

APPENDIX I: RELEVANT DATASETS AND SOURCES

General variable or phenomenon	Specific dataset or variable	Source	Section
Aerosols	Aerosol products	http://apps.ecmwf.int/datasets/data/macc-reanalysis	SB2.2
	CAMS Reanalysis	http://macc.copernicus-atmosphere.eu/catalogue/	2g3, SB2.2
Air-sea fluxes	Woods Hole Oceanographic Institute OAFflux project	http://oafux.who.edu	3e
Albedo	MODIS	http://ladsweb.nascom.nasa.gov	2h1, 5e
Biomass burning	GFAS	http://atmosphere.copernicus.eu/documentation/-fire-emissions	2h3, SB2.2
	GFEDv4	https://daac.ornl.gov/VEGETATION/guides/fire_emissions_v4.html	2h3
Clouds, cloudiness	CALIPSO	http://eosweb.larc.nasa.gov/PRODOCS/calipso/table_calipso.html	2d5
	CLARA-A2	https://climatedataguide.ucar.edu/climate-data/clara-a1-cloud-properties-surface-albedo-and-surface-radiation-products-based-avhrr	2d5
	HIRS	www.ssec.wisc.edu/~donw/PAGE/CLIMATE.HTM	2d5
	MISR	http://eosweb.larc.nasa.gov/PRODOCS/misr/level3/overview.html	2d5
	MODIS C6	http://ladsweb.nascom.nasa.gov	2d5
	NCEP CFSR	http://cfs.ncep.noaa.gov/cfsr/	d5
	PATMOS-x	www.ncdc.noaa.gov/cdr/operationalcdrs.html	2d5
SatCORPS	No public archive		2d5
Evaporation, evapotranspiration, sublimation	ERA-Interim	www.ecmwf.int/en/research/climate-reanalysis/era-interim	SB2.1
	GLEAM	www.gleam.eu/	SB2.1
	Woods Hole Oceanographic Institute OAFflux project	http://oafux.who.edu	3e2
FAPAR	FAPAR	http://fapar.jrc.ec.europa.eu	2h2
	MERIS	https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/envisat/instruments/meris	2h2
	MODIS-TIP	http://modis.gsfc.nasa.gov/about/	2h2
Geopotential height	ERA-Interim	www.ecmwf.int/en/research/climate-reanalysis/era-interim	6b
	JRA-55	http://jra.kishou.go.jp/JRA-55/index_en.html	7g
	NCEP-NCAR reanalysis-I pressure	www.esrl.noaa.gov/psd/data/gridded/data.ncep.reanalysis.pressure.html	5b, 7f
Glacier mass or volume	Glacier mass balance	http://dx.doi.org/10.5904/wgms-fog-2015-11	5f
	Randolph Glacier Inventory v3.2	www.glims.org/RGI/	2c3
	World Glacier Monitoring Service	www.wgms.ch/mbb/sum12.html	2c3, 5f

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Humidity, (near) surface	Dai	By email to adai@ucar.edu	2d1
	ERA-Interim	www.ecmwf.int/research/era	2d1
	HadCRUH	www.metoffice.gov.uk/hadobs/hadcruh	2d1
	HadISDH	www.metoffice.gov.uk/hadobs/hadisdh	2d1
	HOAPS	wui.cmsaf.eu/safira/action/viewDoiDetails?acronym=HOAPS_V001	2d1
	JRA-55	http://jra.kishou.go.jp/JRA-55/index_en.html	2d1
	MERRA-2	http://gmao.gsfc.nasa.gov/reanalysis/MERRA-2/	2d1
	NOCS 2.0	www.noc.soton.ac.uk/noc_flux/noc2.php	2d1
Humidity, upper atmosphere	HIRS	www.ssec.wisc.edu/~donw/PAGE/CLIMATE.HTM	2d3
	UTH	By email to Viju.John@eumetsat.int	2d3
Ice sheet characteristics	DMSP-SSMIS	http://nsidc.org/data/docs/daac/nsidc0001_ssmi_tbs.gd.html	5e, 6e
	GRACE	http://podaac.jpl.nasa.gov/datasetlist?ids=Platform&values=GRACE	5e, 5f
	PROMICE (Greenland)	www.promice.dk/home.html	5e
Lake temperature	Institute of Meteorology and Water Management (Poland)	www.imgw.pl	2b4
	NOAA/GLERL	www.glerl.noaa.gov	2b4
Modes of variability	AMO	www.esrl.noaa.gov/psd/data/timeseries/AMO/	3h, 4e2
	AO	www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml	2e1
	EQ-SOI	www.cpc.ncep.noaa.gov/data/indices	4b, 6d
	MEI	www.esrl.noaa.gov/psd/enso/mei/	3f
	MJO, real-time multivariate	http://monitor.cicsnc.org/mjo/current/rmm/	4c
	NAO	ftp://ftp.cpc.ncep.noaa.gov/wd52dg/data/indices/tele_index.nh	SB3.2, 3h
	NAO (summer)	Courtesy of Chris K. Folland	2e1
	NAO (winter)	https://climatedataguide.ucar.edu/climate-data/hurrell-north-atlantic-oscillation-nao-index-station-based	2e1
	ONI	www.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ensoyears.shtml	4b
	PDO	http://research.jisao.washington.edu/pdo/	3b
	PDO	www.cpc.ncep.noaa.gov/products/GODAS/	3b
	SAM	www.antarctica.ac.uk/met/gjma/sam.html	6b, 6d
	SAM, AAO	www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/ao/ao.shtml	2e1
SOI	ftp://ftp.bom.gov.au/anon/home/ncc/www/sco/soi/soiplaintext.html	2e1	

