Regional Groundwater Recharge in the Surat Basin

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BACKGROUND

- There is significant uncertainty about groundwater recharge rates in the Surat Basin. For example, the Office of Groundwater Impact Assessment (OGIA) estimates are significantly different from deep drainage estimates used by the Bureau of Meteorology (BoM) (Fig 1).

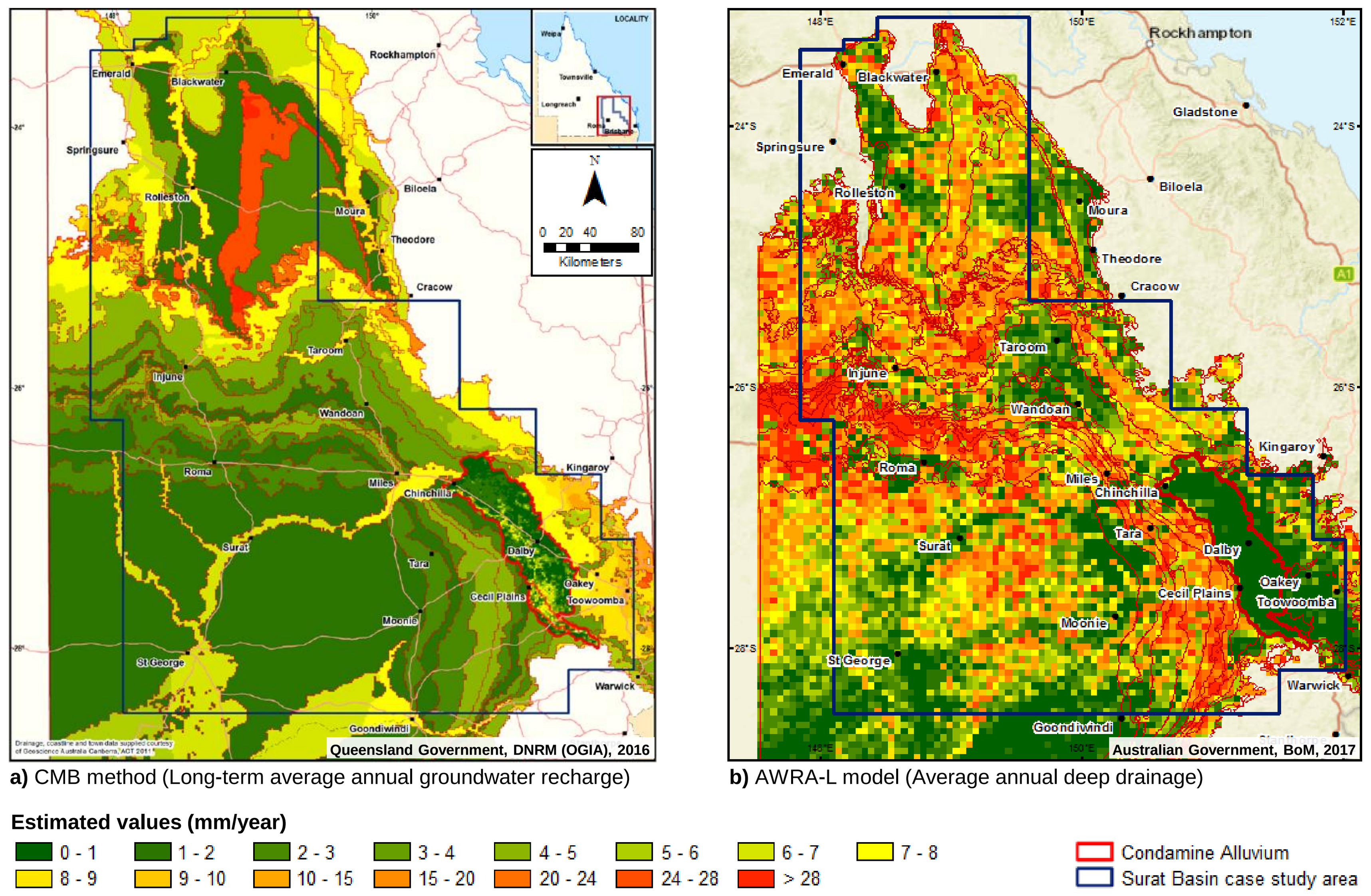

Fig 1 Current estimates of **a)** Recharge using the Chloride Mass Balance method and **b)** Deep drainage using the Australian Water Resources Assessment Landscape model

RESEARCH QUESTIONS

- Which are the important uncertainties in the CMB calculation and what influence do these have on recharge estimates at different spatial scales?
- What are the minimum data requirements to support application of the CMB method?
- Can the CMB method be combined with a water balance model such as AWRA-L to reduce uncertainties associated with surface runoff?

