Appendix: Bias plots for model evaluation

Figures 64 to 67 show bias plots of the CCAM simulated daily maximum (2 m) air temperature, daily minimum (2 m air temperature), average rainfall and 99th percentile rainfall, corresponding to the figures shown in section 4.2.

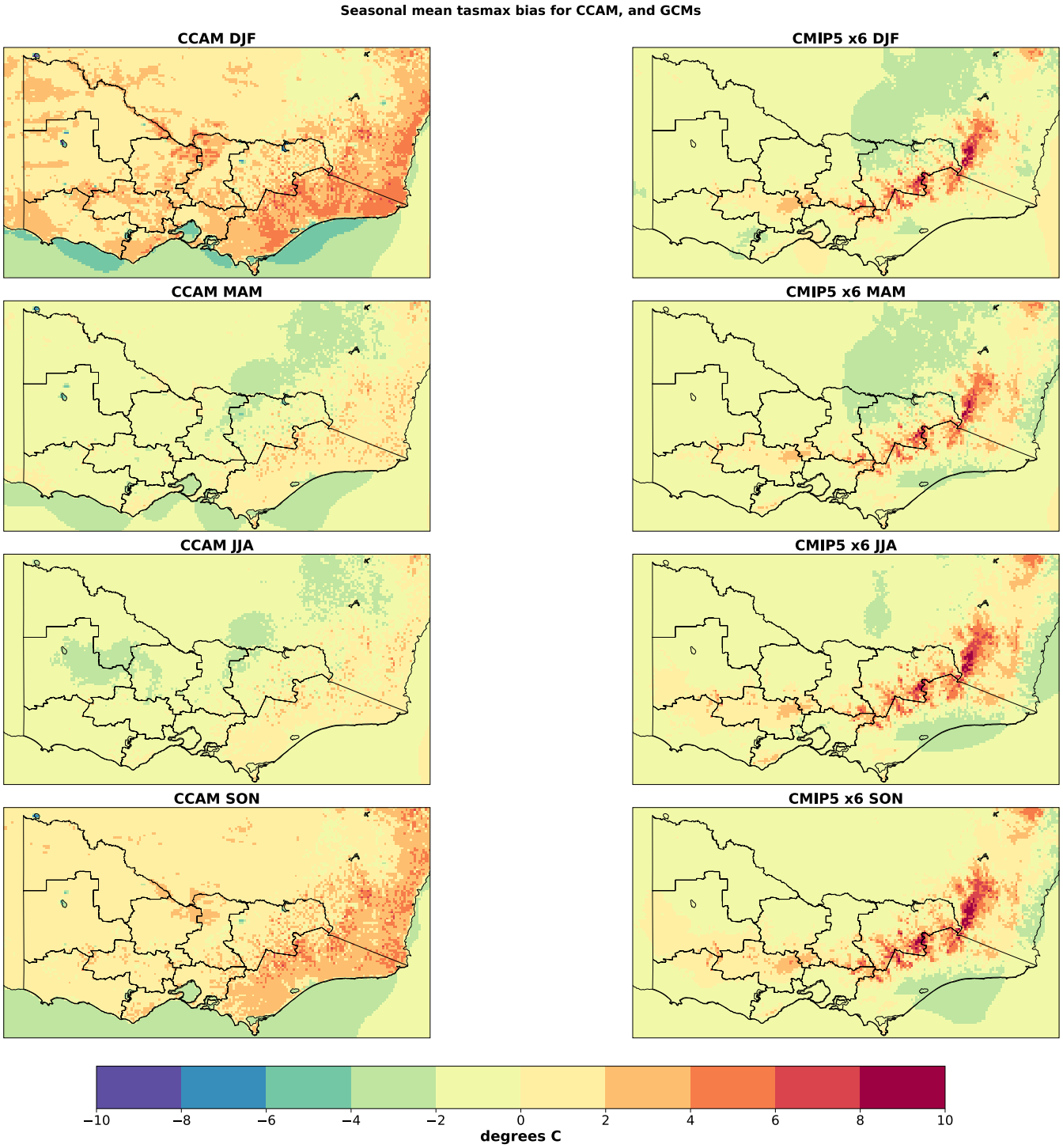


Figure 64. Bias plots for daily (2 m) maximum air temperature corresponding to Figure 8.

