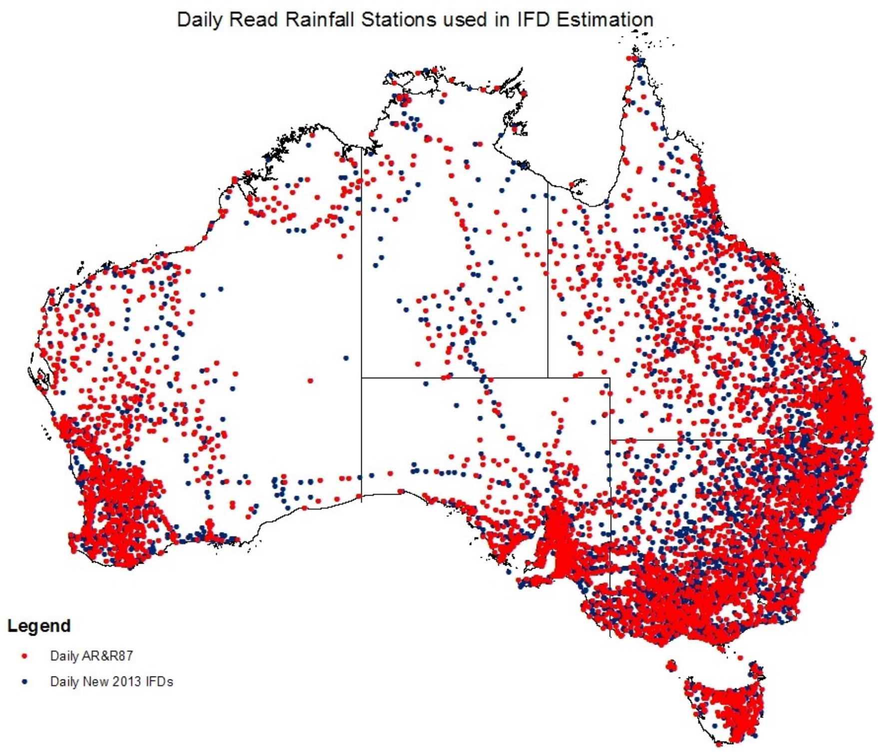
How were the new IFDs estimated?

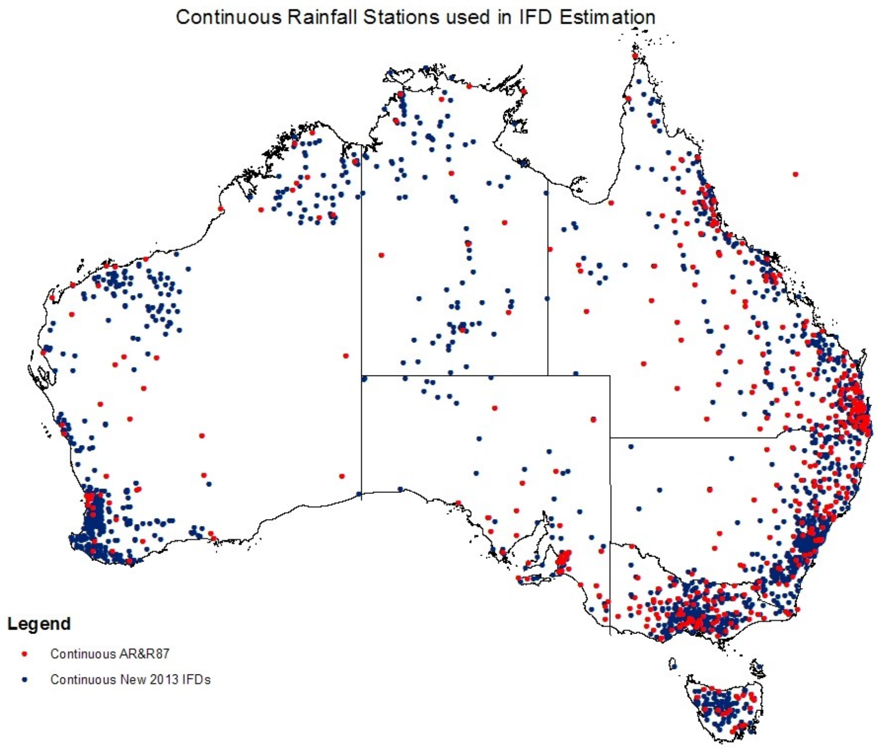
Collation of rainfall database

A database containing data from all available rainfall stations was created. The number of continuously recording (sub-daily) rainfall stations available was significantly greater than the number available to ARR87 due to the inclusion of data collected by other organisations and provided to the Bureau through the Water Regulations 2008 (Commonwealth).

Type	Source	Length of record	ARR87	New IFDs
Daily	Bureau	> 30 years	7500	8074
Continuous	Bureau	> 8 years	600	754
Continuous	Water Regulations	> 8 years	n/a	1526



Location of daily read rain gauges



Location of continuously recording rain gauges

The rainfall records for each of these stations were put through automatic and manual quality control procedures, described in Green et al (2011). Some general types of errors corrected included accumulations, time shifts, missing data, and gross errors. The location information (latitude, longitude and elevation) was also checked.

Undertaking frequency analysis
The Annual Maximum Series (AMS) was extracted from the quality controlled database for (i) all daily-read stations with 30 or more years of record and (ii) all continuously-recording stations with more than 8 years of record. The Annual Maximum Series is the series of maximum rainfalls per calendar year, for a range of rainfall burst durations. Factors were applied to the daily-read rainfalls to convert 9am-to-9am rainfalls to unrestricted 24-hour rainfalls.

A Generalised Extreme Value (GEV) frequency distribution was fitted to the AMS, as this distribution best represents Australian data. The three L-moments (namely, the mean, the coefficient of L-variation (L-CV) and L-skewness) were used to summarise the statistical properties of the AMS data at each station location (Hosking and Wallis, 1997). In order to improve the spatial coverage of the sub-daily rainfall data, a Bayesian Generalised Least Squares Regression (BGLSR) was applied to infer the sub-daily L-moments from those at the daily-read stations. Johnson et al (2012a).

Regionalisation of rainfall data
Regionalisation was undertaken to reduce the sampling uncertainty introduced by stations with shorter periods of record by combining L-moments from stations within a region of influence in a manner that gives more weight

to the longer records. An Index Rainfall Approach was adopted to do this with station point estimates being regionalised using a Region of Influence Approach. The regionalised L-CV and L-Skewness were combined with the at-site mean to estimate GEV distribution parameters (mean, shape and scale) and rainfall quantiles for any required exceedance probability at each station location. Johnson et al (2012b).

Creation of final grids

To extend the regionalised GEV distribution parameters of mean, shape and scale to any point in Australia, the at-site values were translated to regular gridded rainfall estimates using thin plate smoothing splines using the ANUSPLIN algorithm. This enabled rainfall quantiles for any required Annual Exceedance Probability to be estimated at any point in Australia. The et al (2012).

More detailed information

A more detailed explanation of the study can be found in Green et al (2012). A draft Chapter for the revised Australian Rainfall and Runoff which is currently in preparation and due to be released this year will provide further explanation. The Bureau of Meteorology is also preparing a comprehensive report of the derivation of the new IFDs and will publish on its website when available.