015 Feb 5.

**Examples**

```
## Not run:
library(oce)
data(coastlineWorld)
data(endeavour, package="ocedata")
mapPlot(coastlineWorld, type='l', proj='+proj=moll', fill='lightgray')
mapPoints(endeavour$longitude, endeavour$latitude, pch=20, cex=2/3, col='red')

## End(Not run)
```

---

`geosecs235`*GEOSECS station 235 data*

---

**Description**

GEOSECS station 235 data

**Usage**

```
data(geosecs235)
```

**Source**

Data from <https://iridl.ldeo.columbia.edu/SOURCES/.GEOSECS/ISTA/235/VALUE/data.cdf>, a netCDF file.

## References

D. E. Kelley and Van Scoy, K. A., 1999. A basin-wide estimate of vertical mixing in the upper pycnocline: spreading of bomb tritium in the North Pacific Ocean. *Journal of Physical Oceanography*, 29:1759–1771.

## Examples

```
## Not run:
library(oce)
data(geosecs235, package="ocedata")
## Similar to Figure 10 of Kelley and Van Scoy (1999)
plotProfile(geosecs235, xtype="tritium", type='p', ylim=c(600, 0))

## End(Not run)
```

---

giss

*Time series of NASA/GISS land-ocean temperature index*

---

## Description

A data frame containing the Goddard Institute for Space Studies (GISS) time series called LOTI (Land-Ocean Temperature Index) of surface temperature anomaly.

## Usage

```
data(giss)
```

## Details

This is data frame with columns named year for decimal year (sampled monthly and represented here at mid-month, i.e. the first sample in any given year is at year+1/24) and index for the temperature anomaly. The resolution of the latter is 0.01C. The details of the original data processing are provided in [1] and [2], and the site of the (Land-Ocean Temperature Index). Anyone using the present dataset is advised very strongly to read the NASA documents on changes to the processing of the data [3].

## Source

The data were downloaded from [1], yielding a text file that starts as in shown below. These data were then read with R code [5] that skips the headers, chops out the annual means and then assigns columns to year fractions, e.g. the first two numbers in the data shown below are -29 and -20, yielding values -0.29degC and -0.20degC, and times are here represented as 1880+1/24 and 1880+3/24, i.e. 1880.042 and 1880.125.

GLOBAL Land-Ocean Temperature Index in 0.01 degrees Celsius base period: 1951-1980

sources: GHCN-v3 1880-11/2015 + SST: ERSST v4 1880-11/2015  
using elimination of outliers and homogeneity adjustment



Notes: 1950 DJF = Dec 1949 - Feb 1950 ; \*\*\*\*\* = missing

Year													AnnMean					Year	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA		SON
1880	-29	-20	-18	-27	-14	-28	-22	-7	-16	-15	-18	-20	-19	***	*****	-19	-19	-16	1880
1881	-9	-13	2	-2	-4	-28	-5	-2	-8	-19	-25	-14	-11	-11	-14	-1	-12	-17	1881
1882	10	9	2	-19	-17	-24	-9	4	0	-22	-20	-24	-9	-8	1	-11	-10	-14	1882

## References

Note: the URLs given were last checked on February 2, 2018.

1. Web location of the raw LOTI data: [https://data.giss.nasa.gov/gistemp/taledata\\_v3/GLB.Ts+dSST.txt](https://data.giss.nasa.gov/gistemp/taledata_v3/GLB.Ts+dSST.txt)
2. GISTEMP Team, 2015: GISS Surface Temperature Analysis (GISTEMP). NASA Goddard Institute for Space Studies. <http://data.giss.nasa.gov/gistemp/>
3. J. Hansen, R. Ruedy, M. Sato and K. Lo, 2010. Global surface temperature change. *Rev. Geophys.*, 48, RG4004. <http://pubs.giss.nasa.gov/abs/ha00510u.html>
4. Updates to analysis: [https://data.giss.nasa.gov/gistemp/updates\\_v3](https://data.giss.nasa.gov/gistemp/updates_v3)
5. R code to convert from NASA format to the format stored here [https://github.com/dankelley/ocedata/blob/master/create\\_data/giss/create\\_giss.R](https://github.com/dankelley/ocedata/blob/master/create_data/giss/create_giss.R)

