

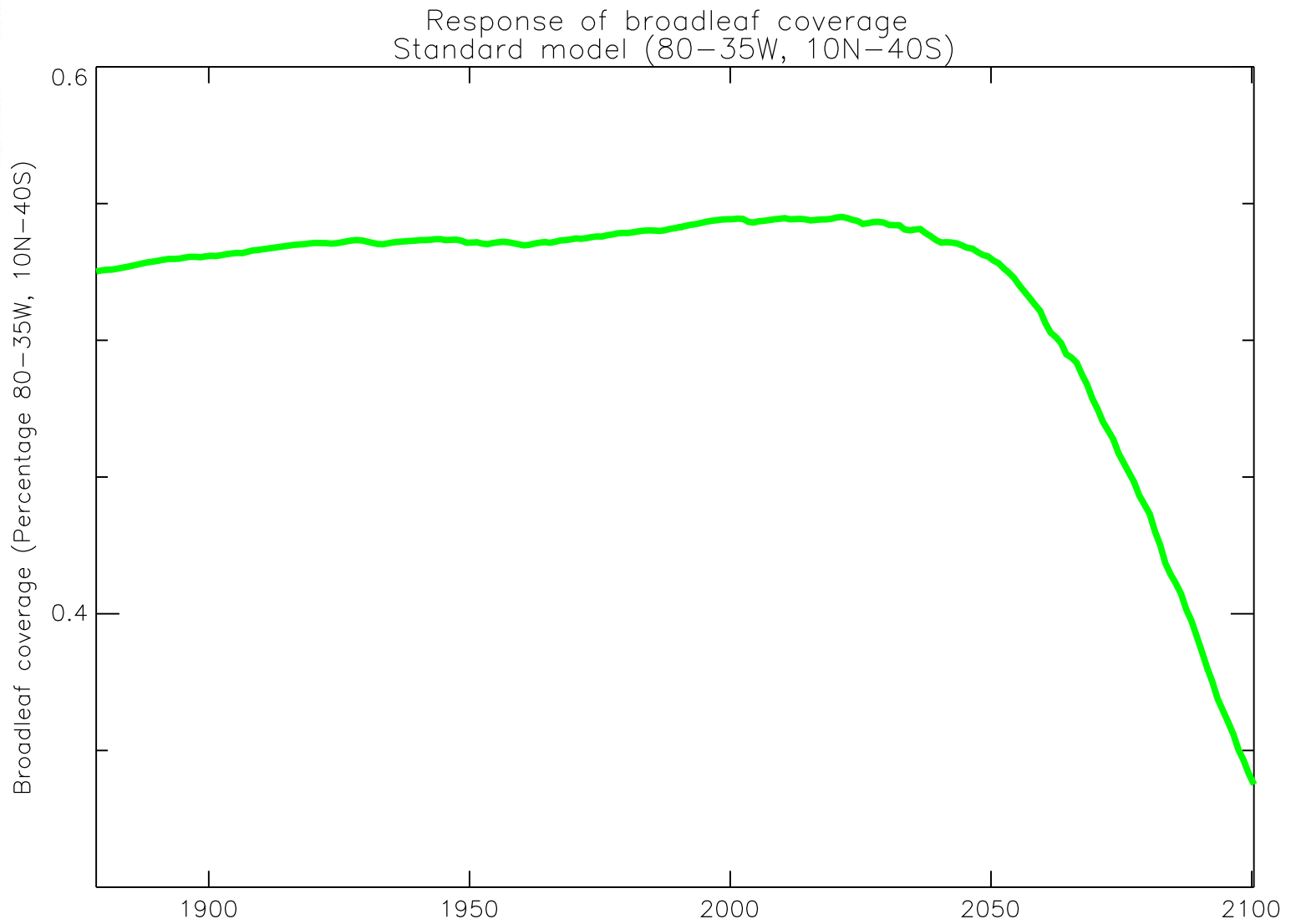


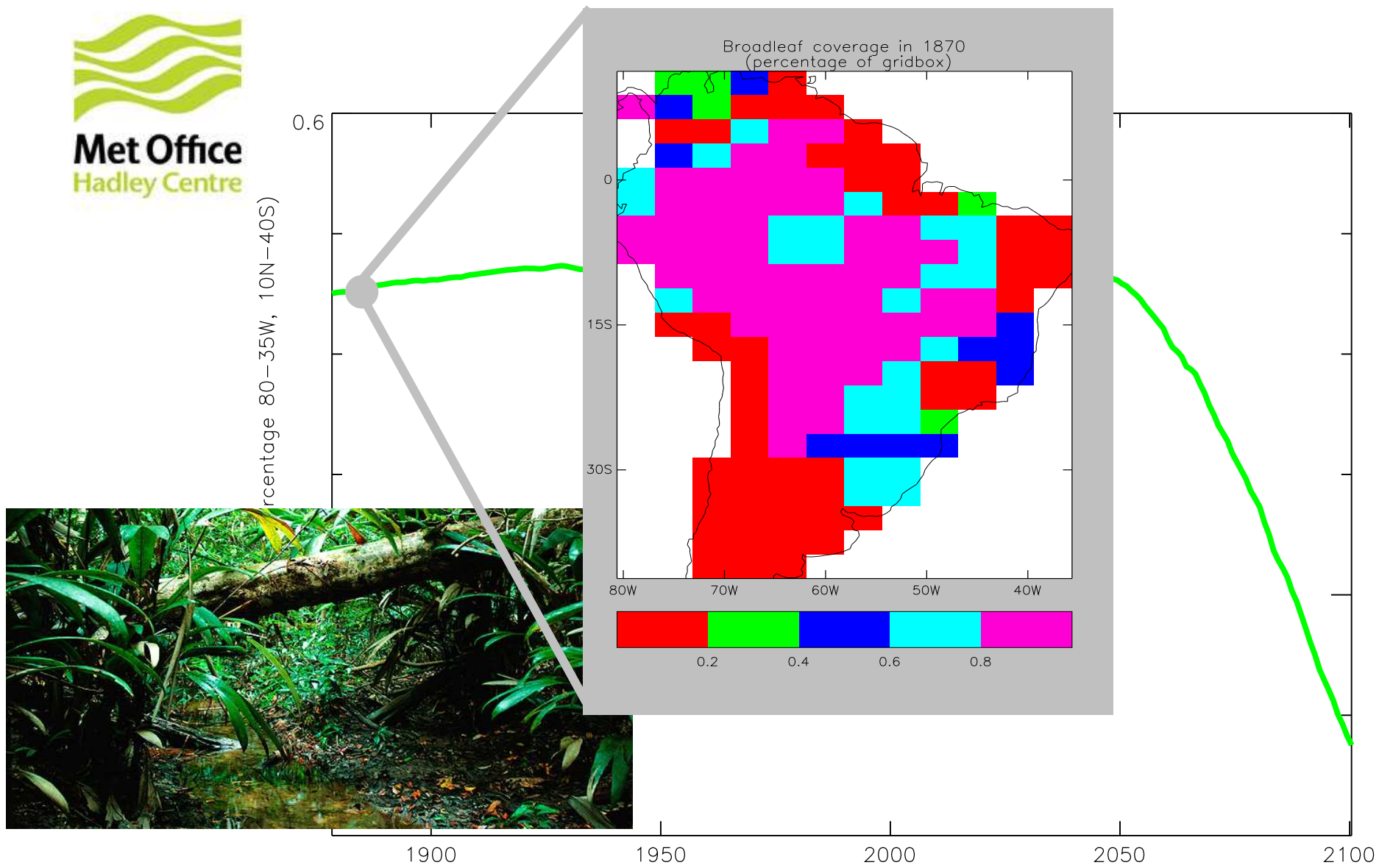
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# Amazon collapse in the next century: exploring the sensitivity to climate and model formulations uncertainties.

