Earth Systems and Climate Change Hub

National Environmental Science Programme

Project Details	
ESCC Project No. & Title(s)	2.7 - Refining Australia's water futures 5.4 - Water Futures under Climate Change
Project Leader(s)	Dewi Kirono, Francis Chiew
Deliverable(s)	Drought Projections across Australia
Data/software Manager	Craig Heady

Description (complete for data and software)	
Title	Projection of Drought Indices using Standardised Climate Indices calculated from rainfall, soil moisture and runoff across Australia informed by CMIP5 GCMs
Description	The datasets include the Standardised Climate Indices which include: Standardised Precipitation Index(SPI), Standardised Soil Moisture Index (SSMI) and Standardised Runoff Index (SRI). The indices are calculated from monthly CMIP5 GCM (Global Climate Model) rainfall(pr), Soil Moisture (mrsos) and runoff(mrsos) variables respectively. The Standardised Climate Indices are calculated for a 12 month seasonal period using the method described in "Loyd – Hughes and Saunders: A Drought Climatology for Europe 2002" and are the transformation of a water related variable timeseries into a standardised normal distribution. There are datasets consisting of monthly timeseries for SPI, SSMI and SRI for approximately 48 models for the historical(1850-2005) experiment and 37 models for the future rcp85(2006-2100) experiment. These monthly drought index timeseries have then also been further processed to calculate 10 standard wet/drought categories with 5 metrics including percent time, frequency, duration, maximum and intensity of events. Historical metric results include both long term 1901-2005 analysis as well as the shorter 1986-2005 period, whilst the future rcp85 experiment metric files contain both long term 2006-2099 analysis as well as 20 yr periods centred on 2030,2050,2070 & 2090 (as usually specified for IPCC CMIP5 reports). Percentage change files of these metrics from the future rcp85 experiment relative to the historical were also calculated. All of these datasets were calculated on the global model native grid, with the resultant metrics having also been regridded to both a common 1.5 degree global grid, as well as the AWAP 5km Australia grid. In addition, the same has been calculated using BoM/CSIRO AWAP 5km gridded observational rainfall to use for model evaluation and inter-comparison.

	All processed data is stored in netCDF file format on the NCI "Gadi" HPC infrastructure using the IPCC DRS structure, and is readable with any software or GIS programs capable of ingesting netCDF3 formatted data (python, panoply, NCL, ferret, ArcGIS etc). Regional subsetted data for Australia and four sub-regions (Rangeland, Northern Australia, Southern Australia and Eastern Australia) have also been calculated and stored on the NCI "Gadi" HPC infrastructure.
Temporal & spatial extent	Temporal extent: SPI and SSMI data for for approximately 48 models for the historical(1850-2005) experiment and 37 models for the future rcp85 (2006-2100) experiment. Drought projected changes for 2030, 2050, 2070 & 2090 relative to 1995. Spatial extent: Available globally in the model native resolution (~200km), also subsetted for the Australia continent on the AWAP grid and four NRM sub-regions (Rangeland, Northern Australia, Southern Australia and Eastern Australia).
Lineage	Climate Model data provided by the IPCC "Earth System Grid" contributed by participating international modelling groups and stored on the NCI "Gadi" HPC computing infrastructure.
Credit	Craig Heady,Stacey Osbrough,Vanessa Round, Dewi Kirono
Keywords	Standardised Climate Indices, Drought, Drought Indices, SPI, SRI, SSMI
ABS Fields of Research Category / Subcategory*	040607,040608

*These are listed in https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1297.02020

Attribution/IP(complete for data and software)	
Owning Organisation	CSIRO
Collaborating Organisations	CSIRO
Primary contact for this data	Craig Heady (craig.heady@csiro.au)
Lead Researcher	Dewi Kirono
Contributors	Craig Heady, Stacey Osbrough, Vanessa Round, Dewi Kirono, Francis Chiew
Access	Currently available on NCI "Gadi" HPC infrastructure
Licencing	Consult CSIRO Data Licence (https://confluence.csiro.au/display/daphelp/CSIRO+Data+Licence)

Related materials: publications, tools, websites, related input data. Please provide full citations for publications, data and software.	
Details	**URL**
Input data: AWAP data, The Australian Bureau of Meteorology's (BoM) monthly rainfall dataset, known as the Australian Water Availability Project (AWAP) (Jones et al., 2009)	http://www.bom.gov.au/metadata/catalogue/19115/ANZCW0503900567
Input data: CMIP5	https://esgf-node.llnl.gov/projects/cmip5/
Publication:	https://www.sciencedirect.com/science/article/pii/S2212094720300645

Kirono, D. G. C., V. Round, C. Heady, F. H. S. Chiew & S. Osbrough. 2020. Drought projections for Australia: Updated results and analysis of model simulations. *Weather and Climate Extremes,* 30. Doi.org/10.1016/j.wace.2020.100280	

Technical Details	
For data: **Total Size of this data collection**	SPI: • timeseries: 97 files 29GB • metrics: 338 files 51GB • metrics%ch: 74 files 40GB SRI: • timeseries: 72 files 22GB • metrics: 278 files 44GB • metrics%ch: 66 files 35GB SSMI: • timeseries: 68 files 22GB • metrics: 262 files 41GB • metrics%ch: 62 files 34 GB
For data: **Total Number of Files**	
Current location of files (data or software)	Currently available on NCI “Gadi” HPC infrastructure in project “dk7”
Format(s)	netCDF3
Associated tool(s)/ Dependencies	-
Proposed publication host	-

Project details	
ESCC Project No. & Title(s)	5.4: Water futures under climate change
Project Leader(s)	Dewi Kirono and Francis Chiew
Deliverable(s)	WA Farm Dam Case Study
Data/software Manager	Guobin Fu