---

gs

*Gulf Stream position*

---

## Description

Monthly latitude and longitude of Gulf Stream position, averaged from 1973 to 1992, according to Drinkwater et al. 1994 (page 103), in the form of a list containing month, the numbers 1 through 12, longitude, the longitudes in degrees east, and latitude, a matrix of latitudes, with columns for months and rows for longitudes. The data were entered by hand by Dan Kelley, and may suffer errors resulting from typos and inaccurate reading of occasionally blurry digits.

## Usage

data(gs)

## Source

Department of Fisheries and Oceans online library at <http://www.dfo-mpo.gc.ca/Library/166053.pdf>

## References

K. F. Drinkwater, R. A. Myers, R. G. Pettipas and T. L. Wright, 1994. Climatic data for the north-west Atlantic: the position of the shelf/slope front and the northern boundary of the Gulf Stream between 50W and 75W, 1973-1992. Canadian Data Report of Fisheries and Ocean Sciences 125. Department of Fisheries and Oceans, Canada.

## Examples

```
## Not run:
library(oce)
data(gs, package="ocedata")
data(coastlineWorldMedium, package="ocedata")
plot(coastlineWorldMedium,
      clon=mean(gs$longitude), clat=mean(gs$latitude), span=3200)
data(topoWorld)
contour(topoWorld[["longitude"]]-360,
        topoWorld[["latitude"]], -topoWorld[["z"]],
        level=1000*(1:5), col='brown', add=TRUE)
for (i in gs$month)
  lines(gs$longitude, gs$latitude[,i], col='blue')

## End(Not run)
```

---

levitus

*Annually-averaged sea-surface temperature and salinity*


---

## Description

Sea-surface temperature and salinity from the 2013 version of the World Ocean Atlas (WOA), commonly referred to as the “Levitus” atlas, in the form of a list containing longitude, latitude, and sea-surface salinity SSS and temperature SST.

## Usage

```
data(levitus)
```

## Details

The levitus dataset was constructed from the World Ocean Atlas as of 2013, downloaded from the link given in “Source”. The data were read with **ncdf4**, and the top layer of temperature and salinity were selected. Then longitude was shifted from (0,360) notation to the (-180,180) notation used by **oce**.

## Author(s)

The atlas was constructed by NOAA personnel [1, 2, 3]. The salinity and temperature fields at the surface level were extracted and packaged for ocedata by Dan Kelley.

## Source

The following URLs sometimes fail, despite being linked-to by the NOAA "threads" server.

1. [https://data.nodc.noaa.gov/thredds/fileServer/woa/WOA13/DATA/temperature/netcdf/decav/1.00/woa13\\_](https://data.nodc.noaa.gov/thredds/fileServer/woa/WOA13/DATA/temperature/netcdf/decav/1.00/woa13_)
2. [https://data.nodc.noaa.gov/thredds/fileServer/woa/WOA13/DATA/salinity/netcdf/decav/1.00/woa13\\_dec](https://data.nodc.noaa.gov/thredds/fileServer/woa/WOA13/DATA/salinity/netcdf/decav/1.00/woa13_dec)

## References

- [1] <https://www.nodc.noaa.gov/OC5/woa13/>
- [2] Locarnini, R. A., A. V. Mishonov, J. I. Antonov, T. P. Boyer, H. E. Garcia, O. K. Baranova, M. M. Zweng, C. R. Paver, J. R. Reagan, D. R. Johnson, M. Hamilton, and D. Seidov, 2013. World Ocean Atlas 2013, Volume 1: Temperature. S. Levitus, Ed., A. Mishonov Technical Ed.; NOAA Atlas NESDIS 73, 40 pp.
- [3] Zweng, M.M, J.R. Reagan, J.I. Antonov, R.A. Locarnini, A.V. Mishonov, T.P. Boyer, H.E. Garcia, O.K. Baranova, D.R. Johnson, D.Seidov, M.M. Biddle, 2013. World Ocean Atlas 2013, Volume 2: Salinity. S. Levitus, Ed., A. Mishonov Technical Ed.; NOAA Atlas NESDIS 74, 39 pp.

