

Foundation Data Products

Water for a Healthy Country

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Australian Government
Bureau of Meteorology

National Research
FLAGSHIPS
Water for a Healthy Country



The Gridded Foundation Products project is delivering new methods and tools to produce gridded water data products of precipitation, actual evapotranspiration and open water mapping. The products will underpin hydrologic assessment and forecasting across Australia.

Transforming Australia's water resources information

The need to accurately monitor, assess and forecast the availability, condition and use of Australia's water resources is now more important than ever. The past decade of severe drought and recent extreme climatic events in Australia pose significant challenges to the management of Australia's water resources as we attempt to deal with an ever-increasing demand for water. The Water Information Research and Development Alliance is transforming the way Australia manages water resources, by bringing together the research and development expertise of CSIRO's Water for a Healthy Country Flagship in water and information sciences, and the Bureau of Meteorology's operational role in hydrological analysis and prediction.

Objective

National water balance estimates are required by the Bureau for production of the National Water Account and Australian Water Resource Assessment report. Accurate estimates of precipitation, evapotranspiration and flooding inundation and flooding volumes are fundamental to the water balance estimate required. This project is providing new and improved national gridded estimates of precipitation, evapotranspiration

and flood inundation. The work builds on previous comparisons of precipitation and actual transpiration estimation methods, and on a trial application of the flood inundation/volume product, to produce operational systems for ongoing production of these foundation data streams at a continental scale.

Key research areas

The Gridded Foundation Products project will extend previous research to deliver systems that:

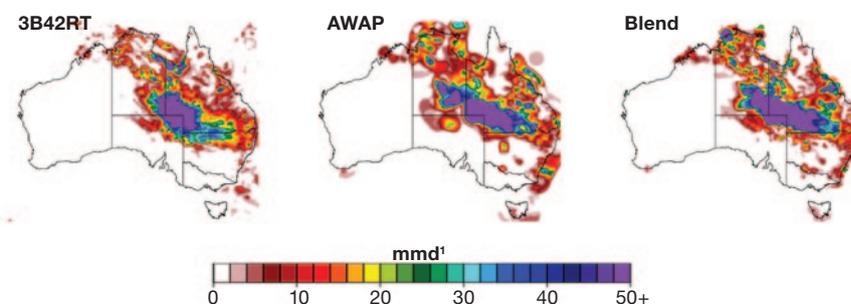
- blend multiple sources of precipitation data (both measured and derived) to produce gridded surfaces of daily precipitation

- produce estimates of actual evapotranspiration appropriate to environments and conditions across the continent
- quantify the surface area inundated by water and the volume of water involved.

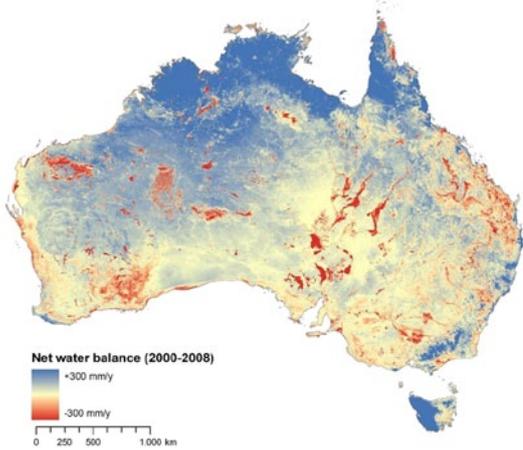
Delivering outcomes

a) Better precipitation data

Researchers have produced blended precipitation products that exploit the strengths of two data sources: the point accuracy of in situ gauge observations, and the comprehensive coverage of satellite estimates. These products have been compared with existing data sets to evaluate their accuracy, and are being implemented alongside current Bureau of Meteorology operations for further extensive testing and evaluation (Figure 1).



> Figure 1. Near real-time continental daily rainfall estimates (millimetres per day) for 1 March 2010. From left to right: daily accumulation from a NASA multi-satellite rainfall product; ground-based rain gauge-only analysis of daily rainfall from the Australia Water Availability Project (AWAP); and blended gauge and satellite rainfall estimate. The figure shows the rain front that led to widespread flooding in southern Queensland and northern New South Wales.