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Ocean carbon	CLIVAR/CO2 Repeat Hydrography Global Ocean Ship-Based Hydrographic Investigations Program	www.go-ship.org	3j
	pCO ₂	www.socat.info	3j, 6g
Ocean circulation	Atlantic Meridional Overturning Circulation	www.noc.soton.ac.uk/rapidmoc	3h
Ocean heat content and temperature	Antarctic Bottom Water	https://portal.aodn.org.au/	6g
	CSIRO/ACE CRC/IMAS-UTAS estimate	www.cmar.csiro.au/sealevel/thermal_expansion_ocean_heat_timeseries.html	3c
	MRI/JMA	www.data.jma.go.jp/gmd/kaiyou/english/ohc/ohc_global_en.html	3c
	NCEI	www.nodc.noaa.gov/OC5/3M_HEAT_CONTENT/	3c
	NCEP ocean reanalysis	www.cpc.ncep.noaa.gov/products/GODAS/	4h
	PMEL/JPL/JIMAR	http://oceans.pmel.noaa.gov	3c
	Roemmich and Gilson (2009) Argo monthly climatology	http://sio-argo.ucsd.edu/RG_Climatology.html	3c, SB3.2
	Met Office EN4.0.2	www.metoffice.gov.uk/hadobs/en4/download-en4-0-2-109.html	3c
Ocean salinity	Antarctic Bottom Water	https://portal.aodn.org.au/	6g
	Argo	www.argo.ucsd.edu/	3d
	Blended Analysis for Surface Salinity	ftp://ftp.cpc.ncep.noaa.gov/precip/BASS	3d2
	NCEI global salinity anomalies	www.nodc.noaa.gov/OC5/3M_HEAT_CONTENT	3d3
	Roemmich and Gilson (2009) Argo monthly climatology	http://sio-argo.ucsd.edu/RG_Climatology.html	SB3.2
	World Ocean Atlas 2009	www.nodc.noaa.gov/OC5/WOA09/pr_woa09.html	3d2, 3d3
Ocean surface heat flux	CERES FLASHflux	https://eosweb.larc.nasa.gov/project/ceres/ebaf_surface_table	3e
Outgoing longwave radiation	CERES FLASHFlux Project	http://flashflux.larc.nasa.gov	3e, 4b2, 4c
	Daily OLR	https://www.ncdc.noaa.gov/cdr/atmospheric/outgoing-longwave-radiation-daily	4e3, 4e6