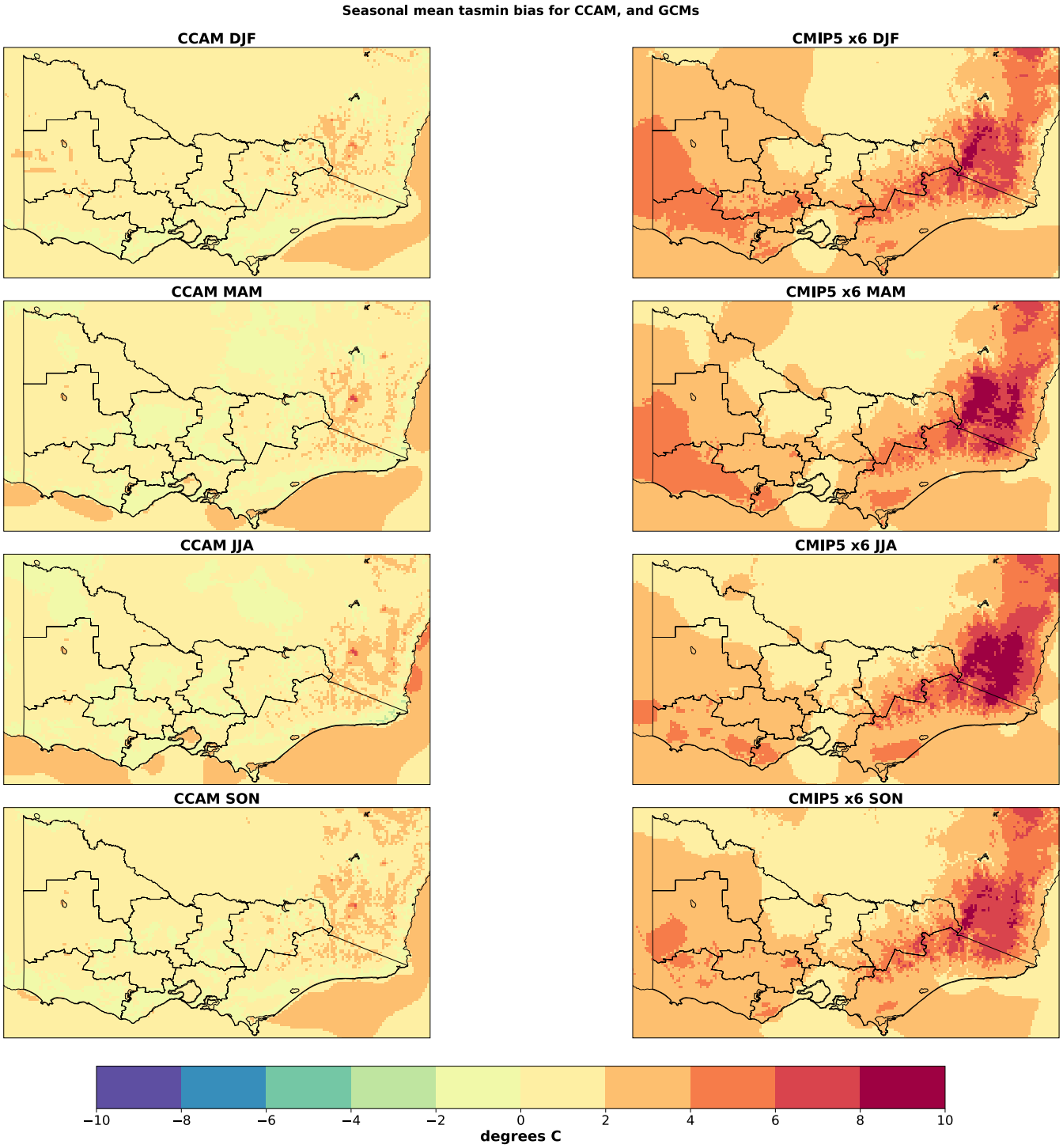


Figure 65. Bias plots for daily (2 m) minimum air temperature corresponding to Figure 9.

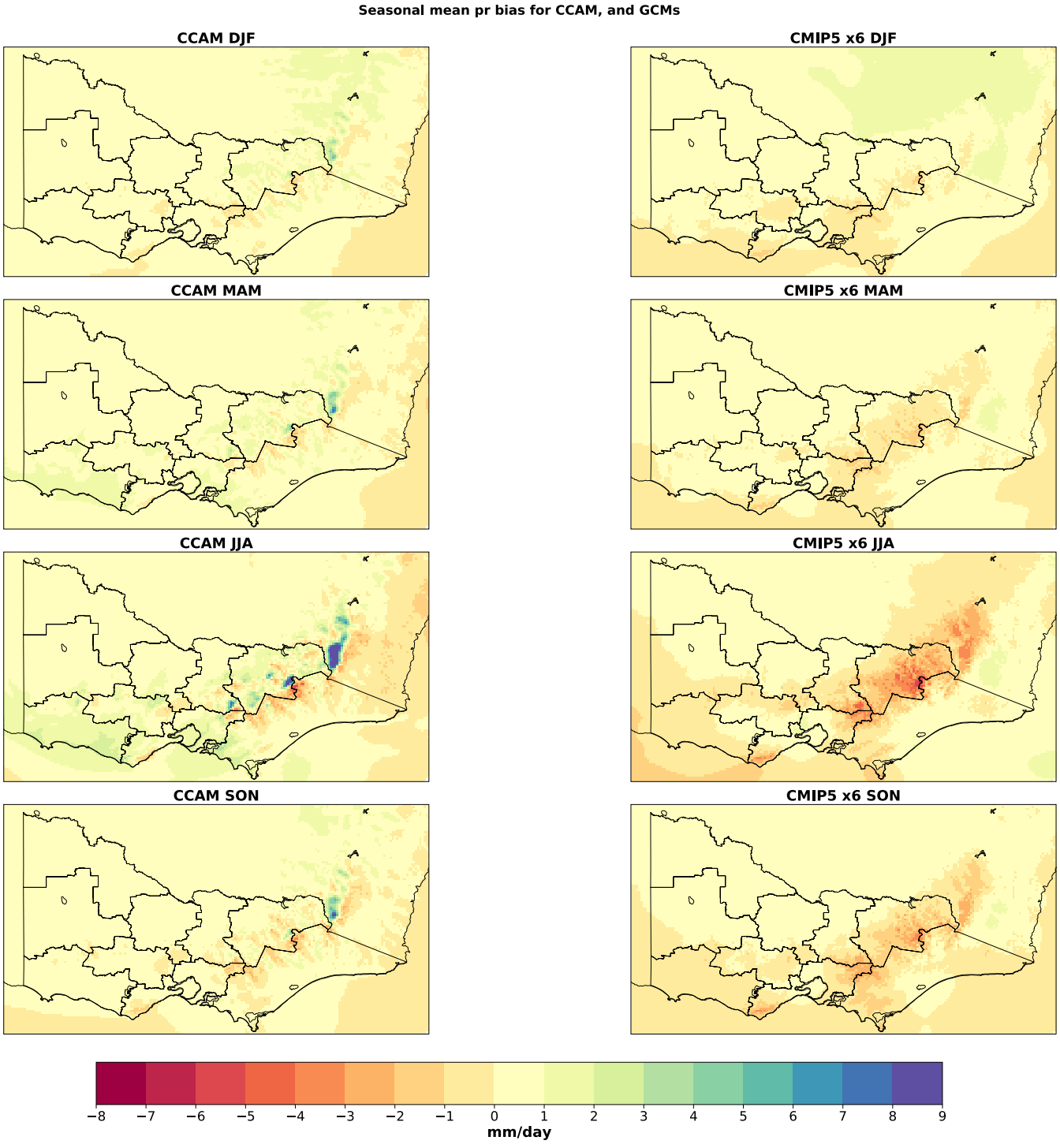


Figure 66. Bias plots for average rainfall in mm/day corresponding to Figure 12.

