Overview

The code in this replication package constructs the calibration targets in Table 3 of the paper using Matlab and Stata. It calculates the externally calibrated parameters in Table 1 of the paper using Stata and Microsoft Excel. It reproduces the regression results in Table 4 and in online Appendix Tables B.2 and B.3 using Stata. It reproduces all model output in all the remaining Tables and Figure 2 of the paper using C and Matlab. The full code is computationally intensive to run. The archive includes data and model output at intermediate steps for the replicator who does not have the resources to re-run the code from scratch.

Data Availability and Provenance Statements

Statement about Rights

- I certify that the author of the manuscript has legitimate access to and permission to use the data used in this manuscript.

Summary of Availability

- All data **are** publicly available.

Details on each data source

- Data on National Income and Product Accounts were downloaded from the U.S. Bureau of Economic Analysis, https://apps.bea.gov.

   o Tables 1.1, 1.5, 5.1, 3.1ESI (BEA 2019a,b,c,d,e,f) are included as part of this archive in /data/raw_data/macro_targets.xlsx.

   o Tables 1.1 and 1.3 (BEA 2019a,g) are included as part of this archive in /data/raw_data/depreciation.xlsx

   o Table 1.1.5 (BEA 2020) is included as part of this archive in /data/raw_data/gdp.xlsx

   o Tables CA1 and CAGDP2 (BEA 2019h,i) are included as part of this archive in /data/raw_data/gdp_data/.

- All FEMA data were retrieved from the OpenFEMA API in 2019. The OpenFEMA API can be accessed here: https://www.fema.gov/about/reports-and-data/openfema. The data include the following disclaimer: "This product uses the Federal Emergency Management Agency's OpenFEMA API, but is not endorsed by FEMA. The Federal Government or FEMA cannot vouch for the data or analyses derived from these data after the data have been retrieved from the Agency's website(s)". I describe the data sets below.

   o Data on Presidential Disaster Declarations (FEMA 2019a) are included as part of this archive in /data/raw_data/DisasterDeclarationSummaries.xlsx.

- o Data on Individuals and Homeowners Program assistance (FEMA 2019b,c) are included as part of this archive in `/data/raw_data/HousingAssistanceOwners.xlsx` and `/data/raw_data/HousingAssistanceRenters.xlsx`.

- o Data on Individual and Households assistance for Flood Damage (FEMA 2019d) are included as part of this archive in `/data/raw_data/IADataset_IHPFloods.xlsx`.

- o Data on Public Assistance (FEMA 2019e,f) are included as part of this archive in `/data/raw_data/PublicAssistanceApplicants.xlsx` and `/data/raw_data/PublicAssistanceFundedPorjectDetails.xlsx`.

- o Data on Hazard Mitigation Assistance (FEMA 2019g) are included as part of this archive in `/data/raw_data/HazardMitigationAssistanceProjects.xlsx`.

- o Data on NFIP policy holders (FEMA 2019h) are included as part of this archive in `/data/raw_data/NFIP`.

- Data on insured losses were collected from the Insurance Information Institute (III, 2019). The data can be downloaded from https://www.iii.org/graph-archive/96537. A copy of the collected data is included as part of this archive in `/data/raw_data/iii_losses_coverage.xlsx`.

- Data on average income of homeowners and renters are from the US Census Current Population Survey (CPS 2019). I use Table PINC-01 for years 2004-2018. To download the data, go to https://www.census.gov/data/tables/time-series/demo/income-poverty/cps-pinc/pinc-01.2012.html, click on the desired year, and click on the All Races excel file under the headings Total Work Experience, Both Sexes. The collected data for years 2004-2018 is included as part of this archive in `/data/raw_data/owner_Renter_income.xlsx`.

- Best track data on cyclone storm tracks is from the HURDAT2 data base (Landsea, et al. 2013), available for download from https://www.nhc.noaa.gov/data/. The extended best track data set RAMMB (2019) is available to download from https://rammb2.cira.colostate.edu/research/tropical-cyclones/tc_extended_best_track_dataset/. Copies of both data sets are included as part of this archive in `/data/raw_data/cyclones/`.

- Data on NCEI storm damage (NCEI 2021) were collected from https://www.ncdc.noaa.gov/billions/events/US/2014-2018. The collected data is included as part of this archive in `/data/raw_data/NCE_raw.xlsx`. The mapping between disaster numbers and disaster names is based on the CBO (2019) and the description and location of the disaster.