APPROACH

- Revisit OGIA's recharge estimates from the CMB method:
  - Identify and prioritise the assumptions used
  - Quantify the uncertainties arising from the priority assumptions
  - Provide a consistent framework for analysing uncertainty in recharge estimates produced using the CMB method
- Baseline analysis, sensitivity analysis, calibration, and validation of AWRA-L:
  - Determine parameters which have the most influence on recharge estimates
- Merging the AWRA-L model with the CMB method

CURRENT WORK – CMB METHOD ANALYSIS

- Review of the OGIA CMB analysis identified a number of limitations, three of which are considered to be priorities:

1. Influence of sample selection on kriging results (see method in Fig 2):
   - Sample size
   - Location/distribution of sampling sites
   - Period of sampling
2. Estimation of runoff at CIGW sample sites
3. Estimation of chloride removal at CIGW sample sites

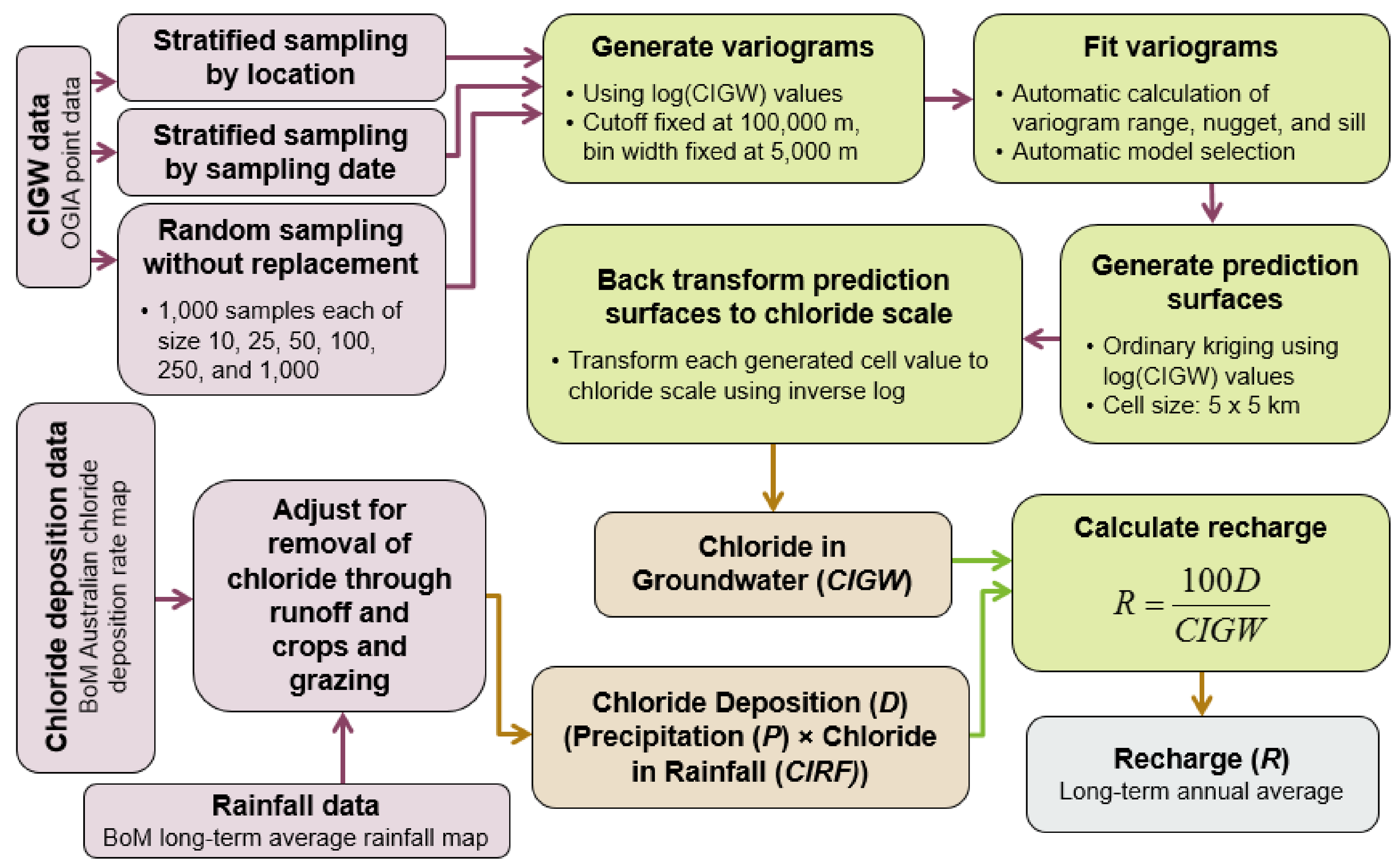

Fig 2 Process used to assess the influence of sample selection on recharge estimates