> Figure 2. Average water balance for Australia averaged over the period 2001–08, produced by combining precipitation and satellite evapotranspiration products. In blue areas, precipitation exceeds water use; in red areas, evapotranspiration exceeds precipitation (e.g. irrigation areas, floodplains, wetlands).

b) Accurate water use estimates at different scales

Evapotranspiration is the sum of evaporation from water, soil and plants. It accounts for more than 85 per cent of Australia's rainfall, and is an important component of the water balance across the whole continent. To improve our understanding of water use, evapotranspiration needs to be characterised for the entire continent: ideally at paddock scale, and at a weekly or better timestep.

Following an evaluation of eight different methods of estimating evapotranspiration, a prototype operational system has been developed to quantify evapotranspiration levels.

The ratio of evapotranspiration to precipitation can identify regions with

quite different water balance characteristics (Figure 2).

c) Tracking and quantifying surface water

In a flat continent such as Australia, flood events often result in surface water movement outside normal stream and river courses. The volumes of water involved in these short-lived events represent a large and dynamic component of the overall water balance. Mapping the extent of flooding is essential to quantify how land is affected and, through the use of accurate digital elevation models, how much water is moving through a river system (Figure 3). In turn, these measurements improve estimates of available water and

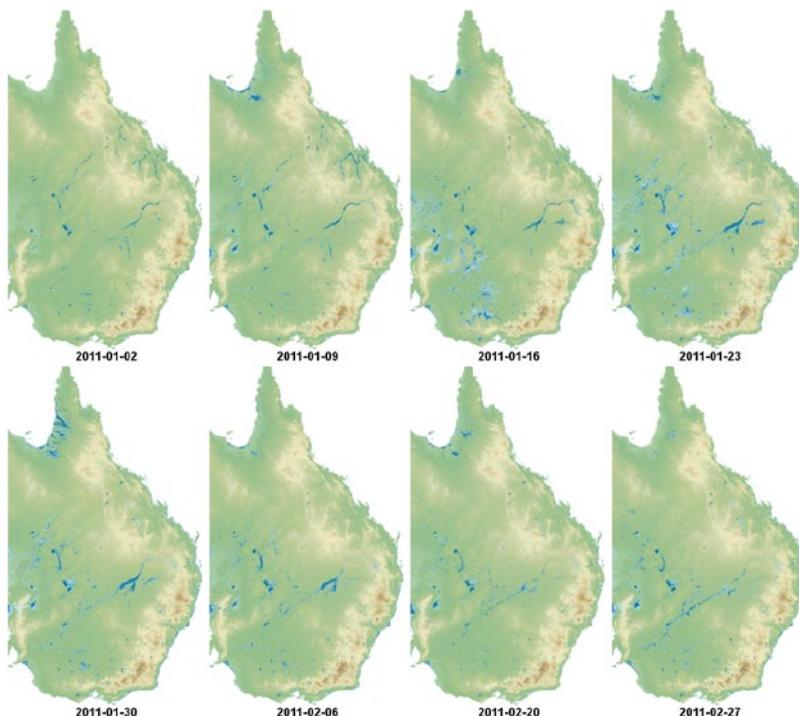
enable better prediction of the extent and timing of impacts downstream as the water moves through the river system.

Partners

From 2008 to 2013, the Water Information Research and Development Alliance is delivering the scientific and research innovation required by the Bureau to fulfil its national water information mandate. Through a strategic investment of \$50 million over five years, more than 40 researchers are focusing on several challenging areas. These include large-scale information architectures, earth observation, hydrological modelling, water accounting, water resource assessment and water forecasting.

Other partners in the Gridded Foundation Products project include:

- Centre for Australian Weather and Climate Research
- University of New South Wales
- WaterWatch, Netherlands
- University of Montana, USA



> Figure 3. Sequence of daily flood extent maps for the first eight weeks of 2011 showing the progression of water across the landscape.

A water information R & D alliance between the Bureau of Meteorology and CSIRO's Water for a Healthy Country Flagship

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Find out more about the Water Information Research and Development Alliance at www.csiro.au/partnerships/WIRADA.html

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CSIRO and the Flagships program

Australia is founding its future on science and innovation. Its national science agency, CSIRO is a powerhouse of ideas, technologies and skills. CSIRO initiated the National Research Flagships to address Australia's major research challenges and opportunities. They apply large scale, long term, multidisciplinary science and aim for widespread adoption of solutions.