## Examples

```
## Not run:
library(oce)
data(levitus, package="oceans")
attach(levitus)
par(mfrow=c(2,1))
imagep(longitude, latitude, SST, col=oceanColorsJet, zlim=c(-2, 30))
imagep(longitude, latitude, SSS, col=oceanColorsJet, zlim=c(20, 40))

## End(Not run)
```

---

munk

*Munk's (1966) temperature profile*

---

## Description

Temperature profile digitized from the left-hand panel of Munk's Figure 1.

## Usage

```
data(munk)
```

## References

Walter H. Munk, 1966. Abyssal recipes. Deep-Sea Research, 13, 707-730.

## Examples

```
## Not run:
library(oceans)
data(munk)
plot(munk$temperature, munk$depth,
      ylim=rev(range(munk$depth)), xlab="Temperature [degC]", ylab="Depth [km]")

## End(Not run)
```

---

nao                                      *North Atlantic Oscillation Index*

---

**Description**

This is the North Oscillation Index, downloaded in May 2014 and processed as follows.

```
d <- scan("https://www.cpc.ncep.noaa.gov/products/precip/CWlink/pna/norm.nao.monthly.b5001.current.ascii.table")
isYear <- d > 1900
index <- d[!isYear]
year <- 1/24 + seq(d[isYear][1], by=1/12, length.out=length(index))
nao <- data.frame(year=year, index=index)
```

**Usage**

```
data(nao)
```

**Author(s)**

Dan Kelley

**Source**

<http://www.cpc.ncep.noaa.gov/products/precip/CWlink/pna/norm.nao.monthly.b5001.current.ascii.table>

---

oceans                                      *Geometries of the five world oceans.*

---

**Description**

Surface areas, average depths, and maximum depths for five world oceans, calculated from the ETOPO-1 dataset. Area is in square metres (converted from square kilometres on the NOAA site), and depths are in metres.

**Usage**

```
data(oceans)
```

**Source**

Data were downloaded from the NOAA website [https://ngdc.noaa.gov/mgg/global/etopo1\\_ocean\\_volumes.html](https://ngdc.noaa.gov/mgg/global/etopo1_ocean_volumes.html) in October 2012.

## References

Amante, C. and B. W. Eakins, ETOPO1 1 Arc-Minute Global Relief Model: Procedures, Data Sources and Analysis. NOAA Technical Memorandum NESDIS NGDC-24, 19 pp, March 2009.

## Examples

```
## Not run:
library(oce)
data(oceans, package="ocedata")
dotchart(oceans$Area, rownames(oceans), main="Surface Area [m^2]",
         xlim=c(0, max(oceans$Area)))

## End(Not run)
```

---

ocedata	<i>Datasets for the oce package</i>
---------	-------------------------------------

---

## Description

Provides datasets for use in oceanographic analysis.

## Details

Some commonly-used oceanographic datasets are too large to be stored within an analysis package such as oce, or are of sufficient general interest to merit inclusion in a separate package. Such datasets are provided here, for use by Oceanographers using the oce package or other more general packages.

---

papa	<i>OWS Papa hydrographic record during 2010</i>
------	---

---

## Description

This dataset holds the temperature and salinity measured at Ocean Weather Station Papa (50N, 145W) in the year 2010. Time and vertical coordinate are in vectors `papa$t` and `papa$z`, while temperature, salinity and  $\sigma_\theta$  are in the matrices `papa$temperature`, `papa$salinity` and `papa$sigmaTheta`. This is an excerpt from a larger dataset that spans 2007-06-08 to 2012-10-24, and it has been trimmed to just those `z` values that are common to the larger dataset, namely -1, -10, -20, -45, -80, -100, -120, -150, and -200m. Time is sampled daily, from 2011-01-01 12:00:00 to 2011-12-31 12:00:00 UTC.