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Ozone, total column and stratospheric	Bodeker Scientific	www.bodekerscientific.com/data/total-column-ozone	5j
	CALIPSO (polar stratospheric clouds)	http://eosweb.larc.nasa.gov/PRODOCS/calipso/table_calipso.html	6h
	GOME/SCIAMACHY/GOME2 (GSG) merged total ozone	www.iup.uni-bremen.de/gome/wfdoas/	2g4
	GOME/SCIAMACHY/GOME2 (GTO) merged total ozone	http://atmos.eoc.dlr.de/gome/gto-ecv.html www.esa-ozone-cci.org	2g4
	GOZCARDS ozone profiles	https://gozcards.jpl.nasa.gov http://mirador.gsfc.nasa.gov	2g4
	KNMI OMI	http://ozoneaq.gsfc.nasa.gov	6h
	Multisensor reanalysis of total ozone	www.temis.nl	2g4
	NASA Aura MLS	http://mls.jpl.nasa.gov/index-eos-mls.php	5j, 6h
	NASA BUV/SBUV v8.6 (MOD v8.6) merged ozone	http://acdb-ext.gsfc.nasa.gov/Data_services/merged	2g4
	NOAA BUV/SBUV v8.6 (MOD v8.6) merged ozone	ftp://ftp.cpc.ncep.noaa.gov/SBUV_CDR	2g4
	Ozonesonde	www.esrl.noaa.gov/gmd/dv/spo_oz	6h
	SAGE II/OSIRIS	Dataset linked to Bourassa et al. (2014)	2g4
	WOUDC ground-based ozone	ftp://ftp.tor.ec.gc.ca/pub/woudc/Project-Campaigns/ZonalMeans	2g4
Ozone, tropospheric	Aura OMI/MLS	http://acd-ext.gsfc.nasa.gov/Data_services/cloud_slice/new_data.html	2g6, SB2.2
Permafrost	Active layer thickness	http://nsidc.org/data/docs/fgdc/ggd313_calm/	5i
	GTN-P	http://gtnpdatabase.org	2c1
	Permafrost temperature	http://permafrost.gi.alaska.edu/sites_map	5i
	Permafrost temperature at French sites	http://edytem.univ-savoie.fr/	2c1
	Permafrost temperature at Norwegian sites	www.tspnorway.com , www.met.no	2c1
	Permafrost temperature at Swiss sites	www.permos.ch	2c1
Phytoplankton, ocean color	MODIS-Aqua Reprocessing R2014.0	http://oceancolor.gsfc.nasa.gov/cms/reprocessing/	3i
	SeaWiFS R2014.0	http://oceancolor.gsfc.nasa.gov/cms/reprocessing/	3i
	VIIRS R2014.0	http://oceancolor.gsfc.nasa.gov/cms/reprocessing/	3i

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Precipitation	CMORPH	www.cpc.ncep.noaa.gov/products/janowiak/cmorph_description.html	4b3, 4d
	GHCN	www.ncdc.noaa.gov/temp-and-precip/ghcn-gridded-products.php	2d4
	GPPC	www.gpcc.dwd.de	2d4, 7f
	GPCPv23	http://precip.gsfc.nasa.gov	2d4, 3e, 4h
	NCEP-NCAR reanalysis	www.esrl.noaa.gov/psd/data/gridded/data.ncep.reanalysis.html	7e
	TRMM MI/PR	http://pmm.nasa.gov/TRMM/products-and-applications	7h
Precipitation (net)	JRA-55	http://jra.kishou.go.jp/JRA-55/index_en.html	6d
Pressure, sea level or near-surface	Antarctic Meteorological Research Center AWS	http://amrc.ssec.wisc.edu/data	6c
	ERA-Interim	www.ecmwf.int/en/research/climate-reanalysis/era-interim	6b, SB6.1
	HadSLP2r	www.metoffice.gov.uk/hadobs	2e1
	JRA-55	http://jra.kishou.go.jp/JRA-55/index_en.html	6d
NCEP-NCAR reanalysis	www.esrl.noaa.gov/psd/data/gridded/data.ncep.reanalysis.html	7f	
River discharge	ELSE	No public archive	2d6
Sea ice concentration	Near-Real-Time DMSP SSM/I-SSMIS Daily Polar Gridded	http://nsidc.org/data/nsidc-0081.html	6f
	Nimbus-7 SMMR and DMSP SSM/I (Bootstrap)	http://nsidc.org/data/docs/daac/nsidc0079_bootstrap_seaice.gd.html	6f
Sea ice duration	ESA CryoSat-2	https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/cryosat	5c
	NASA Operation IceBridge	https://espo.nasa.gov/oib/content/OIB_1	5c
	Near-Real-Time DMSP SSM/I-SSMIS Daily Polar Gridded	http://nsidc.org/data/nsidc-0081.html	6f
	Nimbus-7 SMMR and DMSP SSM/I (Bootstrap)	http://nsidc.org/data/nsidc-0079.html	6f
Sea ice extent	Nimbus-7 SMMR and DMSP SSM/I (Bootstrap)	http://nsidc.org/data/docs/daac/nsidc0079_bootstrap_seaice.gd.html	5c, 6f
Sea ice freeboard/thickness	CryoSat-2	https://earth.esa.int/web/guest/-/how-to-access-cryosat-data-6842	5c
Sea level/sea surface height	Ssalto/Duacs Multimission Altimeter Products	www.aviso.altimetry.fr	3f, 6g
	Tide gauge	http://uhsic.soest.hawaii.edu/	3f
	TOPEX/Jason	http://sealevel.colorado.edu/	3f