INFLUENCE OF SAMPLE SIZE

- Main Range Volcanics (MRV) case study: 1,203 Chloride in Groundwater (CIGW) samples (Figs 3, 4)

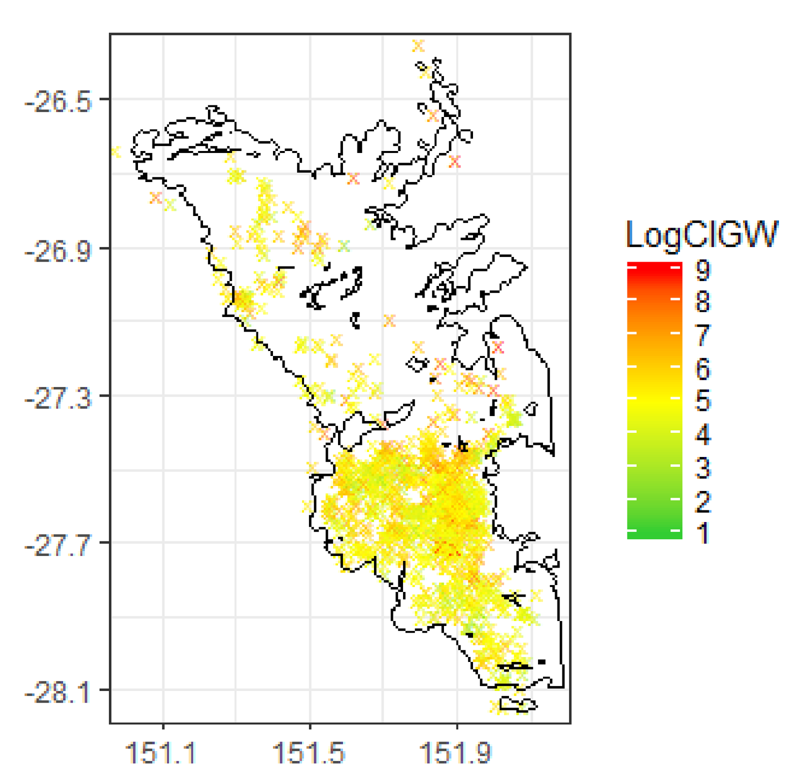

Fig 3 Locations of CIGW samples in the MRV dataset

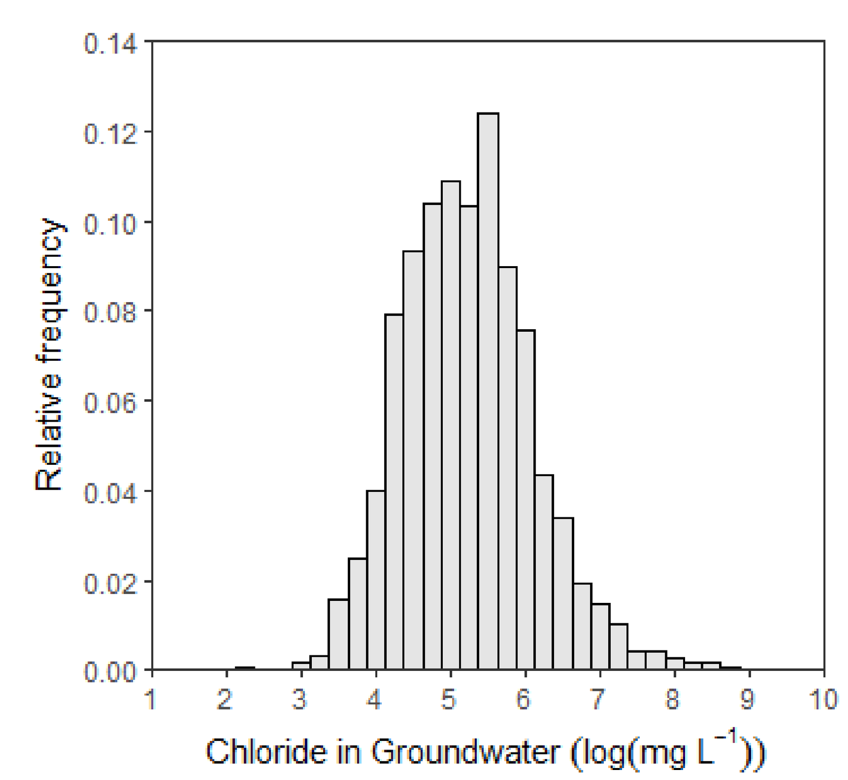

Fig 4 Distribution of CIGW samples in the MRV dataset

RESULTS

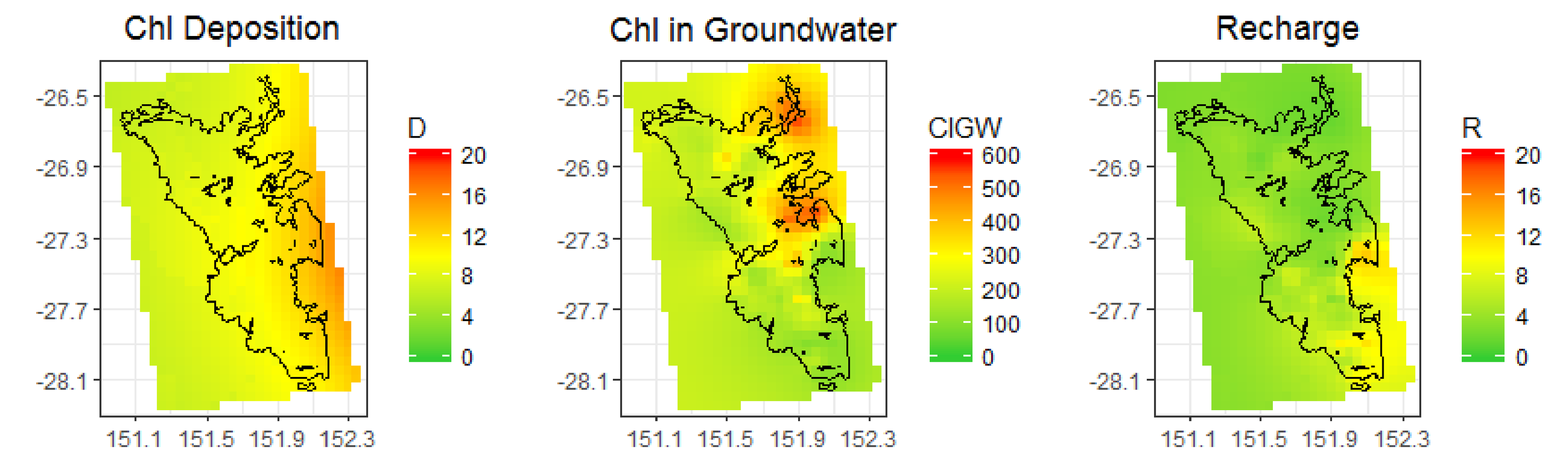

Fig 5 Input layers Chloride Deposition (kg h^{-1} yr^{-1}) (scaled according to Method 3 in OGIA (2016)) and Chloride in Groundwater (mg L^{-1}); and the resulting Recharge (mm yr^{-1}) output layer using all of the samples (1,203) in the dataset

Table 1 Estimated recharge values for the MRV with OGIA's estimates for comparison

Dataset	Min (mm yr^{-1})	Mean (mm yr^{-1})	Max (mm yr^{-1})
All points (1,203 samples)	0.2	7.7	105
Kriging using all points (5km grid)	1.8	4.6	12.8
OGIA (2016)	*0.2*	*9.4*	*130*