## Usage

```
data(papa)
```

## Source

Salinity was inferred from [https://www.pmel.noaa.gov/stnP/data/daily/s50n145w\\_dy.ascii](https://www.pmel.noaa.gov/stnP/data/daily/s50n145w_dy.ascii) and temperature from [https://www.pmel.noaa.gov/stnP/data/daily/t50n145w\\_dy.ascii](https://www.pmel.noaa.gov/stnP/data/daily/t50n145w_dy.ascii), as downloaded in early 2015; PMEL changed its website subsequent to that date, and as of early 2016 there seems to be no way to link directly to the data; instead, one must use a graphical interface provided at <https://www.pmel.noaa.gov/ocs/data/disdell/>, which includes filling out a form identifying the user and purpose.

Although there is a data file for  $\sigma_\theta$  on the NOAA website, here it was calculated with `swSigmaTheta` in the `Oce` package.

## References

The larger data set is described at <http://www.pmel.noaa.gov/stnP/>

## Examples

```
## Not run:
library(oce)
data(papa, package="ocedata")

par(mfrow=c(3,1))
## Page 1: images
imagep(papa$t, papa$z, papa$temperature, col=oceColorsJet, filledContour=TRUE)
imagep(papa$t, papa$z, papa$salinity, col=oceColorsJet, filledContour=TRUE)
imagep(papa$t, papa$z, papa$sigmaTheta, col=oceColorsJet, filledContour=TRUE)
## Page 2: lineplots
xlim <- c(min(papa$t)-3*28*86400, max(papa$t)) # extra for legend
plot(papa$t, papa$temperature[,1], type='l', xlim=xlim,
     xlab="", ylab="Temperature", ylim=range(papa$temperature))
for (i in 2:dim(papa$temperature)[2])
  lines(papa$t, papa$temperature[,i], col=i, lwd=2)
legend("topleft", title="z [m]", lwd=2, legend=papa$z, col=1:length(papa$z), bg="white")
plot(papa$t, papa$salinity[,1], type='l', xlim=xlim,
     xlab="", ylab="Salinity", ylim=range(papa$salinity), lwd=2)
for (i in 2:dim(papa$salinity)[2])
  lines(papa$t, papa$salinity[,i], col=i, lwd=2)
legend("topleft", title="z [m]", lwd=2, legend=papa$z, col=1:length(papa$z), bg="white")
plot(papa$t, papa$sigmaTheta[,1], type='l', xlim=xlim,
     xlab="", ylab=expression(sigma[theta]), ylim=range(papa$sigmaTheta), lwd=2)
for (i in 2:dim(papa$sigmaTheta)[2])
  lines(papa$t, papa$sigmaTheta[,i], col=i, lwd=2)
legend("topleft", title="z [m]", lwd=2, legend=papa$z, col=1:length(papa$z), bg="white")

## End(Not run)
```

**Description**

Data digitized from Redfield's (1934) Figure 3, showing  $\text{NO}_3$  dependence on total  $\text{CO}_2$ .

**Usage**

```
data(redfieldNC)
```

**Source**

Data digitized by Dan Kelley from a scanned copy of Redfield (1934).

**References**

Alfred C. Redfield, 1934. On the proportions of organic derivations in sea water and their relation to the composition of plankton. Pages 177–192 in James Johnstone Memorial Volume, University Press of Liverpool.

**See Also**

See [redfieldNP](#) and [redfieldPlankton](#).

**Examples**

```
## Not run:
library(oce)
data(redfieldNC, package="ocedata")
plot(redfieldNC$CO2, redfieldNC$NO3, xlab=expression(CO[2]), ylab=expression(NO[3]))
slope <- 1/7
abline(-275.5, slope, lwd=3)
abline(-288.5, slope, lwd=3)

## End(Not run)
```

---

redfieldNP

*Redfield's (1934)  $\text{NO}_3$  and  $\text{PO}_4$  data*

---

**Description**

Data digitized from Redfield's (1934) Figure 1, showing  $\text{NO}_3$  dependence on  $\text{PO}_4$ . This dataset is used in Chapter 4 of [1].