- Data on the GDP deflator (BEA 2019j) were accessed from the Federal Reserve Bank of St. Louis (FRED), https://fred.stlouisfed.org/series/GDPDEF. A copy of the data is included as part of this archive in `/data/raw/GDPDEF.xlsx`.

- County-level climate projections for extreme precipitation events are from the fourth National Climate Assessment (NCA 2017), downloaded from https://scenarios.globalchange.gov/loca-viewer/. Use the dropdown menu to choose "Annual Number of days >2 inches" and "Annual Maximum 1-Day Precipitation." Download the resulting data for the late 21st century. A copy of the data is included in this archive in `/data/raw_data/pr2.xlsx` and `/data/raw_data/prmax1day.xlsx`.

- Data on household size, number of homeowners and renters and the quarterly workforce indicators are from the US Census (Census 2019a,b,c). Copies of the data are included as part of the archive in the folders `/data/raw_data/HH_size/`, `/data/raw_data/home_ownership_rate/`,and`/data/raw_data/QWI`.

- Data on the civil works budget for the U.S. army corps (USACE 2018) were retrieved from https://usace.contentdm.oclc.org/digital/collection/p16021coll6/id/43. A copy of the budget reports are included in the archive in `/data/raw_data/USACE`.

- U.S. county shape files (NOAA 2018) were downloaded from http://www.nws.noaa.gov/geodata/catalog/county/html/county.html on January 10, 2018. Copies of the data are included as part of the archive in `/data/raw_data/ c_11au16.shp` and `/data/raw_data/c_03mar20.shp`.

Dataset list

Raw data (all files are provided in /data/raw_data and are publically available)

Data file	Source	Notes
/gdp_data	BEA	County GDP, population, and personal income
depreciation.xlsx	BEA	Tables 1.1 and 1.3
macro_targets.xlsx	BEA	Tables 1.1. 1.1.5, 3.1ESI, 1.5, 5.1,2.3.5
gdp.xlsx	BEA	Table 1.1.5
GDPDEF.xlsx	FRED	
DisasterDeclarationsSummaries.xlsx	FEMA	
HazardMitigationAssistanceProjects.xlsx	FEMA	
HousingAssistanceOwners.xlsx	FEMA	
HousingAssistanceRenters.xlsx	FEMA	
IADataset_IHPFloods.xlsx	FEMA	
PublicAssistanceApplicants.xlsx	FEMA	
PAApplicantsFundedProjectDetails.xlsx	FEMA	
/NFIP	FEMA	
iii_losses_coverage.xlsx	III.org	
NCE_raw.xlsx	NCEI	
pr2in.xlsx	globalchange.gov	

prmax1day.xlsx	globalchange.gov	
/HH_size	Census	Table DPO4
/home_ownership_rate	Census	Table B25008
/QWI	Census	Quarterly workforce indicators
city_pop_2000_2010.xlsx	Census	Mapping between cities and counties
owner_Renter_income.xlsx	Census	
cbo_supp.xlsx	CBO (2019)	
/USACE	USACE	
c_03mr20.shp	NOAA	County shape files
c_11au16.shp	NOAA	County shape files

Cleaning (all files are provided in data/cleaning and were created manually by the author)

Data file	Notes
city_county_2.dta	Lists cities, counties, and states
city_county_corrections2.xlsx	Lists cities, counties, and states
city_spelling_corrections.dta	Corrects spelling of cities in PA data
Counties_trans_jan2019.dta	Lists cities, counties, and states
county_lat_lon.xlsx	Lists lat lon coordinates of county centroids
state_trans.dta	State names and abbreviations
storm_name_trans.dta	Fips, year, storm name, storm id
usdb.dta	County shapefiles for Figure 1 in .dta format

Derived data (all files are provided in data/derived and can be reproduced by /data/do_files/clean/clean_master.do)

