# Working Group E: What is climate?

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- What is climate? What is the climate **now**? (Latter needed for initial-value predictions)
- The widespread consensus that initial conditions are relatively unimportant in climate prediction was challenged
- We cannot observe the climate; we merely observe the states of the various components of the climate system at various instants in time
- It can be helpful to study imperfectly observed toy models such as the logistic map, $x_{t+1}=1-ax_t^2$ where $x_0=[-1,1]$ and $a=[0,2]$, although the climate is much more complicated
- Climate is:
  - the invariant measure in a hypothetical thought experiment in which the forcing is held constant indefinitely
  - what is obtained by taking the joint PDF for the state and the parameters, and then integrating it over the parameters
- Alternative viewpoint:
  - climate should be defined operationally
- The climate now is:
  - the PDF of the current system state given all the historical observations
- Current GCMs are not configured to produce PDFs, and hence additional effort and assumptions (e.g. ergodicity) are required to compute climate as defined above
- Suggestions for the Newton Institute programme:
  - Study toy models to clarify helpful ways of thinking about definitions of climate (but always tie them back to practical questions)
  - Resolve the tension between the conceptual and operational definitions of climate