**Usage**

```
data(redfieldNP)
```

**Source**

Data digitized by Dan Kelley from a scanned copy of Redfield's (1934) Figure 1, showing the dependence of  $\text{NO}_3$  on  $\text{PO}_4$ .

**References**

Dan Kelley, in preparation. Oceanographic Analysis with R. Springer Verlag.

Alfred C. Redfield, 1934. On the proportions of organic derivations in sea water and their relation to the composition of plankton. Pages 177–192 in James Johnstone Memorial Volume, University Press of Liverpool.

**See Also**

See [redfieldNC](#) and [redfieldPlankton](#).

**Examples**

```
## Not run:
data(redfieldNP, package="ocedata")
plot(redfieldNP$P04, redfieldNP$N03, xlab=expression(P0[4]), ylab=expression(N0[3]))
abline(0, 20, lwd=3)           # line N:P = 20:1, as shown by Redfield

## End(Not run)
```

---

redfieldPlankton      *Redfield's (1934) Table II*

---

**Description**

Contents of Redfield's (1934) Table II, containing columns for sampled species, carbon content by weight (normalized to 100), Nitrogen content by weight, and Phosphorus content by weight. This dataset is used in Chapter 4 of [1].

**Usage**

```
data(redfieldPlankton)
```

**Source**

Data entered verbatim (sans italics for species name) by Dan Kelley from [2] Table II.

**References**

1. Dan Kelley, in preparation. Oceanographic Analysis with R. Springer Verlag.
2. Alfred C. Redfield, 1934. On the proportions of organic derivations in sea water and their relation to the composition of plankton. Pages 177–192 in James Johnstone Memorial Volume, University Press of Liverpool.

**See Also**

See [redfieldNP](#) and [redfieldNC](#).



**Examples**

```
## Not run:
library(ocedata)
data(redfieldPlankton)
par(mfrow=c(1,2))
boxplot(redfieldPlankton$Nitrogen)
abline(h=16.7, col='gray')
boxplot(redfieldPlankton$Phosphorus)
abline(h=1.85, col='gray')

## End(Not run)
```

riley

*Riley's (1946) observation and theory of phytoplankton concentration***Description**

Riley's (1946) observation and theory of phytoplankton concentration. The list `riley` contains three entries.

- `riley$fig21points` is a data frame representing the data shown in Riley's Figure 21. Resulting from digitization of his graph, this is a list containing day (day in year) and P (phytoplankton concentration, in grams of Carbon per square meter).
- `riley$fig21curve` is a data frame with columns named day and P, containing a digitized trace of the curve with which Riley illustrates his numerical solution of the differential equations for phytoplankton growth.
- `DEparameters` is a list containing data about twice per month, in elements day for the day of the year, Ph for phytoplankton growth rate, R for phytoplankton respiration rate, and G for the rate at which zooplankton graze on phytoplankton. The rates are in inverse days.

This is used in Chapter 4 of [1].

**Usage**

```
data(riley)
```

**Source**

`riley$fig21points` is based on manual manual digitization of Riley's Figure 21. `riley$fig21curve` are based on manual digitization of Riley's theoretical curve in the same figure, fitted to a spline with [splinefun](#), which yields a function that can be used to predict at any time. `riley$DEparameters` was transcribed from Riley's appendix.

**References**

1. Dan Kelley, in preparation. Oceanographic Analysis with R. Springer Verlag.
2. Gordon A. Riley, 1946. Factors controlling phytoplankton populations on Georges Bank. Journal of Marine Research, 6(1): 54-73.

