Assessing patterns of future hydrological change for Australia: insights from the National Hydrological projections

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As one of the world’s driest continents, Australia’s water resources need to be carefully managed to ensure sustainable access to water for livelihoods, human well-being, and ecosystem health. Australia is also a land of extremes from floods to droughts and catastrophic wildfires which are all becoming more frequent and destructive. It is essential to understand future changes in water availability and hydrologic extremes to support the development of mitigation strategies and the planning for water infrastructure and policies. To build this understanding, the Bureau of Meteorology has released the Australian Water Outlook (AWO), a seamless national landscape water service. The AWO includes National Hydrological Projections, as well as seasonal forecast and historical products, all using the Bureau’s Australian Water Landscape Water Balance model (awo.bom.gov.au).

Projection results feature many sources of uncertainty, including how future greenhouse gas emissions will develop, how a changing climate will lead to changes to hydrological features and feedback loops, and the climate and hydrological models used to simulate those changes. Acknowledging these uncertainties, the Bureau’s National Hydrological Projections ensemble provides a unique opportunity to examine impacts of future changes on Australia’s hydroclimate and its water resources. It allows nationally consistent impact assessments across multiple spatial and temporal scales. To produce these projections, three bias-correction approaches were used as well as a regional downscaling model. These methods were in turn applied to four global climate models in an operational framework resulting in a nationally consistent future change dataset for climate (rainfall, solar radiation, temperature, and wind) and hydrological (soil moisture, evapotranspiration, and runoff) variables.

An overview of the National Hydrological Projections methods and results, including a series of 8 regional water resource assessment reports, will be presented. The reports were created to facilitate understanding and use of the data and describe future changes in regional hydrology using a novel storyline approach. The storyline approach is used to improve the communication of plausible impacts to Australia’s future water availability. Plausible futures portend a drier climate for large parts of Australia which could pose challenges for future water resource management.