Data file	Notes
cbo.dta	Aid, number of approved applicants, for events in CBO (2019)
county_policies4.dta	NFIP policies by county, month, and homeownership status
county_pop_gdp.dta	County population, personal income, and GDP
deflator.dta	US GDP deflator
distribution.dta	County, region, storm probability
fema_1.dta	Fips, aid, storm characteristics
hma.dta	Year, hazard mitigation grants
ihp_1.dta	IHP aid, aggregated by Fips, year, PDD
ihp_2.dta	IHP aid, aggregated, by PDD, year
ihp_full.dta	IHP aid, disaggregated
ncei.dta	PDD number and NCEI damage

nfip_policies4.dta	Fraction of renters and homeowners with flood insurance, by county, month
number_trans.dta	Year, state, storm name, PDD title, PDD number
pa_1.dta	PA aid, by Fips, year, PDD
pa_2.dta	PA aid, aggregated by PDD, year
pdd_indicators.dta	List of county, year, quarters with PDDs
regions.dta	Fips, state, region
usace.dta	USACE adaptation expenditures by year
usgdp.dta	US GDP

Computational requirements

Software Requirements

- Stata (code was last run with version 16)

- Matlab (code was run with Matlab Release R2020b)

- GCC compiler: 7.5.0

Memory and Runtime Requirements

Summary

Approximate time needed to process the raw data on a standard (2017) laptop computer: 10-60 minutes.

Approximate time needed to process the model output on a standard (2017) laptop computer: 10-60 minutes.

It is not feasible to solve the model on a standard (2017) laptop computer, as described below.

Details

The C-code to solve the model was last run in parallel on an 88-core Linux server with 128 GB of ram. It takes approximately 4 hours to solve the model for the baseline experiment. The code to process the model results and the raw data was run on a 4-core windows laptop.

Description of programs/code

Data cleaning

It is necessary to first process the cyclone data, to calculate the maximum sustained wind speed for every county-cyclone pair. After this is processed, the rest of the data can be cleaned to generate all of the data sets in /data/derived/.

- Cyclones

- Stata program `/data/cyclones/HURDAT.do` cleans the cyclone storm track data.

- Stata program `/data/cyclones/cyclone_list.do` creates a list of all counties that experience each cyclone.

- Matlab program `/data/cyclones/cyclone_wind_8.m` uses the cleaned storm track data to determine the maximum sustained wind speed for every county-cyclone pair. It stores these results in `cyclone_wind_19.xlsx`.

- All other data

  - Programs in `data/do_files/clean/` will clean all of the raw data referenced above. Program `/do_files/clean/clean_master.do` runs all of the cleaning programs in the necessary order. The code stores the processed (derived) data sets in `/data/derived/`.

Programs to compute regression results and model targets

These programs can all be run using the data sets provided in /data/derived/. It is not necessary to run the cleaning programs to reproduce these data sets first.

- Program `/data/do_files/map.do` will produce the map in Figure 1 of the paper.

- Program `/data/do_files/validation.do` runs the regression for Table 4 of the paper.

- Program `/data/do_files/agg_mom.do` produces the aggregate moments related to FEMA aid in Table 3 of the paper, the summary statistics reported in online Appendix Table B.1, the values in online Appendix Table B.4, the storm probabilities reported in Table 1, the ratio of GDP across regions reported in Section 4, and the fraction of households that received the maximum grant reported in footnote 17.

- Program `/data/do_files/psi.do` calculates the ratio of disaster aid to damage, reported in Table 3 of the paper. Additionally, it runs the regressions for online Appendix Tables B.2 and B.3 and calculates the fraction of events with NCEI reported damage data.

- Program `/data/do_files/qwi.do` runs the regression reported in footnote 10 of the paper.

- Program `/data/precip.do` computes the projected changes in extreme precipitation for the extreme-precipitation method of modeling climate change.

- All calibration targets in Table 3 that are not produced by the above Stata code and all parameter values in Table 1 that are not taken from the literature are computed directly from the raw data in the excel spreadsheets: `/data/raw_data/macro_targets.xlsx`, `/data/raw_data/iii_losses_coverage.xlsx` and `/data/raw_data/owner_Renter_income.xlsx`.

Model solution

Programs in `/c_programs` compute the model solution in C and store the results in `/c_programs/results_1109`.

- `/c_programs/shell.c`: runs model for the baseline and counterfactual experiments. Lines 75-84 are flags to determine the model experiment.

- `/c_programs/solveModel.c` solves the firm and household optimization problems, computes aggregate quantities.

- `/c_programs/err_hrahrp.c` computes the first order condition for the rental-housing firm's optimization problem

- `/c_programs/err_lb.c` computes lower bound on the initial guess for the final good firm's optimization problem.

- `/c_programs/err_kakp.c` computes the first order condition for the final-good firm's optimization problem

- `/c_programs/value_function_loop.c` uses value function iteration to solve the household's optimization problem.