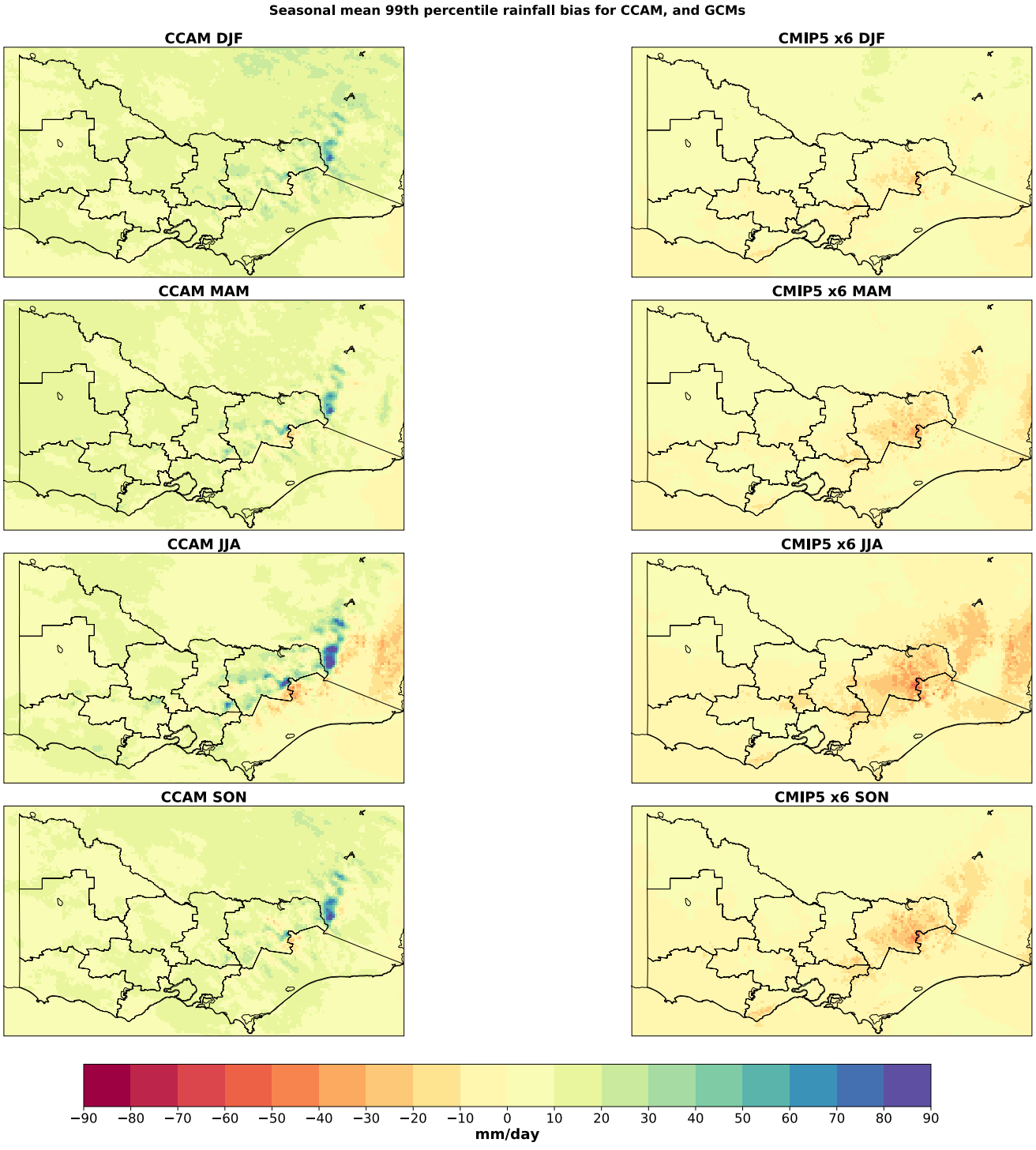


Figure 67. Bias plots for 99th percentile rainfall in mm/day corresponding to Figure 13.

Shortened forms

Acronym	Definition
BOM	Australian Bureau of Meteorology
CCAM	Conformal Cubic Atmospheric Model
CMIP5	Coupled Model Intercomparison Project phase 5
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DELWP	Department of Environment, Land, Water and Planning
DJF	Summer months – December January February
GCM	Global climate model
IPCC	Intergovernmental Panel on Climate Change
JJA	Winter months – JJA is June July August
MAM	Autumn months – MAM is March April May
RCM	Regional climate model
RCP	Representative Concentration Pathway
SON	Spring months – September October November
Tmax / Tmin	Daily maximum temperature / Daily minimum temperature
VCP19	Victorian Climate Projections 2019
VicCI	Victorian Climate Initiative

Glossary of terms

The following table provides descriptions of scientific terms that are used in this technical report. Some important terms that may be encountered in further reading are also included.

Term	Description
Adaptation	Changes made to natural or human systems to prepare for actual or expected changes in the climate in order to minimise harm, act on opportunities or cope with the consequences. *Incremental adaptation* Adaptation actions where the central aim is to maintain the essence and integrity of a system or process at a given scale. *Transformational adaptation* Adaptation that changes the fundamental attributes of a system in response to climate and its effects.
Aerosol	A suspension of very small solid or liquid particles in the air, residing in the atmosphere for at least several hours.
Anomaly	The departure of an element from its long-period average value for the location concerned. For example, a positive temperature anomaly means that the temperature was warmer than normal.
Atmosphere	The gaseous envelope surrounding the Earth. The dry atmosphere consists almost entirely of nitrogen and oxygen with a number of trace gases (e.g. argon, helium) and greenhouse gases (e.g. carbon dioxide, methane, nitrous oxide). The atmosphere also contains aerosols and clouds.