**Examples**

```
## Not run:
data(riley, package="oce")
plot(riley$fig21points$day, riley$fig21points$P, xlab="Day of Year", ylab="Phytoplankton [gC/m^2]")
lines(riley$fig21curve$day, riley$fig21curve$P)

## End(Not run)
```

---

RRprofile

*Seawater profile used by Reiniger and Ross (1968)*


---

**Description**

This is the hydrographic profile used by Reiniger and Ross (1968) to illustrate the use of their method for interpolating oceanographic data.

**Usage**

```
data(RRprofile)
```

**Source**

Table 2 of Reiniger and Ross (1968).

**References**

R.F. Reiniger and C.K. Ross, 1968. A method of interpolation with application to oceanographic data. *Deep Sea Research*, **15**, 185-193.

**Examples**

```
## Not run:
library(oce)
data(RRprofile, package="oce")
par(mgp=getOption('oceMgp'))
par(mar=c(3,3,1,1))
ctd <- as.ctd(RRprofile$salinity, RRprofile$temperature, RRprofile$depth)
plot(ctd)
zz <- seq(0,2000,5)
plot(RRprofile$temperature, RRprofile$depth, ylim=c(500,0), xlim=c(2,11),
     xlab="Temperature", ylab="Depth [m]")
TT <- oceApprox(RRprofile$depth, RRprofile$temperature, zz)
lines(TT, zz)
a <- approx(RRprofile$depth, RRprofile$temperature, zz)
lines(a$y, zz, col='red')
s <- smooth.spline(RRprofile$depth, RRprofile$temperature)
lines(predict(s, zz)$y, zz, col='blue')
legend("topright", lwd=1, col=c("black", "red", "blue"),
     legend=c("oceApprox", "approx", "smooth.spline"), cex=2/3)
```

```
## End(Not run)
```

---

```
schmitt
```

```
Schmitt's (1981) NACW temperature-salinity data
```

---

**Description**

Schmitt's (1981) temperature-salinity data for North Atlantic Central Water.

**Usage**

```
data(schmitt)
```

**Source**

Data were digitized from Schmitt's Figure 1, to a tolerance of about half the symbol size in that diagram. Schmitt reported the original data source as a cruise of the vessel T. G. Thompson in 1970, and a location of 25.2N and 35.8W.

**References**

R. W. Schmitt, 1981. Form of the temperature-salinity relationship in central water: evidence for double-diffusive mixing. *Journal of Physical Oceanography*, 11:1015-1026.

**Examples**

```
## Not run:  
library(oce)  
data(schmitt, package="ocedata")  
plotTS(as.ctd(schmitt$S, schmitt$theta, 0))  
  
## End(Not run)
```

---

```
secchi
```

```
Secchi depth dataset
```

---

**Description**

Measurements of Secchi depth in the North and Baltic Seas

**Usage**

```
data(secchi)
```

## Source

The data were downloaded as a file named `Secchi-Ships.csv` in October 2013 from <https://ocean.ices.dk/Project/SECCHI/>, and made into a data frame with new variable names, for use in R. See references for more on the data.

## References

Thorkild Aarup 2002, Transparency of the North Sea and Baltic Sea—a Secchi Depth data mining study, *Oceanologia*, 44(3), 323-337.

## Examples

```
## Not run:
library(oce)
data(secchi, package="ocedata")
mapPlot(coastlineWorld, longitudelim=c(-5, 20), latitudelim=c(50, 66),
        grid=5, fill='gray', proj="lambert",
        parameters=c(lat0=50, lat1=65))
col <- rev(oceColorsJet(100))[rescale(secchi$depth, xlow=0, xhigh=20, rlow=1, rhigh=100)]
mapPoints(secchi$longitude, secchi$latitude, pch=20, cex=1, col=col)
mapPolygon(coastlineWorld, col='gray')

## End(Not run)
```

---

 soi

*Southern Oscillation Index*


---

## Description

A data frame containing the Southern Oscillation Index with columns named `year` for decimal year (sampled monthly and represented at mid-month) and `index` for the index.