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Sea surface temperature	ERSST.v3b and v4	www.esrl.noaa.gov/psd/data/gridded/data.noaa.ersst.html	3b, 4e2, 4e4, 4g
	HadISST1	www.metoffice.gov.uk/hadobs/hadisst	3b
	HadISST3	www.metoffice.gov.uk/hadobs/hadisst3	2b1
	NOAA OISSTv2	www.esrl.noaa.gov/psd/data/gridded/data.ncep.oisst.v2.html	3b, 4b1, 4d2, 4e3, 4e6, 4h, 5d, 7d
Snow cover	NOAA daily Interactive Multisensor Snow and Ice Mapping System	http://nsidc.org/data/g02156	5g
	Snow cover extent and duration	www.snowcover.org	2c2, 5g
Snow depth	Canadian Meteorological Centre daily gridded global snow depth analysis	http://nsidc.org/data/nsidc-0447	5g
Soil moisture	ESA CCI SM	www.esa-soilmoisture-cci.org/node?page=3	2d8
Solar transmission	Mauna Loa solar transmission	www.esrl.noaa.gov/gmd/grad/mloapt.html	2f2
Stratospheric water vapor	Frost Point Hygrometer Data (Boulder, Hilo, Lauder)	ftp://aftp.cmdl.noaa.gov/data/ozwv/WaterVapor	2g5
	Frost Point Hygrometer Data (San Jose)	http://physics.valpo.edu/ozone/ticosonde.html	2g5
	MLS data	http://disc.sci.gsfc.nasa.gov/Aura/data-holdings/MLS/index.shtml	2g5
	NASA Aura MLS	http://aura.gsfc.nasa.gov/instruments/mls.html	2g5
Surface current	Brazil-Malvina Region Confluence Region	www.aoml.noaa.gov/phod/altimetry/cvar/mal/BM_anm.php	3g
	Long-term time series of surface currents: Agulhas Current	www.aoml.noaa.gov/phod/altimetry/cvar/agu/	3g
	Long-term time series of surface currents: North Brazil Current	www.aoml.noaa.gov/phod/altimetry/cvar/nbc	3g
	Long-term time series of surface currents: Yucatan Current	www.aoml.noaa.gov/phod/altimetry/cvar/yuc/transport.php	3g
	OSCAR	www.oscar.noaa.gov	3h

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Temperature, (near) surface	Antarctic Meteorological Research Center AWS	http://amrc.ssec.wisc.edu/data	6c
	CRUTEM4	www.metoffice.gov.uk/hadobs/crutem4 www.cru.uea.ac.uk/cru/data/temperature	2b1, 5b, 7f
	ERA-Interim	www.ecmwf.int/en/research/climate-reanalysis/era-interim	2b1, 2b5, 6b
	EURO4m E-obs	www.ecad.eu/download/ensembles/ensembles.php	7f
	GHCNDEX	www.climdex.org/datasets.html	2b5
	HadCRUT4 global temperature	www.metoffice.gov.uk/hadobs/hadcrut4	2b1
	JMA global temperature	http://ds.data.jma.go.jp/tcc/tcc/products/gwp/temp/map/download.html	2b1, 7g
	JRA-55	http://jra.kishou.go.jp/JRA-55/index_en.html	2b1
	MERRA-2	http://gmao.gsfc.nasa.gov/reanalysis/MERRA-2/	2b1
	NASA/GISS global temperature	http://data.giss.nasa.gov/gistemp	2b1
	NCEP–NCAR reanalysis	www.esrl.noaa.gov/psd/data/gridded/data.ncep.reanalysis.html	5b, 5i, 7e, 7h
NOAA/NCEI global temperature	www.ncdc.noaa.gov/monitoring-references/faq/anomalies.php	2b1	
Temperature, upper atmosphere	Berkeley Earth surface temperature	www.berkeleyearth.org	2b1
	ERA-Interim	www.ecmwf.int/en/research/climate-reanalysis/era-interim	2b1, 2b2, 2b3, 6b
	JRA-55	http://jra.kishou.go.jp/JRA-55/index_en.html	2b2, 2b3
	MERRA-2	http://gmao.gsfc.nasa.gov/reanalysis/MERRA-2/	2b2, 2b3
	NCEP CFSR	http://cfs.ncep.noaa.gov/cfsr/	2b3
	NCEP–DOE Reanalysis 2	www.esrl.noaa.gov/psd/data/gridded/data.ncep.reanalysis2.html	6h
	NCEP–NCAR reanalysis	www.esrl.noaa.gov/psd/data/gridded/data.ncep.reanalysis.html	7f
	NOAA/NESDIS/STAR	www.star.nesdis.noaa.gov/smcd/emb/mscat/	2b2, 2b3
	RAOBCORE, RICH	www.univie.ac.at/theoret-met/research/raobcore	2b2, 2b3
	RATPAC	www.ncdc.noaa.gov/oa/climate/ratpac	2b2, 2b3
	RSS	www.remss.com	2b2, 2b3
	UAH MSU	http://vortex.nsstc.uah.edu/public/msu	2b2, 2b3
	University of New South Wales	web.science.unsw.edu.au/~stevensherwood/radproj/index.html	2b2
University of Washington	www.atmos.uw.edu/~pochedls/nobackup/share/	2b2, 2b3	
Terrestrial groundwater storage	GRACE	http://podaac.jpl.nasa.gov/star/index.php	2d7
TOA earth radiation budget	CERES EBAF Ed2.8	http://ceres.larc.nasa.gov/products.php?product=EBAF-TOA	2f1
	CERES FLASHFlux	https://eosweb.larc.nasa.gov/project/ceres/ebaf_toa_table	2f1