Term	Description
Bias	The tendency of a climate model to over- or under-estimate the value of a population parameter. For example, a positive temperature bias indicates that the simulated temperature is too warm compared to observed temperatures.
Carbon dioxide (CO_2)	A naturally occurring gas, also a by-product of burning fossil fuels from fossil carbon deposits, such as oil, gas and coal, of burning biomass, of land use changes and of industrial processes (e.g. cement production). It is the principal anthropogenic greenhouse gas that affects the Earth's radiative balance.
CCAM	Conformal Cubic Atmospheric Model, a dynamical model used to simulate the atmosphere, ocean surface and land. For this project it is used as a regional climate model to dynamical downscale global climate model outputs to add finer detail.
Climate	The average weather experienced at a site or region over a period of many years, ranging from months to many thousands of years. The relevant measured quantities are most often surface variables such as temperature, rainfall and wind.
Climate change	A change in the state of the climate that can be identified (e.g. by statistical analysis) by changes in the mean and/or variability of its properties, and that persists for an extended period of time, typically decades or longer.
Climate feedback	An interaction in which a perturbation in one climate quantity causes a change in a second, and that change ultimately leads to an additional (positive or negative) change in the first.
Climate projection	A climate projection is the simulated response of the climate system to a scenario of future emission or concentration of greenhouse gases and aerosols, generally derived using climate models. Climate projections are distinguished from climate predictions by their dependence on the emission/concentration/radiative forcing scenario used, which in turn is based on assumptions concerning, for example, future socioeconomic and technological developments that may or may not be realised. Throughout this report, we differentiate between 'climate projection data sets' and 'climate projections': *Climate projection data set* – data relating to future climate, usually obtained from a climate model. *Climate projection* – statements and/or data that describe future climate states that have been assessed as plausible, given the current state of knowledge of the climate system and informed by climate projection data sets.
Climate scenario	A plausible and often simplified representation of the future climate, based on an internally consistent set of climatological relationships that has been constructed for explicit use in investigating the potential consequences of anthropogenic climate change, often serving as input to impact models.
Climate sensitivity	An estimate of the global mean surface temperature response to doubled carbon dioxide concentration that is evaluated from model output or observations for evolving non-equilibrium conditions (units °C).
Climate variability	Variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all spatial and temporal scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability).
CMIP3 and CMIP5	Phases three and five of the Coupled Model Intercomparison Project, which coordinated and archived climate model simulations based on shared model inputs by modelling groups from around the world. The CMIP3 multi-model data set includes projections using SRES emission scenarios. The CMIP5 data set includes projections using the representative concentration pathways.
Confidence	The validity of a finding based on the type, amount, quality, and consistency of evidence (e.g. mechanistic understanding, theory, data, models, expert judgment) and on the degree of agreement.
Downscaling	A method that derives local to regional-scale information from larger-scale models or data analyses. Different methods include dynamical, statistical and empirical downscaling.

Term	Description
El Niño Southern Oscillation (ENSO)	A fluctuation in global scale tropical and subtropical surface pressure, wind, sea surface temperature, and rainfall, and an exchange of air between the southeast Pacific subtropical high and the Indonesian equatorial low. Often measured by the surface pressure anomaly difference between Tahiti and Darwin or the sea surface temperatures in the central and eastern equatorial Pacific. There are three phases: neutral, El Niño and La Niña. During an El Niño event the prevailing trade winds weaken, reducing upwelling and altering ocean currents such that the eastern tropical surface temperatures warm, further weakening the trade winds. The opposite occurs during a La Niña event.
Emissions scenario	A plausible representation of the future development of emissions of substances that are potentially radiatively active (e.g. greenhouse gases, aerosols) based on a coherent and internally consistent set of assumptions about driving forces (such as demographic and socioeconomic development, technological change) and their key relationships.
Extreme weather	An extreme weather event is an event that is rare at a particular place and time of year. Definitions of rare vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile of a probability density function estimated from observations.
Fire weather	Weather conditions conducive to triggering and sustaining wildfires, usually based on a set of indicators and combinations of indicators including temperature, soil moisture, humidity, and wind. Fire weather does not include the presence or absence of fuel load.
Global climate model or general circulation model (GCM)	A numerical representation of the climate system that is based on the physical, chemical and biological properties of its components, their interactions and feedback processes. The climate system can be represented by models of varying complexity and differ in such aspects as the spatial resolution (size of grid cells), the extent to which physical, chemical or biological processes are explicitly represented, or the level at which empirical parameterisations are involved.
Greenhouse gas	Gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of terrestrial radiation emitted by the Earth's surface, the atmosphere itself and by clouds. Water vapour (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4) and ozone (O_3) are the primary greenhouse gases in the Earth's atmosphere.
Hadley cell/circulation	A direct, thermally driven circulation in the atmosphere consisting of poleward flow in the upper troposphere, descending air into the subtropical high-pressure cells, return flow as part of the trade winds near the surface, and with rising air near the equator in the so-called Inter-Tropical Convergence Zone.
Host model	The model used as input when downscaling. In the case of climate simulations, the global climate model (such as ACCESS 1.0) is the host, and the regional climate model (in this case CCAM) takes input from this host and produces a finer-scale simulation.
Indian Ocean Dipole (IOD)	Large-scale mode of interannual variability of sea surface temperature in the Indian Ocean. This pattern manifests through a zonal gradient of tropical sea surface temperature, which in its positive phase in September to November shows cooling off Sumatra and warming off Somalia in the west, combined with anomalous easterlies along the equator.
Intergovernmental Panel on Climate Change (IPCC)	An organisation established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP). The IPCC provides governments at all levels with scientific information that they can use to develop climate policies (https://www.ipcc.ch/about/).
Jet stream	A narrow and fast-moving westerly air current that circles the globe near the top of the troposphere. The jet streams are related to the global Hadley circulation. In the southern hemisphere the two main jet streams are the polar jet that circles Antarctica at around 60°S and 7–12 km above sea level, and the subtropical jet that passes through the mid-latitudes at around 30°S and 10–16 km above sea level.
Madden Julian Oscillation (MJO)	The largest single component of tropical atmospheric intra-seasonal variability (periods from 30 to 90 days). The MJO propagates eastwards at around 5 ms^{-1} in the form of a large-scale coupling between atmospheric circulation and deep convection. As it progresses, it is associated with large regions of both enhanced and suppressed rainfall, mainly over the Indian and western Pacific Oceans.
Monsoon	A tropical and subtropical seasonal reversal in surface winds and associated rainfall caused by differential heating between a continental-scale land mass and the adjacent ocean. Monsoon rains occur mainly over land in summer.