Research output data collection, tool or software URLs if applicable

Description (complete for data, tools and software)	
Title	2000 runs of stochastic daily rainfall and evaporation time series for Wilyabrup catchment, Western Australia
Description	The historical daily rainfall, maximum temperature and potential evaporation (PET, Morton's wet) from 1981 to 2010 at the centre of Wilyabrup catchment (115.05E and 33.80S) were extracted from SILO data (Jeffrey et al. 2001). The observed data were then used to generate 1000 runs of stochastic daily rainfall and evaporation time series with SCL The monthly scaling factors from a 2030 dry scenario GCM (HadGEM2-CC, RCP 8.5) were extracted from Climate Change in Australia (CSIRO and Bureau of Meteorology, 2015) Application-ready projection data and applied to "observation" time series to produce a future 30 years (2014-2043) daily climate (rainfall, evaporation and daily maximum temperature) time series. The GCM data were then used to generate another 1000 runs of stochastic daily rainfall and evaporation time series with SCL. 15 of these 2000 time series were used by DWER to run Source Farm Dam Model. The outputs is stored in DWER.
Temporal & spatial extent	Historical 1981-2010 Future: 2014-2043 Spatial extent: Wilyabrup catchment
Lineage	SILO, CCiA (Climate Change in Australia)
Credit	CSIRO Land and Water
Keywords	Farm dam, Stochastic model, Daily rainfall and evaporation
ABS Fields of Research Category / Subcategory*	37 Earth Sciences

*These are listed in https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1297.02020

Attribution/IP (complete for data, tools and software)	
Owning organisation	CSIRO
Collaborating organisations	CSIRO
Primary contact for this data	Guobin.Fu@csiro.au
Lead researcher	Guobin Fu, Steve Charles
Contributors	Dewi Kirono, Vanessa Round
Access	The metadata and files are available to the public.

□ **Licencing**	Consult CSIRO Data Licence https://confluence.csiro.au/display/daphelp/CSIRO+Data+Licence

□ Required field

Related materials: publications, tools, websites, related input data. Please provide full citations for publications, data and software.	
Details	**URL**
Input data: SILO climate data	https://www.longpaddock.qld.gov.au/silo/
Input data: Climate Change in Australia	https://www.climatechangeinaustralia.gov.au

Technical details	
For data: Total size of this data collection	~1TB
For data: Total number of files	8
Current location of files (data or software)	CSIRO
Format(s)	csv
Associated tool(s)/ dependencies	N/A
Proposed publication host	CSIRO

Project details	
ESCC Project No. & Title(s)	5.4: Water futures under climate change
Project Leader(s)	Dewi Kirono and Francis Chiew
Deliverable(s)	Hydrological projections across Australia
Data/software Manager	Hongxing Zheng

Research output data collection, tool or software URLs if applicable

Description (complete for data, tools and software)	
Title	Gridded dataset of reconstructed and projected daily streamflow across Australia
Description	The dataset includes the reconstructed daily streamflow for the historical period (1889-2018) and projected daily streamflow for the future period (2046-2075) for each 5km×5km grid across the Australian continent. The daily streamflow was produced by three hydrological models (GR4J, Simhyd and XAJ). The inputs to the models were the SILO climate datasets. The projection of streamflow was informed by the change signals derived from ~40 CMIP5 GCMs of both RCP4.5 and RCP8.5.
Temporal & spatial extent	Reconstructed daily streamflow: 1889-2018 Projected daily streamflow: 2046-2075 Spatial extent: Australia continent
Lineage	CMIP5, SILO
Credit	CSIRO Land and Water hydrological projection team
Keywords	Streamflow, CMIP5, projection
ABS Fields of Research Category / Subcategory*	37 Earth Sciences

*These are listed in https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1297.02020

Attribution/IP (complete for data, tools and software)	
Owning organisation	CSIRO
Collaborating organisations	CSIRO
Primary contact for this data	Hongxing.zheng@csiro.au
Lead researcher	Hongxing Zheng, Francis Chiew
Contributors	Nick Potter, Dewi Kirono
Access	The metadata and files are available to the public.
□ **Licencing**	Consult CSIRO Data Licence https://confluence.csiro.au/display/daphelp/CSIRO+Data+Licence

□ Required field

Related materials: publications, tools, websites, related input data. Please provide full citations for publications, data and software.	
Details	**URL**
Input data: SILO climate data	https://www.longpaddock.qld.gov.au/silo/
Input data: CMIP5	https://esgf-node.llnl.gov/projects/cmip5/
Publication: Chiew FHS, Zheng H, Potter NJ, Ekstrom M, Grose MR, Kirono DGC, Zhang L and Vaze J (2017) Future runoff projections for Australia and science challenges in producing next generation projections. Proceedings of the 22nd International Congress on Modelling and Simulation, Hobart,	http://mssanz.org.au/modsim2017/L16/chiew.pdf

December 2017, pp. 1745–1751, http://mssanz.org.au/modsim2017/L16/chiew.pdf	
Publication: Zheng H, Chiew FHS, Potter NJ and Kirono DGC (2019) Projections of water futures for Australia: an update. Proceedings of the 23nd International Congress on Modelling and Simulation, Canberra, December 2019, pp. 1000 –1006. https://doi.org/10.36334/modsim.2019.K7.zhengH.pdf	https://doi.org/10.36334/modsim.2019.K7.zhengH.pdf

Technical details	
For data: **Total size of this data collection**	~6TB
For data: **Total number of files**	560,000
Current location of files (data or software)	CSIRO
Format(s)	csv
Associated tool(s)/ dependencies	N/A
Proposed publication host	CSIRO