- `/c_programs/nelder.c` and `/c_programs/nelder_nr.c` calls the Nelder-Mead optimization routine from Numerical Recipes (Press et al. 1988) as part of the optimization step in `/c_programs/value_function_loop.c`.

- `/c_programs/cond_v.c` computes the continuation value conditional on the realization of the shock.

- `/c_programs/ucont.c` computes u + beta*E(v) as part of the value function iteration. Uses cubic splines to interpolate the continuation value for off-grid points.

- `/c_programs/sim_peeps.c` uses approximate aggregation to construct the distribution of households across the state space.

- `/c_programs/save_results.c` saves model results as .dat files to be processed in Matlab.

- `/c_programs/moments.c` computes model values of the calibration targets in the model.

- The following routines in `/c_programs/` are taken directly from Numerical Recipes (Press et al. 1988). They are modified slightly to fit the context of the specific problem. The names of the routines correspond to the names in Press et al. 1988.

    - `amoeba.c, amoeba_nr.c amoeba_r.c amotry.c amotry_nr.c amotry_r.c, golden.c, rtbis.c, splie2.c, splin2.c, spline.c,` and `splint.c`

Process model output

Programs in folder `/process_output` process .dat files produced by the C code and create Figure 2 and Tables 1-3 and 5-14 in the main paper and Tables C.1 and C.2 in the online Appendix.

- Program `/process_output/readc.m` processes all model results from C data files.

- Program `/process_output/elasticity.m` calculates the damage-probability and the aid-probability elasticities in the model, reported in Section 4 of the paper.

- Program `/process_output/tables.m` produces Figure 2 and Tables 1-3 and 5-14 in the main paper and Tables C.1 and C.2 in the online Appendix. Output files are called names that should be easy to correlate with the titles of the tables in the paper (see chart below).

- Program `/process_output/income_shocks.m` computes the Markov transition matrix for income shocks, reported in online Appendix B.5. Calls `rouwen.m` (Lkhagvasuren, 2005) to implement the Rouwenhorst discretization method. The Markov transition matrix is hard-coded into `/c_programs/shell.c`.

Miscellaneous
- Program `/cyclones/county_cyclones_1.m` computes the fraction of counties that experience a category 1 or higher cyclone that have a PDD (reported on page 23 of the paper).

Instructions for replicators

The archive has the file structure necessary to run the code including the empty folders: `/data/output, /data/temp, /process_output/figures` and `/process_output/tables.`

To replicate calibration targets and regression output
1. Edit all program files to adjust the default path.

2. Clean cyclone data: run in the following order:

    - `/data/cyclones/HURDAT.do`,

    - `/data/cyclones/cyclone_list.do`

    - `/data/cyclones/cyclone_wind_8.m`

3. Clean remaining data: run `data/do_files/clean/clean_master.do`

4. Produce calibration targets and regression results. These programs can be run in any order.

    - `/data/do_files/agg_mom.do` and `/data/do_files/psi.do` reproduce the calibration targets related to FEMA aid in Table 3, the summary statistics reported in online Appendix Table B.1, the values in online Appendix Table B.4,

the storm probabilities reported in Table 1, the ratio of GDP across regions reported in Section 4, and the fraction of households that received the maximum grant reported in footnote 17.

- `/data/do_files/psi.do` reproduces the regressions in online Appendix Tables B.2 and B.3.
- `/data/do_files/validation.do` reproduces the regression for Table 4.
- `/data/do_files/qwi.do` reproduces the regression for footnote 10.
- `/data/do_files/map.do` reproduces Figure 1.
- `/data/do_files/precip.do` constructs the changes in probability and severity for the extreme-precipitation method for modeling climate change.
- `/data/cyclones/county_cyclones_1.m` computes the fraction of counties that experience a category 1 or higher cyclone that have a PDD (reported on page 23 of the paper).

Note that steps 2 and 3 can be skipped if the replicator wishes to start from the derived data files (included as part of this archive) instead of the raw data.

To replicate the model solution

1. Edit all programs to adjust the default path.

2. Set the flags in line 75-80 of `/c_programs/shell.c` to run the desired experiment (e.g., the baseline, climate change, changes in federal policy, etc.). The notes in the code indicate which flag corresponds to which experiment.

3. Compile the C code using the provided makefile and run the resulting executable.

4. Adjust the exper_vec1 and exper_vec2 in `/process_output/readc.m` to the relevant experiments. Run `/process_output/readc.m`. This will generate all the aggregate quantities for the particular experiment discussed in the paper.