Term	Description
Percentile	A value on a scale of one hundred that indicates the percentage of the data set values that is equal to, or below it. The percentile is often used to estimate the extremes of a distribution. For example, the 90th (or 10th) percentile may be used to refer to the threshold for the upper (or lower) extremes.
Radiative forcing	Radiative forcing is the change in the net, downward minus upward, radiative flux (expressed in Wm^{-2}) at the tropopause or top of atmosphere due to a change in an external driver of climate change, such as a change in the concentration of carbon dioxide or the output of the Sun.
Regional climate model (RCM)	A climate model for downscaling GCM results. Like a GCM, an RCM runs a numerical representation of the climate system that is based on the physical, chemical and biological properties of its components, their interactions and feedback processes.
Representative concentration pathway (RCP)	A scenario that includes time-series of emissions and concentrations of the full suite of greenhouse gases and aerosols and chemically active gases, as well as land use/cover. The word 'representative' signifies that each RCP provides only one of many possible scenarios that would lead to the specific radiative forcing characteristics (van Vuuren et al. 2011).
Return period	An estimate of the average time interval between occurrences of an event (e.g. flood or extreme rainfall) of a defined size or intensity.
Risk	The potential for consequences where something of value is at stake and where the outcome is uncertain. Risk is often represented as a probability of occurrence of hazardous events or trends multiplied by the consequences if these events occur.
Risk assessment	The qualitative and/or quantitative scientific estimation of risks.
Risk management	The plans, actions, or policies implemented to reduce the likelihood and/or consequences of risks or to respond to consequences.
Statistical climate model	A method of downscaling that estimates fine-scale climate information using the statistical relationships with large-scale climate parameters. When used to produce projections of future climate, the large-scale parameters are provided by a GCM. This approach assumes the statistical relationships will remain unchanged under a changing climate. For a recent evaluation of statistical downscaling, see Lanzante et al. (2018).
Subtropical ridge	A belt of high pressure that encircles the globe in the middle latitudes. It is part of the global circulation of the atmosphere. The position of the subtropical ridge plays an important part in the way the weather in Australia varies from season to season.
Southern Annular Mode (SAM)	The leading mode of variability of southern hemisphere geopotential height, which is associated with shifts in the latitude of the mid-latitude jet.
SAM index	A measure of the strength of SAM, otherwise known as the Antarctic Oscillation Index (AOI) is the index is based on mean sea-level pressure around the whole hemisphere at 40°S compared to 65°S. A positive index means a positive or high phase of the SAM, while a negative index means a negative or low SAM. This index shows a relationship to rainfall variability in some parts of Australia in some seasons.
SRES scenarios	Greenhouse gas emissions scenarios developed by Nakićenović and Swart (2000) in their Special Report on Emissions Scenarios (hence SRES) and used, among others, as a basis for some of the climate projections shown in Chapters 10 and 11 of IPCC (2007) and Chapter 5 of CSIRO and Bureau of Meteorology (2015).
Temperature (near-surface air temperature)	Unless specified otherwise, when the term temperature is used it refers to the temperature in observations, gridded data sets and models as that measured at weather stations at 1.2 to 2 m above the land surface in a clearing and behind a shading Stevenson's screen. Other terms for this include near-surface temperature, 2 m temperature and screen temperature.
Uncertainty	A state of incomplete knowledge that can result from a lack of information or from disagreement about what is known or even knowable. It may have many types of sources, from imprecision in the data to ambiguously defined concepts or terminology, or uncertain projections of human behaviour. Uncertainty can therefore be represented by quantitative measures (e.g. a probability density function) or by qualitative statements (e.g. reflecting the judgment of a team of experts).

For more definitions, see http://www.ipcc-data.org/guidelines/pages/glossary/glossary_a.html

References

Ashok, K., Guan, Z. and Yamagata, T. (2003). Influence of the Indian Ocean Dipole on the Australian winter rainfall. *Geophysical Research Letters* 30: 1821.

Bhend, J., Bathols, J.M. and Hennessy, K.J. (2012). Climate change inpacts on snow in Victoria. *CAWCR Research Report*, Centre for Australian Weather and Climate Research: 42 pp.

Bureau of Meteorology and CSIRO (2019). State of the Climate 2018.

Cai, W., Cowan, T. and Raupach, M. (2009). Positive Indian Ocean Dipole events precondition southeast Australia bushfires. *Geophysical Research Letters* 36: L19710.

Cai, W. and co-authors (2015). ENSO and greenhouse warming. *Nature Clim. Change* 5: 849-859.

Cai, W., Zheng, X.-T., Weller, E., Collins, M., Cowan, T., Lengaigne, M., Yu, W. and Yamagata, T. (2013). Projected response of the Indian Ocean Dipole to greenhouse warming. *Nature Geoscience* 6: 999.

CAWCR. 2016. Victorian Climate Initiative (VicCI). Retrieved 18th April 2019, from https://www.cawcr.gov.au/projects/vicci/.

Church, J., Gregory, J., White, N., Platten, S. and Mitrovica, J. (2011a). Understanding and projecting sea level change. *Oceanography* 24: 130-143.

Church, J.A. and White, N.J. (2006). A 20th century acceleration in global sea-level rise. *Geophysical Research Letters* 33.

Church, J.A. and co-authors (2011b). Revisiting the Earth's sea-level and energy budgets from 1961 to 2008. *Geophysical Research Letters* 38: n/a-n/a.

Clarke, J., Whetton, P.H. and Hennessy, K.J. (2011). Providing application-specific climate projections datasets: CSIRO's Climate Futures Framework. *MODSIM 2011, 19th International Congress on Modelling and Simulation.* F. Chan, D. Marinova and R. S. Anderssen. Perth, Western Australia, Modelling and Simulation Society of Australia and New Zealand: 2683-2690.

Collins, M. and co-authors (2013). Long-term Climate Change: Projections, Commitments and Irreversibility. *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. T. F. Stocker, D. Qin, G.-K. Plattner et al. Cambridge, United Kingdom and New York, NY, USA, Cambridge University Press 10.1017/CBO9781107415324.024: 1029–1136.

Crimp, S.J., Gobbett, D., Kokic, P., Nidumolu, U., Howden, M. and Nicholls, N. (2016). Recent seasonal and long-term changes in southern Australian frost occurrence. *Climatic Change* 139: 115-128.

CSIRO and Bureau of Meteorology (2015). Climate Change in Australia, Technical Report. Melbourne Australia. www.climatechangeinaustralia.gov.au.

