

This readme.txt file was generated on 20170515 by Kevin Befus

GENERAL INFORMATION

1. Supplemental data for "The rapid yet uneven turnover of Earth's groundwater"

2. Author Information

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3. Date of data: 2017

4. Geographic location of data: Global

5. Information about funding sources that supported the creation of the data:

Befus: NSF (EPS-1208909)

SHARING/ACCESS INFORMATION

1. Licenses/restrictions placed on the data: None. The authors request that the source article be cited when using these data.

2. Links to publications that cite or use the data:

Befus, K.M., S. Jasechko, E. Luijendijk, T. Gleeson, and M.B. Cardenas (2017), The rapid yet uneven turnover of Earth's groundwater, *Geophysical Research Letters*, doi: 10.1002/2017GL073322.

3. Links to other publicly accessible locations of the data:

4. Links/relationships to ancillary data sets:

HydroSHEDs: <http://www.hydrosheds.org/>
Recharge after Doll and Fiedler (2008): <http://www.hydrol-earth-syst-sci.net/12/863/2008/>
Recharge after de Graaf et al. (2015): <http://www.hydrol-earth-syst-sci.net/19/823/2015/>
Global near surface porosity data after Gleeson et al. (2014): <http://dx.doi.org/10.1002/2014GL059856>
Porosity-depth relationships after Gleeson et al. (2015):
<http://www.nature.com/doi/10.1038/ngeo2590>
Global climate model TraCE-21ka by Feng (2011): <http://www.cgd.ucar.edu/ccr/TraCE/>

5. Was data derived from another source? As indicated in article
If yes, list source(s):

6. Recommended citation for the data:

Befus, K.M., S. Jasechko, E. Luijendijk, T. Gleeson, and M.B. Cardenas (2017), The rapid yet uneven turnover of Earth's groundwater, *Geophysical Research Letters*, doi: 10.1002/2017GL073322.

DATA & FILE OVERVIEW

1. File List

A. Filename: GWturnover_spatial_data.csv
Short description:

The spatial data used to run the water budget model and the results plotted in Figure 2a-b in the main text. Each row represents the data for one HydroSHEDs catchment. See Data-Specific Information section below for explanation of columns.

These data can be joined to HydroSHEDs polygonal data (i.e., shapefiles) by joining/relating the HYBAS_ID column in this data set with the column of the same name in the HydroSHEDs level 00 or 12 shapefiles, available at the continental level.

B. Filename: Nporevols_hist2d_degraaf_rchg_vol_avg.nc

Nporevols_hist2d_degraaf_rchg_vol_max.nc
Nporevols_hist2d_degraaf_rchg_vol_min.nc
Nporevols_hist2d_doll_rchg_vol_avg.nc
Nporevols_hist2d_doll_rchg_vol_max.nc
Nporevols_hist2d_doll_rchg_vol_min.nc

Short description:

These data show the two-dimensional histogram of the time series of cumulative groundwater turnover (Nturnover) for all studied catchments. The data for the best volume estimate (vol_avg) using recharge after de Graaf et al. (2015), Nporevols_hist2d_degraaf_rchg_vol_avg.nc, were the data used to construct Figure 3a in the main text.

The filename convention is as follows: Nporevols_hist2d_RechargeSource_rchg_vol_VolumeType.nc where RechargeSource is either degraaf (for deGraaf et al 2015) or doll (for Doll and Fiedler 2008) and VolumeType is min (low groundwater volume estimate), avg (best groundwater volume estimate), or max (high groundwater volume estimate).

C. Filename: readme.txt

Short description: This readme file.

2. Relationship between files:

GWturnover_spatial_data.csv contains the input data and outputs for the present-day from the model while the .nc files contain globally-assimilated information on the time-dependent results.

3. Additional related data collected that was not included in the current data package:

The TraCE-21ka precipitation data used to alter current Recharge (Rcurrent) and construct Figure 1 in the main text can be downloaded from <http://www.cgd.ucar.edu/ccr/TraCE/> . These gridded data can then be assigned to the HydroSHEDs catchments using catchment centroids.

4. Are there multiple versions of the dataset? no

If yes, list versions:

Name of file that was updated:

i. Why was the file updated?

ii. When was the file updated?

Name of file that was updated:

i. Why was the file updated?

ii. When was the file updated?