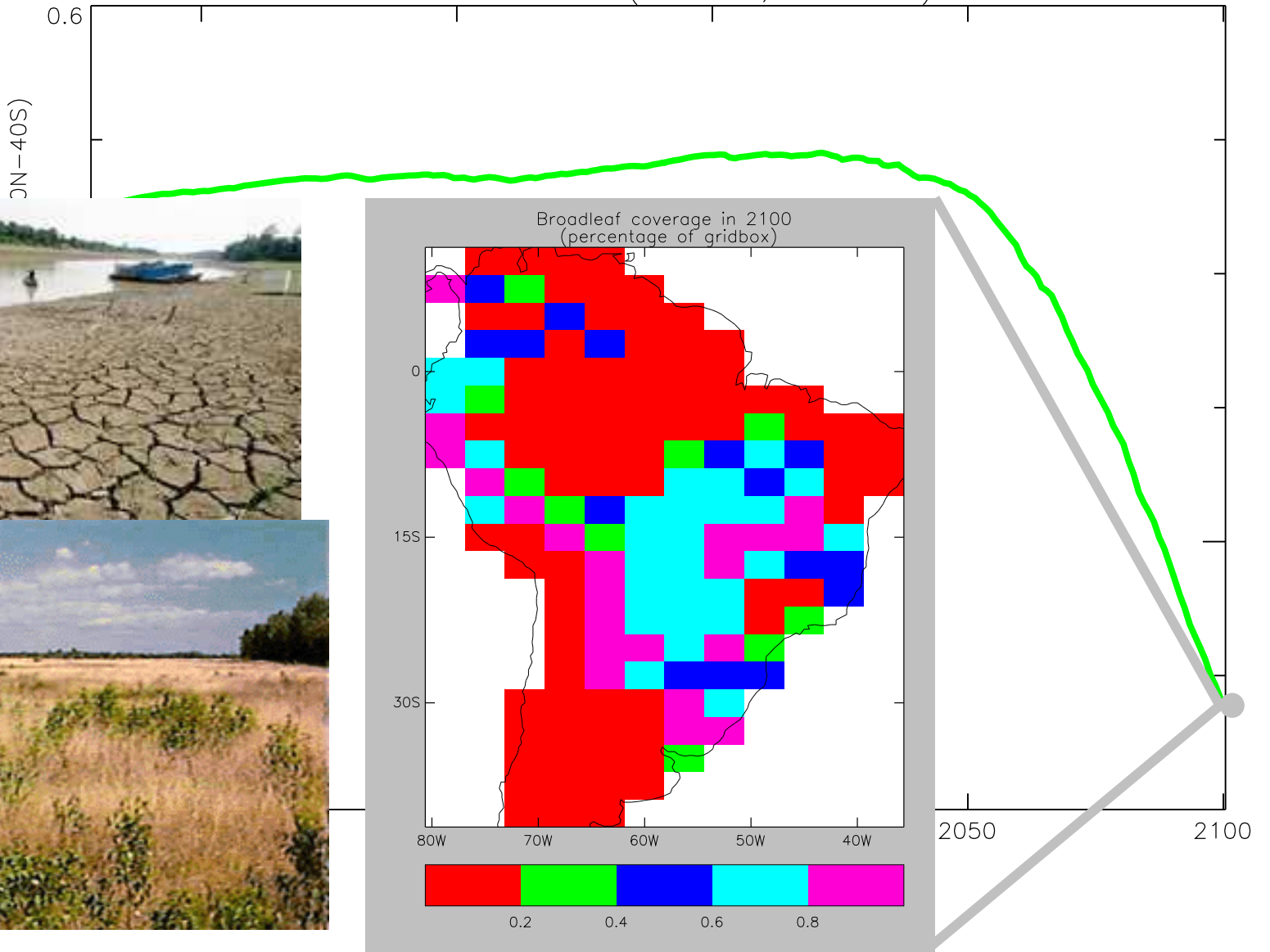
B. Booth, G. Harris, C. Huntingford, S. Sitch, C. D. Jones, M. Collins and P. P. Harris

Climate change impacts and adaptation: Dangerous rates of change, Exeter 22-24<sup>th</sup> Sept.





Response of broadleaf coverage  
Standard model (80–35W, 10N–40S)





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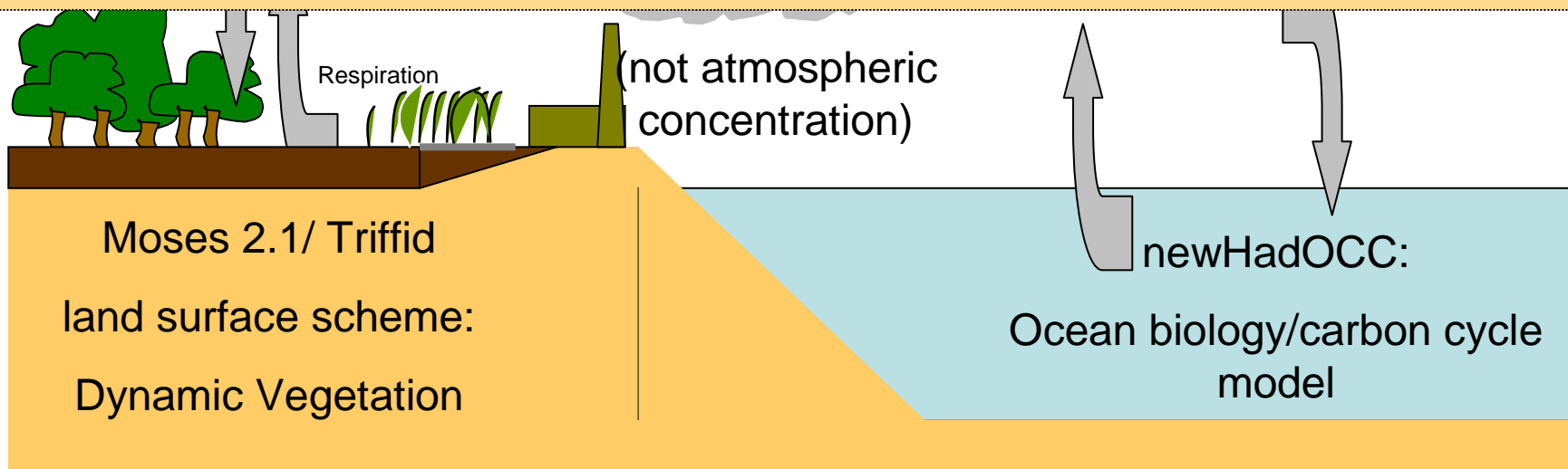