Note steps 2 and 3 can be skipped if the replicator wishes to start from the c_program output included as part of this archive in `/c_programs/results_1109`.

List of tables and programs

The provided code reproduces all numbers, tables, and figures in the paper.

Figure/Table #	Program	Line Number	Output file
Table 1	process_output/tables.m	20	params_direct.tex
Table 2	process_output/tables.m	50	params_mom.tex
Table 3	process_output/tables.m	88	targets.tex
Table 4	data/do_files/validation.do		
Table 5	process_output/tables.m	173	baseline_agg.tex
Table 6	process_output/tables.m	209	adaptive_capacity.tex

Table 7	process_output/tables.m	234	quintiles.tex
Table 8	process_output/tables.m	269	federal_policy.tex
Table 9	process_output/tables.m	299	fed_welfare.tex
Table 10	process_output/tables.m	341	climate_params.tex
Table 11	process_output/tables.m	379	adaptation_capital.tex
Table 12	process_output/tables.m	463	adapt_cc.tex
Table 13	process_output/tables.m	415	welfare_cc.tex
Table 14	process_output/tables.m	556	welfare_ccnr.tex
Table B.1	data/do_files/agg_mom.do	188	
Table B.2	data/do_files/psi.do	100	
Table B.3	data/do_files/psi.do	101	
Table B.4	data/do_files/agg_mom.do	77	
Table C.1	process_output/tables.m	125	income_quintile.tex
Table C.2	process_output/tables.m	149	wealth_quintile.tex
Figure 1	data/do_files/map.do	99	map.eps
Figure 2	process_output/tables.m	496	D_45.eps, D_85.eps

References

BEA (2019a) U.S. Bureau of Economic Analysis (BEA). 2019: "Table 1.1. U.S. Net International Investment Position at the End of the Period, 2004-2018." (release date March 31, 2020).

BEA (2019b) U.S. Bureau of Economic Analysis (BEA). 2019: "Table 1.5 Investment in Fixed Assets and Consumer Durable Goods 2000-2018." (release date August 8, 2019).

BEA (2019c) U.S. Bureau of Economic Analysis (BEA). 2019: "Table 1.1. Current-Cost Net Stock of Fixed Assets and Consumer Durable Goods 2000-2018." (release date August 8, 2019).

BEA (2019d) U.S. Bureau of Economic Analysis (BEA). 2019: "Table 5.1. Current-Cost Net Stock of Residential Fixed Assets by Type of Owner, Legal Form of Organization, and Tenure Group, 2004-2018." (release date August 8, 2019).

BEA (2019e) U.S. Bureau of Economic Analysis (BEA). 2019: "Table 2.3.5. Personal Consumption Expenditures by Major Type of Product." (release date May 28, 2020).

BEA (2019f) U.S. Bureau of Economic Analysis (BEA). 2019: "Table 3.1ESI. Current-Cost Net Stock of Private Fixed Assets by Industry 2004-2018." (release date August 8, 2019).

BEA (2019g) U.S. Bureau of Economic Analysis (BEA). 2019: "Table 1.3. Current-Cost Depreciation of Fixed Assets and Consumer Durable Goods, 2004-2018." (release date August 8, 2019).

BEA (2019h) U.S. Bureau of Economic Analysis (BEA). 2019: "Table CA1 Personal Income Summary: Personal Income, Population, Per Capita Personal Income."

BEA (2019i) U.S. Bureau of Economic Analysis (BEA). 2019: "Table CAGDP2 Gross domestic product (GDP) by county and metropolitan area."

BEA (2019j): U.S. Bureau of Economic Analysis, Gross Domestic Product: Implicit Price Deflator [GDPDEF], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/GDPDEF

BEA (2020): U.S. Bureau of Economic Analysis (BEA). 2019: "Table 1.5 Gross Domestic Product, 2004-2018." (release date May 28, 2020).

CBO (2019): "Expected Costs of Damage from Hurricane Winds and Storm-Related Flooding, Congressional Budget Office Publication number 55019.