METHODOLOGICAL INFORMATION

1. Description of methods used for collection/generation of data:
Please refer to the main text and supplemental information document for details on the analysis methods.
2. Methods for processing the data:
Please refer to the main text and supplemental information document for details on the analysis methods.
3. Instrument- or software-specific information needed to interpret the data:
The data were analyzed and model was run using Python 2.7
4. Standards and calibration information, if appropriate: None
5. Environmental/experimental conditions: None
6. Describe any quality-assurance procedures performed on the data: No specific tests
7. People involved with sample collection, processing, analysis and/or submission: Contributors listed above

DATA-SPECIFIC INFORMATION FOR: GWturnover_spatial_data.csv

1. Number of variables: 19
2. Number of cases/rows: 1,019,079 (catchments)
3. Missing data codes:
 NaN Not a Number
4. Variable List
 - A. Name: HYBAS_ID
 Description: 10-digit HydroSHEDS catchment identifier
 Units: None
 Source: <http://www.hydrosheds.org/>
 - B. Name: SUB_AREA
 Description: Hydrobasin catchment area
 Units: meters³
 Source: <http://www.hydrosheds.org/>
 - C. Name: vol_min
 Description: Minimum calculated groundwater volume
 Units: meters³
 Source: calculated after Gleeson et al. (2014,2015)
 - D. Name: vol_avg

Description: Average calculated groundwater volume
Units: meters³
Source: calculated after Gleeson et al. (2014,2015)

E. Name: vol_max
Description: Maximum calculated groundwater volume
Units: meters³
Source: calculated after Gleeson et al. (2014,2015)

F. Name: doll_rchg
Description: Groundwater Recharge after Doll and Fiedler (2008)
Units: meters/year
Source: after Doll and Fiedler (2008)

G. Name: deGraaf_rchg
Description: Groundwater Recharge after deGraaf et al. (2015)
Units: meters/year
Source: after deGraaf et al. (2015)

H. Name: doll_minTt
Description: Turnover time with minimum groundwater volume
Units: thousands of years (ka)
Source: Model result with recharge after Doll and Fiedler (2008)

I. Name: doll_avgTt
Description: Turnover time with average groundwater volume
Units: thousands of years (ka)
Source: Model result with recharge after Doll and Fiedler (2008)

J. Name: doll_maxTt
Description: Turnover time with maximum groundwater volume
Units: thousands of years (ka)
Source: Model result with recharge after Doll and Fiedler (2008)

K. Name: deGraaf_minTt
Description: Turnover time with minimum groundwater volume
Units: thousands of years (ka)
Source: Model result with recharge after deGraaf et al. (2015)

L. Name: deGraaf_avgTt
Description: Turnover time with average groundwater volume
Units: thousands of years (ka)
Source: Model result with recharge after deGraaf et al. (2015)

M. Name: deGraaf_maxTt
Description: Turnover time with maximum groundwater volume
Units: thousands of years (ka)
Source: Model result with recharge after deGraaf et al. (2015)

N. Name: doll_minNt
Description: Number of turnovers with minimum groundwater volume
Units: count
Source: calculated after Gleeson et al. (2014,2015)

O. Name: doll_avgNt
Description: Number of turnovers with average groundwater volume
Units: count

Source: calculated after Gleeson et al. (2014,2015)

Q. Name: doll_maxNt

Description: Number of turnovers with maximum groundwater volume

Units: count

Source: calculated after Gleeson et al. (2014,2015)

R. Name: deGraaf_minNt

Description: Number of turnovers with minimum groundwater volume

Units: count

Source: Model result with recharge after deGraaf et al. (2015)

S. Name: deGraaf_avgNt

Description: Number of turnovers with average groundwater volume

Units: count

Source: Model result with recharge after deGraaf et al. (2015)

T. Name: deGraaf_maxNt

Description: Number of turnovers with maximum groundwater volume

Units: count

Source: Model result with recharge after deGraaf et al. (2015)

DATA-SPECIFIC INFORMATION FOR: Nporevols_hist2d_RechargeSource_rchg_vol_VolumeType.nc

1. Number of variables: 3

2. Number of cases/rows: 6 datasets

3. Missing data codes:

NaN Not a Number (np.NaN in Python)

4. Variable List

A. Name: Time

Description: Negative time before present

Units: -thousand years before present (-kbp)

Size: 2206L

B. Name: Nporevolumes

Description: log10 Pore volumes flushed since LGM

Units: log10(count)

Size: 999L

C. Name: Global_Ncatchments

Description: Number of catchments in 2D histogram bin

Units: count

Size: 999 rows by 2206 columns

5. Other information

```
# Example load script in Python 2.7
```

```
# Kevin Befus 2016
```

```
import netCDF4
```

```
fpath = r"Nporevols_hist2d_degraaf_rchg_vol_avg.nc"
f = netCDF4.Dataset(fpath)
time_key, pvols_key, count_key = "Time", "Nporevolumes", "Global_Ncatchments"
time_ka = -f.variables[time_key][:] # also converts negative kbp to kbp
pvols = f.variables[pvols_key][:]
global_count = f.variables[count_key][:]
f.close()
```