CSIRO and Bureau of Meteorology (2007). *Climate change in Australia : technical report*. Aspendale, Australia, CSIRO Marine and Atmospheric Research.

Davis, C.J. (2013). Towards the development of long-term winter records for the Snowy Mountains. *Australian Meteorological and Oceanographic Journal* 63: 303-313.

DELWP (2016). Guidelines for assessing the impact of climate change on water supplies in Victoria., Department of Environment, Land, Water and Planning.

Di Virgilio, G. and co-authors (2019). Evaluating reanalysis-driven CORDEX regional climate models over Australia: model performance and errors. *Climate Dynamics* 10.1007/s00382-019-04672-w.

Dowdy, A.J. (2018). Climatological Variability of Fire Weather in Australia. *Journal of Applied Meteorology and Climatology* 57: 221-234.

Dowdy, A.J. and Catto, J.L. (2017). Extreme weather caused by concurrent cyclone, front and thunderstorm occurrences. *Scientific Reports* 7: 40359.

Ekström, M., Grose, M.R. and Whetton, P.H. (2015). An appraisal of downscaling methods used in climate change research. *Wiley Interdisciplinary Reviews: Climate Change* 6: 301-319.

Ekström, M., Hingray, B., Mezghani, A. and Jones, P.D. (2007). Regional climate model data used within the SWURVE project – 2: addressing uncertainty in regional climate model data for five European case study areas. *Hydrol. Earth Syst. Sci.* 11: 1085-1096.

Frederiksen, J.S. and Frederiksen, C.S. (2011). Twentieth Century Winter Changes in Southern Hemisphere Synoptic Weather Modes. *Advances in Meteorology* 2011: 16 pages, doi:10.1155/2011/353829.

Giorgi, F., Torma, C., Coppola, E., Ban, N., Schar, C. and Somot, S. (2016). Enhanced summer convective rainfall at Alpine high elevations in response to climate warming. *Nature Geosci* 9: 584-589.

GISTEMP_Team (2019). GISS Surface Temperature Analysis (GISTEMP). N. G. I. f. S. Studies. data.giss.nasa.gov/gistemp/

Grose, M.R. and co-authors (2015a). Southern Slopes Cluster Report. *Climate Change in Australia Projections for Australia's Natural Resource Management Regions: Cluster Reports.* M. Ekström, P. H. Whetton, C. Gerbing et al, CSIRO and Bureau of Meteorology.

Grose, M.R., Foster, S., Risbey, J.S., Osbrough, S.L. and Wilson, L. (2019a). Using indices of atmospheric circulation to refine southern Australian winter rainfall climate projections. *Climate Dynamics* 10.1007/s00382-019-04880-4.

Grose, M.R., Moise, A.F., Timbal, B., Katzfey, J.J., Ekstrom, M. and Whetton, P.H. (2015b). Climate projections for southern Australian cool-season rainfall: insights from a downscaling comparison. *Climate Research* 62: 251-265.

Grose, M.R., Risbey, J.S., Moise, A.F., Osbrough, S., Heady, C., Wilson, L. and Erwin, T. (2017a). Constraints on Southern Australian Rainfall Change Based on Atmospheric Circulation in CMIP5 Simulations. *Journal of Climate* 30: 225-242.

Grose, M.R., Risbey, J.S. and Whetton, P.H. (2017b). Tracking regional temperature projections from the early 1990s in light of variations in regional warming, including 'warming holes'. *Climatic Change* 140: 307-322.

Grose, M.R., Syktus, J., Thatcher, M., Evans, J.P., Ji, F., Rafter, T. and Remenyi, T. (2019b). The role of topography on projected rainfall change in mid-latitude mountain regions. *Climate Dynamics* 10.1007/s00382-019-04736-x.

Grose, M.R., Timbal, B., Wilson, L., Bathols, J. and Kent, D. (2015c). The subtropical ridge in CMIP5 models, and implications for projections of rainfall in southeast Australia. *Australian Meteorological and Oceanographic Journal* 65: 90-106.

Guerreiro, S.B., Fowler, H.J., Barbero, R., Westra, S., Lenderink, G., Blenkinsop, S., Lewis, E. and Li, X.-F. (2018a). Detection of continental-scale intensification of hourly rainfall extremes. *Nature Climate Change* 10.1038/s41558-018-0245-3.

Guerreiro, S.B., Fowler, H.J., Barbero, R., Westra, S., Lenderink, G., Blenkinsop, S., Lewis, E. and Li, X.-F. (2018b). Detection of continental-scale intensification of hourly rainfall extremes. *Nature Climate Change* 8: 803-807.

Harris, R.M.B. and co-authors (2018). Biological responses to the press and pulse of climate trends and extreme events. *Nature Climate Change* 8: 579-587.

Harris, R.M.B., Remenyi, T. and Bindoff, N.L. (2016). The Potential Impacts of Climate Change on Victorian Alpine Resorts. A Report to the Alpine Resorts Co-ordinating Council. Hobart, Australia, Antarctic Climate and Ecosystems Cooperative Research Centre.

Hennessy, K., Whetton, P., Walsh, K., Smith, I., Bathols, J., Hutchinson, M. and Sharples, J. (2008). Climate change effects on snow conditions in mainland Australia and adaptation at ski resorts through snowmaking. *Climate Research* DOI 10.3354/cr00706: 255-270.

Hoffmann, P., Katzfey, J.J., McGregor, J.L. and Thatcher, M. (2016). Bias and variance correction of sea surface temperatures used for dynamical downscaling. *Journal of Geophysical Research: Atmospheres* 121: 12877– 12890.

Hope, P., Timbal, B., Hendon, H. and Ekström, M. (2015a). Victorian Climate Initiative annual report 2014-15.

Hope, P., Timbal, B., Hendon, H.H., Ekström, M. and Potter, N.J. (2017). A Synthesis of Findings from the Victorian Climate Initiative (VicCI). Melbourne Australia, Bureau of Meteorology: 56.

Hope, P.K. and co-authors (2015b). Seasonal and regional signature of the projected southern Australian rainfall reduction. *Australian Meteorological and Oceanographic Journal* 65: 54-71.

