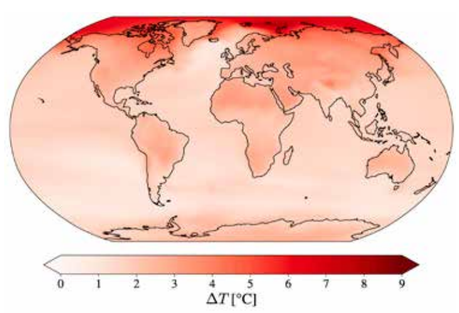
Goal: Emulate the statistics of a chaotic system

1

Select a climate variable of interest



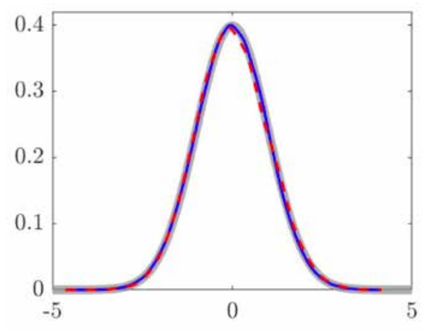
$$\frac{\partial w}{\partial t} = \mathcal{N}(w, F) + \epsilon\xi,$$

Option 1:

2a

Target the full probability distribution

$p(w)$



3a

Approximate Fokker-Planck Operator

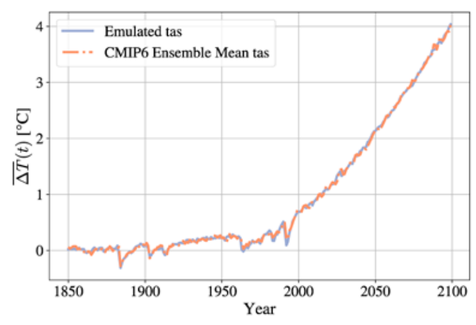
$$\mathcal{F}(\cdot) = \frac{\partial}{\partial w}\left[D\frac{\partial}{\partial w}(\cdot) - \mathcal{N}(w, F)(\cdot)\right]$$

Option 2:

2b

Target a statistical quantity (e.g. mean/variance)

$g(w)$



3b

Approximate Koopman Operator

$$\mathcal{K}(\cdot) = \mathcal{N}(w, F)\frac{\partial(\cdot)}{\partial w} + D\frac{\partial^2(\cdot)}{\partial w^2}$$

4

Emulate variable with new scenario