Census (2020a): U.S. Census American Community Survey 2020: "Table B25008: Total Population in Occupied Housing Units by Tenure." Retrieved from https://data.census.gov/cedsci/table?q=b25008&tid=ACSDT1Y2019.B25008

Census (2020b): U.S. Census American Community Survey 2020: "Table DP04: Selected Housing Characteristics." Retrieved from https://data.census.gov/cedsci/table?q=DP04&tid=ACSDP1Y2019.DP04

Census (2020c): U.S. Census Quarterly Workforce Indicators 2020. "Series EarnS: Full Quarter Employment (Stable) Average Monthly Earnings. Retrieved from https://qwiexplorer.ces.census.gov/static/explore.html#x=0&g=0

III (2019): Insurance Information Institute (III). 2019: "Natural Catastrophe Losses in the United States." https://www.iii.org/graph-archive/96537.

CPS (2019): U.S. Census Current Population Survey Annual Social and Economic Supplement (CPS) 2019: "PINC-01. Selected Characteristics of People 15 Years and Over, by Total Money Income, Work Experience, Race, Hispanic Origin, and Sex." (accessed August, 2020).

FEMA (2019a): Federal Emergency Management Agency (FEMA) 2019: OpenFEMA Dataset: Disaster Declarations Summaries –v2. Retrieved from https://www.fema.gov/openfema-data-page/disaster-declarations-summaries-v2.

FEMA (2019b) Federal Emergency Management Agency (FEMA) 2019: OpenFEMA Dataset: "Housing Assistance Program Data – Owners – v2". Retrieved from https://www.fema.gov/openfema-data-page/housing-assistance-program-data-owners-v2.

FEMA (2019c) Federal Emergency Management Agency (FEMA) 2019: OpenFEMA Dataset: "Housing Assistance Program Data – Renters – v2". Retrieved from https://www.fema.gov/openfema-data-page/housing-assistance-program-data-renters-v2.

FEMA (2019d) Federal Emergency Management Agency (FEMA) 2019: OpenFEMA Dataset: "Individuals and Households Program (IHP) Flood Damage". Retrieved from https://www.fema.gov/about/openfema/data-sets/individuals-households-program-flood-damage

FEMA (2019e) Federal Emergency Management Agency (FEMA) 2019: OpenFEMA Dataset: "Public Assistance Applicants –v1". Retrieved from https://www.fema.gov/openfema-data-page/public-assistance-applicants-v1.

FEMA (2019f) Federal Emergency Management Agency (FEMA) 2019: OpenFEMA Dataset: "Public Assistance Funded Project Details –v1". Retrieved from https://www.fema.gov/openfema-data-page/public-assistance-funded-projects-details-v1.

FEMA (2019g) Federal Emergency Management Agency (FEMA) 2019: OpenFEMA Dataset: "Hazard Mitigation Assistance Projects –v2". Retrieved from https://www.fema.gov/openfema-data-page/hazard-mitigation-assistance-projects-v2.

FEMA (2019h) Federal Emergency Management Agency (FEMA) 2019: OpenFEMA Dataset: "FIMA NFIP Redacted Policies –v1". Retrieved from https://www.fema.gov/openfema-data-page/openfema-dataset-fima-nfip-redacted-policies--v1.

Landsea, C. W. and J. L. Franklin, 2013: Atlantic Hurricane Database Uncertainty and Presentation of a New Database Format. Mon. Wea. Rev., 141, 3576-359

Lkhagvasuren, Damba. rouwen.m. (2005).

NCA (2017): Scenarios of the National Climate Assessment 2017. Retrieved from https://scenarios.globalchange.gov/loca-viewer/.

NCEI (2021), NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2021). Retrieved from https://www.ncdc.noaa.gov/billions/.

NOAA (2018), "US County shape files", retrieved from http://www.nws.noaa.gov/geodata/catalog/county/html/county.htm on January 10, 2018.

Press, William H., Saul A. Teukolsky, William T. Vetterling, and Brian P. Flannery. "Numerical recipes in C 2nd Edition." (1988).

RAMMB (2019) Regional and Mesoscale Meterology Branch Cooperative Institute for Research in the Atmosphere (RAMMB) 2019: "The Tropical Cyclone Extended Best Track Dataset." Retrieved from https://rammb2.cira.colostate.edu/research/tropical-cyclones/tc_extended_best_track_dataset/.

USACE (2018): "Civil Works Budgets of the U.S. Army Corps of Engineers, fiscal years 2004-2018." Department of the Army, Office, Assistant Secretary of the Army (civil works). Retrieved from https://usace.contentdm.oclc.org/digital/collection/p16021coll6/id/43