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Total column water vapor	COSMIC GPS-RO	www.cosmic.ucar.edu/ro.html	2d2
	ERA-Interim	www.ecmwf.int/en/research/climate-reanalysis/era-interim	2d2
	GNSS ground-based total column water vapor	http://rda.ucar.edu/datasets/ds721.1/	2d2
	JRA-55	http://jra.kishou.go.jp/JRA-55/index_en.html	2d2
	MERRA-2	http://gmao.gsfc.nasa.gov/reanalysis/MERRA-2/	2d2
	RSS SSM/I AMSR-E ocean total column water vapor	www.remss.com	2d2
Total solar irradiance	SORCE/TIM	http://science.nasa.gov/missions/sorce/	2f
Trace gases	AGGI	www.esrl.noaa.gov/gmd/aggi	2g1
	Carbon dioxide	www.esrl.noaa.gov/gmd/dv/iadv	2g1
	Carbon monoxide	https://www2.acom.ucar.edu/mopitt	2g7, SB2.2
	Chlorine monoxide, Aura MLS	http://mls.jpl.nasa.gov/products/clo_product.php	6h
	Hydrogen chloride, Aura MLS	http://disc.sci.gsfc.nasa.gov/datacollection/ML2HCL_V004.html	6h
	Methane	www.esrl.noaa.gov/gmd/dv/iadv	2g1
	Nitrous oxide	www.esrl.noaa.gov/gmd/hats/combined/N2O.html	2g1
	ODGI	www.esrl.noaa.gov/gmd/odgi	2g2
	Perfluorocarbons	http://agage.eas.gatech.edu	2g1, 2g2
	Sulfur hexafluoride	www.esrl.noaa.gov/gmd/hats/combined/SF6.html	2g1
Tropical cyclone data	IBTrACS	www.ncdc.noaa.gov/oa/ibtracs	4e
	JTWC best-track data (2011 preliminary)	www.usno.navy.mil/NOOC/nmfc-ph/RSS/jtwc/best_tracks	4e4, 4e5, 4e6
	RSMC-Tokyo, JMA best-track data	www.jma.go.jp/jma/jma-eng/jma-center/rsmc-hp-pub-eg/besttrack.html	4e4
	SPEARcTC	http://apdrc.soest.hawaii.edu/projects/spearc	4e7, 4e8
Wind, (near) surface	Australian (McVicar)	http://doi.org/10.4225/08/56A8549IDDED2	2e2
	ERA-Interim	www.ecmwf.int/en/research/climate-reanalysis/era-interim	2e2, SB6.1
	HadISD	www.metoffice.gov.uk/hadobs/hadisd/	2e2
	JRA-55	http://jra.kishou.go.jp/JRA-55/index_en.html	2e2, 4h
	MERRA-2	http://gmao.gsfc.nasa.gov/reanalysis/MERRA-2/	2e2
	RapidScat	winds.jpl.nasa.gov/missions/RapidScat/	SB4.2

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Wind, upper atmosphere	Climate Forecast System	http://cfs.ncep.noaa.gov/	4b1
	ERA-Interim	www.ecmwf.int/en/research/climate-reanalysis/era-interim	2e3, 6b
	GRASP	http://doi.pangaea.de/10.1594/PANGAEA.823617	2e3
	JRA-55	http://jra.kishou.go.jp/JRA-55/index_en.html	2e3
	MERRA	http://gmao.gsfc.nasa.gov/research/merra/	2e3
	NCEP–NCAR reanalysis	www.esrl.noaa.gov/psd/data/gridded/data.ncep.reanalysis.html	4e3, 4e4, 4e6, 4g

