

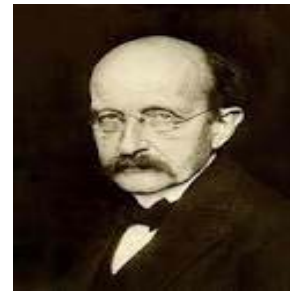
# Thinking probabilistically about future projections

Professor Tim Palmer FRS  
University of Oxford

Comprehensive climate models are based on the primitive laws of physics e.g.

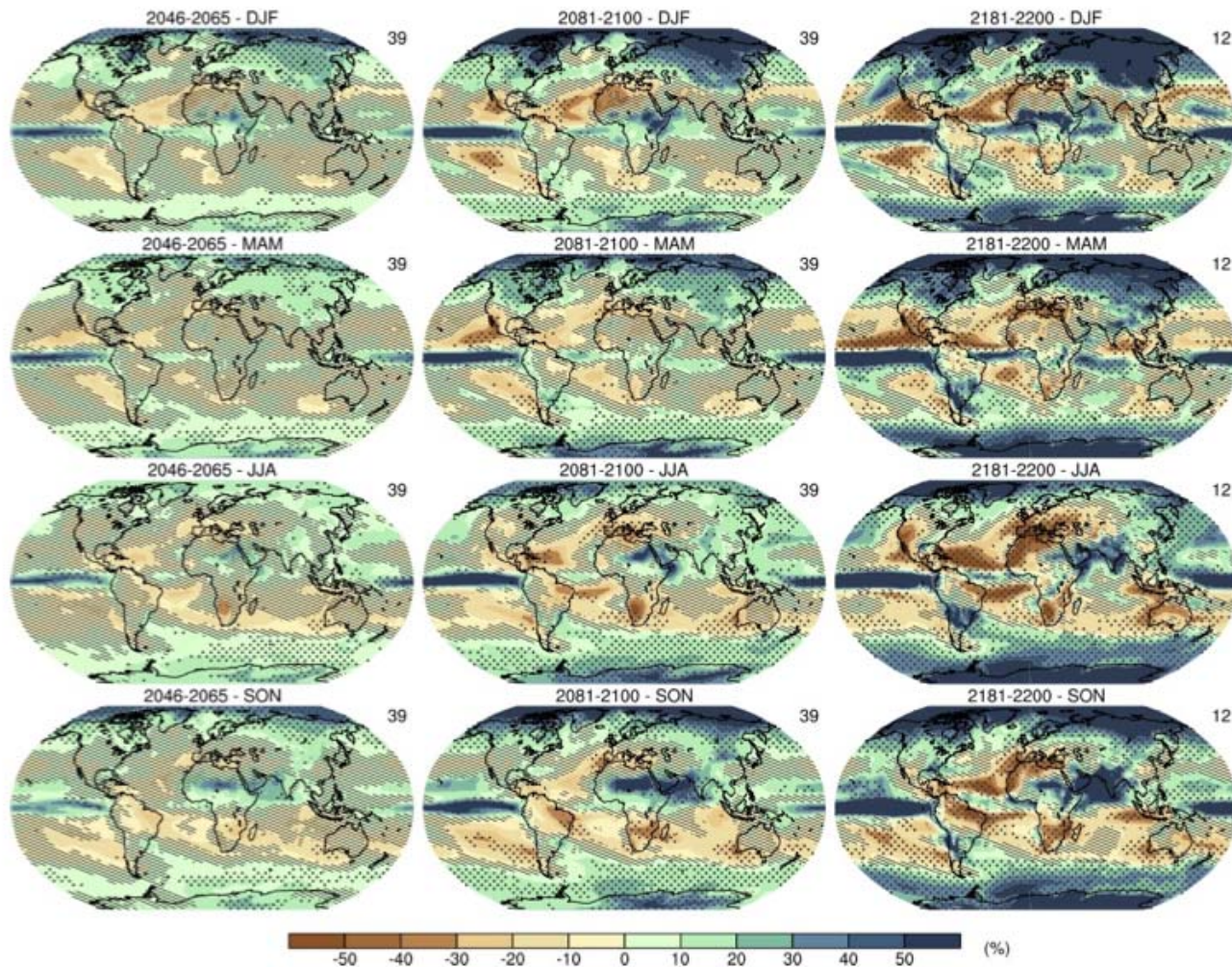


$$\mathbf{F} = m\mathbf{a}$$



$$E = \hbar\omega$$

## Seasonal mean percentage precipitation change (RCP8.5)



**Figure 12.22:** Multi-model CMIP5 average percentage change in seasonal mean precipitation relative to the reference period 1985–2005 averaged over the periods 2045–2065, 2081–2100 and 2181–2200 under the RCP8.5 forcing scenario. Hatching indicates regions where the multi model mean is less than one standard deviation of internal variability. Stippling indicates regions where the multi model mean is greater than two standard deviations of internal variability and where 90% of models agree on the sign of change (see Box 12.1).

# Are Climate Models “Fundamentally Flawed”?

- Only if the basic laws of physics are!

## Can climate models be improved?

- Certainly! Ability to represent small-scale processes accurately (e.g. associated with clouds) requires bigger computers

## How do we deal with uncertainties in current climate models?

- Make multiple predictions varying uncertain aspects of the representation of small-scale processes. Means (IPCC AR5) predictions are inherently probabilistic.