Hunter, J., Coleman, R. and Pugh, D. (2003). The sea level at Port Arthur, Tasmania, from 1841 to the present. *Geophysical Research Letters* 30.

IPCC (2013a). *Climate Change 2013: The Physical Science Basis*. Cambridge, UK, and New York, NY, USA, Cambridge University Press.

IPCC (2013b). Climate Change 2013: The Physical Science Basis. *Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. T. F. Stocker, D. Qin, G.-K. Plattner et al. Cambridge, UK, and New York, NY, USA, Cambridge University Press.

IPCC (2018). *Global Warming of 1.5°C*. Geneva, Switzerland, World Meteorological Organization.

Jevrejeva, S., Grinsted, A., Moore, J.C. and Holgate, S. (2006). Nonlinear trends and multiyear cycles in sea level records. *Journal of Geophysical Research* 111.

Jevrejeva, S., Moore, J.C., Grinsted, A. and Woodworth, P.L. (2008). Recent global sea level acceleration started over 200 years ago? *Geophysical Research Letters* 35.

Jones, D.A., Wang, W. and Fawcett, R. (2009). High-quality spatial climate data-sets for Australia. *Australian Meteorological and Oceanographic Journal* 58: 233-248.

Jones, R.N. and Ricketts, J.H. (2017). Reconciling the signal and noise of atmospheric warming on decadal timescales. *Earth System Dynamics* 8: 177-210.

Katzfey, J.J. and co-authors (2016). High-Resolution Simulations for Vietnam - Methodology and Evaluation of Current Climate. *Asia-Pacific Journal of Atmospheric Sciences* 52: 91-106.

King, A.D., Karoly, D.J. and Henley, B.J. (2017). Australian climate extremes at 1.5 °C and 2 °C of global warming. *Nature Climate Change* 7: 412.

Knutti, R. (2018). A wider role for climate scenarios. *Nature Sustainability* 1: 214-215.

Kowalczyk, E. and co-authors (2013). The land surface model component of ACCESS: Description and impact on the simulated surface climatology. *Australian Meteorological and Oceanographic Journal* 63: 65-82.

Lanzante, J.R., Dixon, K.W., Nath, M.J., Whitlock, C.E. and Adams-Smith, D. (2018). Some Pitfalls in Statistical Downscaling of Future Climate. *Bulletin of the American Meteorological Society* 99: 791-803.

Lewis, S.C., King, A.D. and Mitchell, D.M. (2017). Australia's Unprecedented Future Temperature Extremes Under Paris Limits to Warming. *Geophysical Research Letters* 44: 9947-9956.

Lim, E.-P., Hendon, H.H., Arblaster, J.M., Delage, F., Nguyen, H., Min, S.-K. and Wheeler, M.C. (2016). The impact of the Southern Annular Mode on future changes in Southern Hemisphere rainfall. *Geophysical Research Letters* 43: 7160-7167.

Lipson, M., Thatcher, M., Hart, M. and Pitman, A. (2018). A building energy demand and urban land surface model. *Quarterly Journal of the Royal Meteorological Society* 144: 1-19.

Lucas, C. (2010). A High-quality Historical Humidity Database for Australia *CAWCR Technical Report*. Melbourne, Australia, The Centre for Australian Weather and Climate Research.

Marshall, G.J. (2003). Trends in the Southern Annular Mode from Observations and Reanalyses. *Journal of Climate* 16: 4134-4143.

Mastrandrea, M.D. and co-authors (2010). Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties, Intergovernmental Panel on Climate Change.

McGregor, J.L. (2005). C-CAM: Geometric aspects and dynamical formulation. *CSIRO Atmospheric Research Technical Paper*: 43.

McGregor, J.L. and Dix, M.R. (2008). An updated description of the Conformal-Cubic Atmospheric Model. *High Resolution Simulation of the Atmosphere and Ocean*. K. Hamilton and W. Ohfuchi, Springer: 51-76.

Mitrovica, J., Gomez, N., Morrow, E., Hay, C., Latychev, K. and Tamisiea, M. (2011). On the robustness of predictions of sea level fingerprints. *Geophysical Journal International* 187: 729-742.

Nicholls, N. (2005). Climate variability, climate change and the Australian snow season. *Australian Meteorological Magazine* 54: 177-185.

Pepler, A., Timbal, B., Rakich, C. and Coutts-Smith, A. (2014). Indian Ocean Dipole Overrides ENSO's Influence on Cool Season Rainfall across the Eastern Seaboard of Australia. *Journal of Climate* 27: 3816-3826.

Pook, M., Risbey, J. and McIntosh, P. (2013a). A comparative synoptic climatology of cool-season rainfall in major grain-growing regions of southern Australia. *Theoretical and Applied Climatology* 10.1007/s00704-013-1021-y: 1-13.

Pook, M.J., Risbey, J.S., McIntosh, P.C., Ummenhofer, C.C., Marshall, A.G. and Meyers, G.A. (2013b). The Seasonal Cycle of Blocking and Associated Physical Mechanisms in the Australian Region and Relationship with Rainfall. *Monthly Weather Review* 141: 4534-4553.

Potter, N.J., Ekström, M., Chiew, F.H.S., Zhang, L. and Fu, G. (2018). Change-signal impacts in downscaled data and its influence on hydroclimate projections. *Journal of Hydrology* 564: 12-25.

Power, S., Delage, F., Chung, C., Kociuba, G. and Keay, K. (2013). Robust twenty-first-century projections of El Nino and related precipitation variability. *Nature* advance online publication.

Ray, R.D. and Douglas, B.C. (2011). Experiments in reconstructing twentieth-century sea levels. *Progress in Oceanography* 91: 496-515.

Risbey, J.S., Pook, M.J., McIntosh, P.C., Wheeler, M.C. and Hendon, H.H. (2009). On the remote drivers of rainfall variability in Australia. *Monthly Weather Review* 137: 3233-3253.

Rohde, R., Muller, R.A., Jacobsen, R., Muller, E., Perlmutter, S. and al., e. (2013). A New Estimate of the Average Earth Surface Land Temperature Spanning 1753 to 2011. *Geoinformatics and Geostatistics: An Overview* 1.

