Building narratives to characterise uncertainty in future regional rainfall change through expert elicitation

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Knowledge about regional and local climate change can inform climate risk assessments and adaptation decisions. However, estimates of future rainfall change at the regional and local level are deeply uncertain for many parts of the world. A novel methodology was developed that uses climate processes and expert elicitation to build narratives of future regional rainfall change. The narratives qualitatively describe physically plausible evolutions of future regional climate substantiated by climate processes. This method is applied to the Indian Summer Monsoon, focusing on the Cauvery river basin in Karnataka, Southern India. Six climate narratives are constructed as a function of two drivers prioritised by the experts: moisture availability over the Arabian Sea and strength of the low-level westerly flow. The narratives describe how climate processes and anthropogenic factors could influence their potential evolution. Analysis using observed (Global Precipitation Climatology Centre) and re-analysis (ERA20 and Interim) data shows the experts' judgement on key drivers fits well with empirical relationships. The expert elicited drivers explain 70% of the variance in peak monsoon rainfall (July and August) over the Western Ghats between 1979-2013 (using ERA Interim). The study shows that through expert elicitation, process-based narratives enable climate scientists to characterise deep uncertainty in future rainfall change. Expert judgment techniques should be more widely applied to characterise uncertainty in regional and local climate change.