## Usage

```
data(soi)
```

## Details

The data were downloaded from [1] and processed with the following

```
library(ncdf4)
url <- "https://www.cgd.ucar.edu/cas/catalog/climind/SOI.nc"
download.file(url, "SOI.nc")
f <- nc_open("SOI.nc")
year <- as.vector(ncvar_get(f, "TIME"))
index <- as.vector(ncvar_get(f, "SOI_SIGNAL"))
ok <- is.finite(index)
year <- year[ok]
```

```
index <- index[ok]
soi <- data.frame(year=year, index=index)
```

### Author(s)

Dan Kelley

### Source

1. The source data were downloaded as <http://www.cgd.ucar.edu/cas/catalog/limind/SOI.nc> on August 11, 2017.

### Examples

```
data(soi, package="ocedata")
recent <- subset(soi, year > 1950)
plot(recent$year, recent$index, type='l', xlab="Year", ylab="SOI")
```

---

topo2

*World topography data, on a 2-degree grid.*

---

### Description

A matrix containing world topography data, on a 2-degree grid. This is provided for occasions where the higher resolution topography in [topoWorld](#) is not needed. See “Examples” for a plot that illustrates the longitude and latitude grid for the data.

### Usage

```
data(topo2)
```

### Source

The data are calculated by applying [decimate](#) to the `topoWorld` dataset from the `oce` package, followed by extraction of the “z” value.

### Examples

```
## Not run:
# Compare with topoWorld in oce
library("oce")
data(topoWorld, package="oce")
w <- topoWorld
contour(w[["longitude"]], w[["latitude"]], w[["z"]], level=0, drawlabels=FALSE)
data(topo2, package="ocedata")
lon <- seq(-179.5, 178.5, by=2)
lat <- seq(-89.5, 88.5, by=2)
contour(lon, lat, topo2, level=0, add=TRUE, col='red', lty='dotted', drawlabels=FALSE)

## End(Not run)
```

---

turbulence	<i>Grant et al. (1962) turbulence data</i>
------------	--

---

### Description

Turbulence spectrum  $\phi$ , as a function of wavenumber  $k$  for a run starting at 0905h on October 3, 1959, with data in their Appendix 1 and graph in their Figure 9 and Appendix 1. The units are c.g.s., that is  $k$  is in  $cm^{-2}$  and  $\phi$  is in  $cm^3/s^2$ .

### Usage

```
data(turbulence)
```

### References

H. L. Grant and R. W. Stewart and A. Moilliet, 1962. Turbulence spectra from a tidal channel. *Journal of Fluid Mechanics*, 12(2): 241-268.

### Examples

```
## Not run:
## Recreate Fig 9 of Grant et al. (1962), with intercept
## chosen to mimic the published figure
data(turbulence, package="ocedata")
plot(log10(turbulence$k), log10(turbulence$phi),
      xlab=expression(log[10]*k), ylab=expression(log[10]*phi), pch=20)
grid()
power <- -5/3
intercept <- -0.3
abline(intercept, power)

## End(Not run)
```

---

wilson	<i>Wilson's (1963) table of seafloor spreading</i>
--------	--

---

### Description

Wilson's (1963) table of seafloor spreading.

### Usage

```
data(wilson)
```

### Source

Data transcribed from Wilson's (1963) Table 1, taking only the first 3 columns, and only those rows for which Wilson reported an estimate of spreading rate.

## References

J. Tuzo Wilson, 1963. Evidence from islands on the spreading of ocean floors. *Nature*, 197(4867):536-538. //dx.doi.org/10.1038/197536a0

## Examples

```
## Not run:
data(wilson, package="ocedata")
plot(wilson$Age, wilson$Distance, xlab="Age [My]", ylab="Distance [km]",
      xlim=c(125,0), ylim=c(0,4000))
abline(0,4000/125)
m <- lm(Distance~Age-1, data=wilson)
## Wilson reports in cm/year; 1cm/y = 1km/1My * 1e5 / 1e6
spreadingRate <- as.numeric(coef(m)) / 10
print(spreadingRate)
abline(m, col='red')

## End(Not run)
```

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