Sanderson, B.M., Oleson, K.W., Strand, W.G., Lehner, F. and O'Neill, B.C. (2018). A new ensemble of GCM simulations to assess avoided impacts in a climate mitigation scenario. *Climatic Change* 146: 303-318.

Seneviratne, S.I., Corti, T., Davin, E.L., Hirschi, M., Jaeger, E.B., Lehner, I., Orlowsky, B. and Teuling, A.J. (2010). Investigating soil moisture-climate interactions in a changing climate: A review. *Earth-Science Reviews* 99: 125-161.

Seneviratne, S.I. and co-authors (2012). Changes in Climate Extremes and their Impacts on the Natural Physical Environment. *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*. C. B. Field, V. Barros, T. F. Stocker et al. Cambridge, UK and New York, NY, USA, Cambridge University Press.

Shepherd, T.G. and co-authors (2018). Storylines: an alternative approach to representing uncertainty in physical aspects of climate change. *Climatic Change* 151: 555-571.

Thatcher, M. and Hurley, P. (2012). Simulating Australian urban climate in a mesoscale atmospheric numerical model. *Boundary-Layer Meteorology* 142: 149-175.

Thatcher, M. and McGregor, J.L. (2009). Using a scale-selective filter for dynamical downscaling with the conformal cubic atmospheric model. *Monthly Weather Review* 137: 1742-1752.

Timbal, B. and co-authors (2015). Murray Basin Cluster Report. . *Climate change in Australia projections for Australia's natural resource management regions.* M. Ekström, P. H. Whetton, C. Gerbing et al, CSIRO and Bureau of Meteorology.

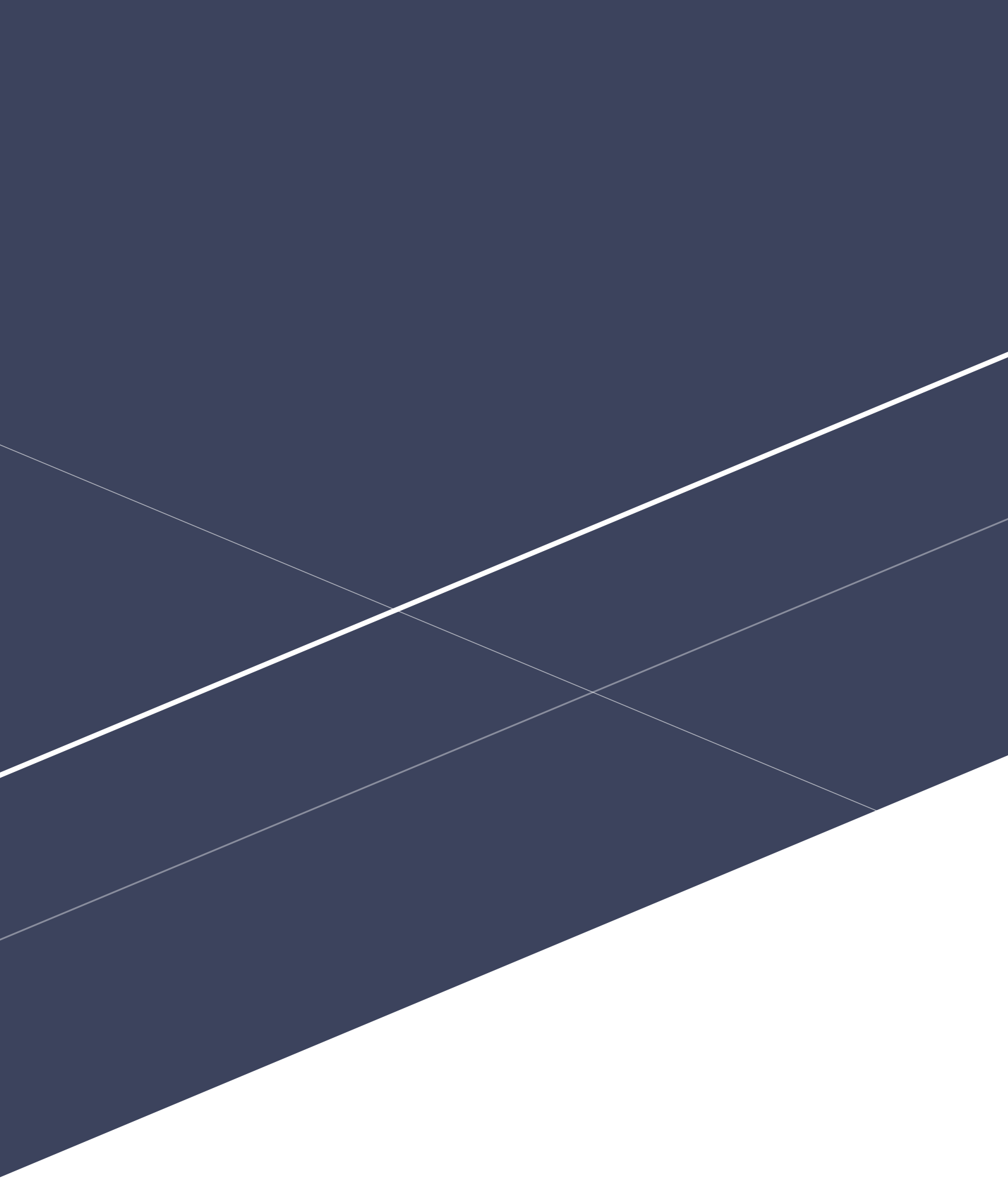
Timmermann, A. and co-authors (2018). El Niño–Southern Oscillation complexity. *Nature* 559: 535-545.

Trewin, B. (2013). A daily homogenized temperature data set for Australia. *International Journal of Climatology* 33: 1510-1529.

van Vuuren, D.P. and co-authors (2011). The representative concentration pathways: an overview. *Climatic Change* 109: 5-31.

Watterson, I.G. (2008). Calculation of probability density functions for temperature and precipitation change under global warming. *Journal of Geophysical Research* 113.

Whetton, P., Hennessy, K., Clarke, J., McInnes, K. and Kent, D. (2012). Use of Representative Climate Futures in impact and adaptation assessment. *Climatic Change* 115: 433-442.



VICTORIA State Government | Environment, Land, Water and Planning

CSIRO