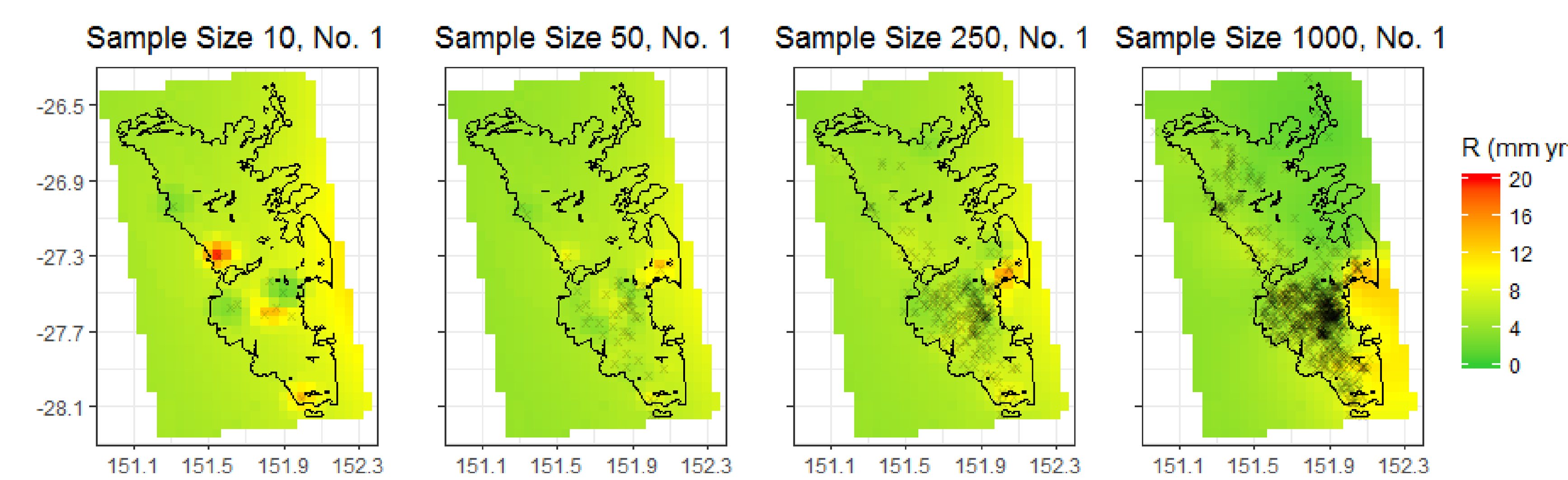

Fig 6 Examples of recharge maps using different sizes of CIGW data sets for kriging

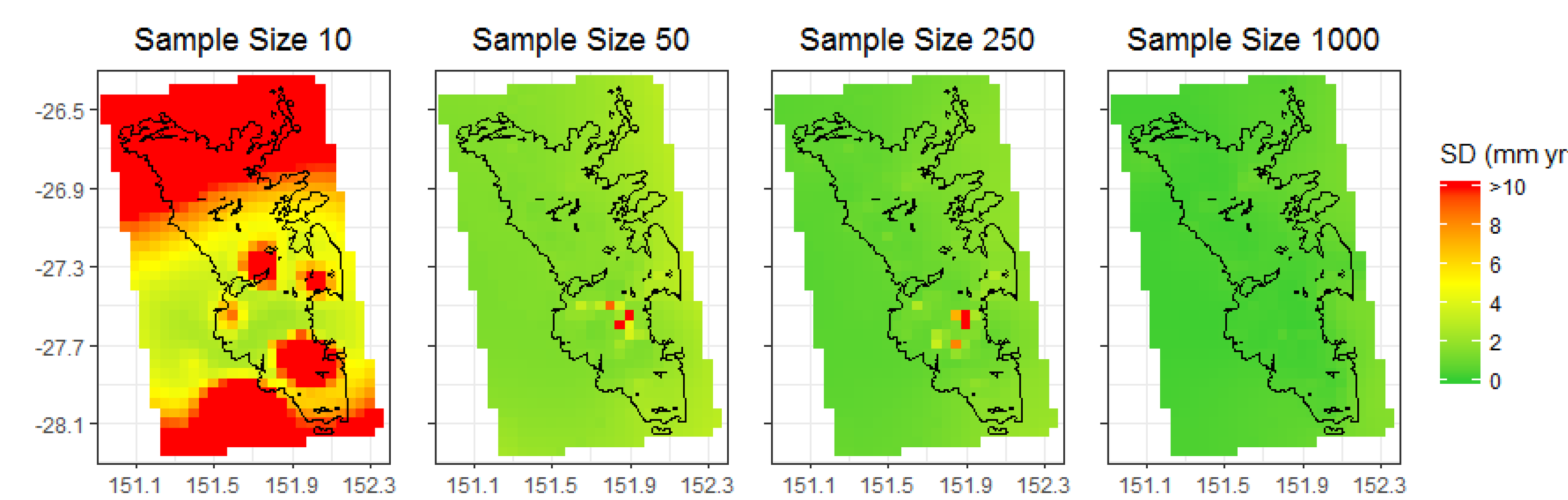

Fig 7 Recharge standard deviation maps produced from the 1,000 realisations (random sampling without replacement) using sample sizes 10, 50, 250, and 1000

ACKNOWLEDGEMENTS

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