# Impact of uncertainty in atmospheric feedbacks.

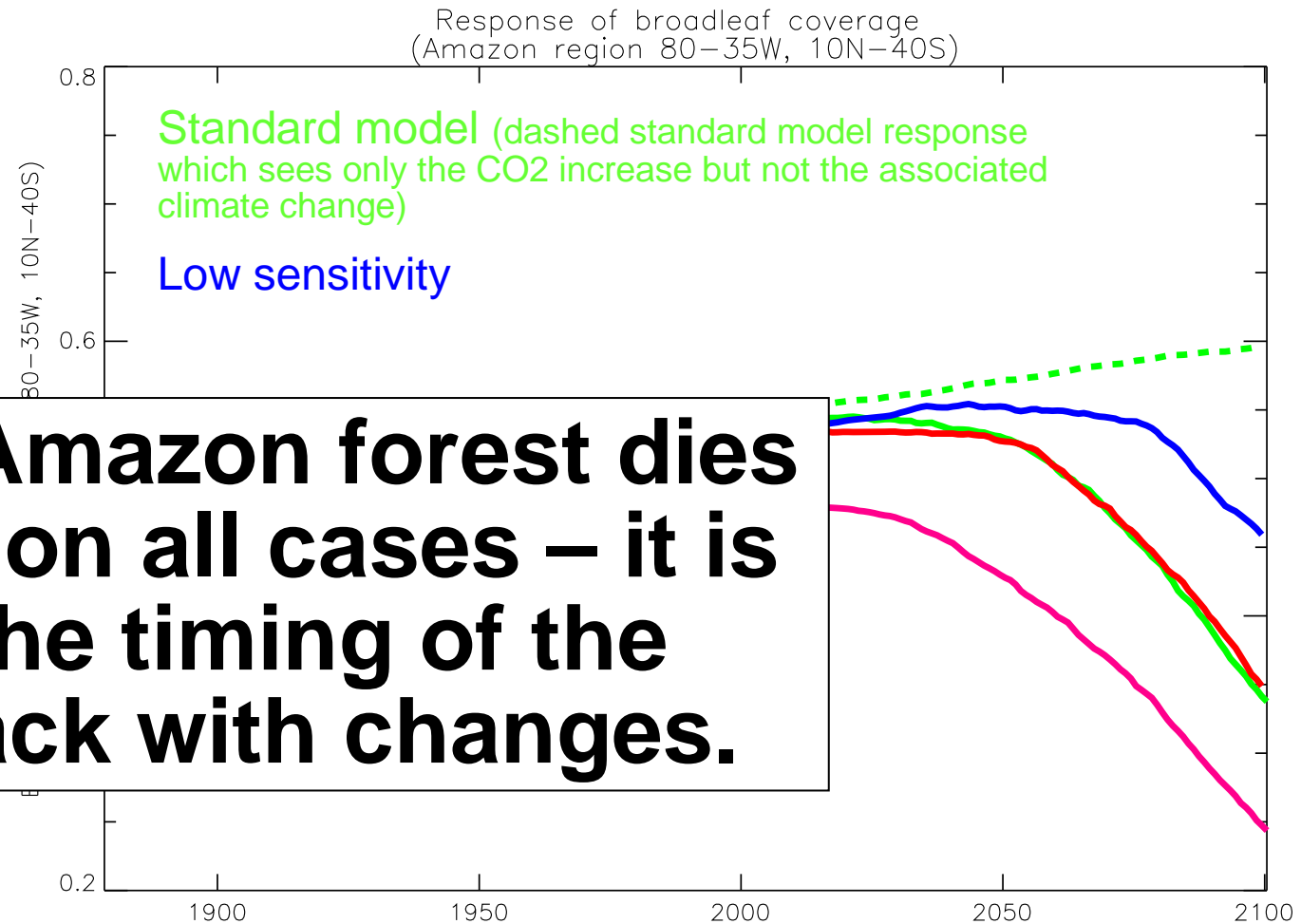
# Impact of atmospheric feedback uncertainties on the Amazon

**How does uncertainty in the sensitivity and magnitude of the atmospheric response impact Amazon forest stability?**

We couple the same land surface model (MOSES TRIFFID) to 4 different implementations of the atmospheric model – which span the range of climate sensitivity.



# Impact of climate uncertainty on Amazon forest stability.



**The Amazon forest dies back on all cases – it is just the timing of the dieback with changes.**

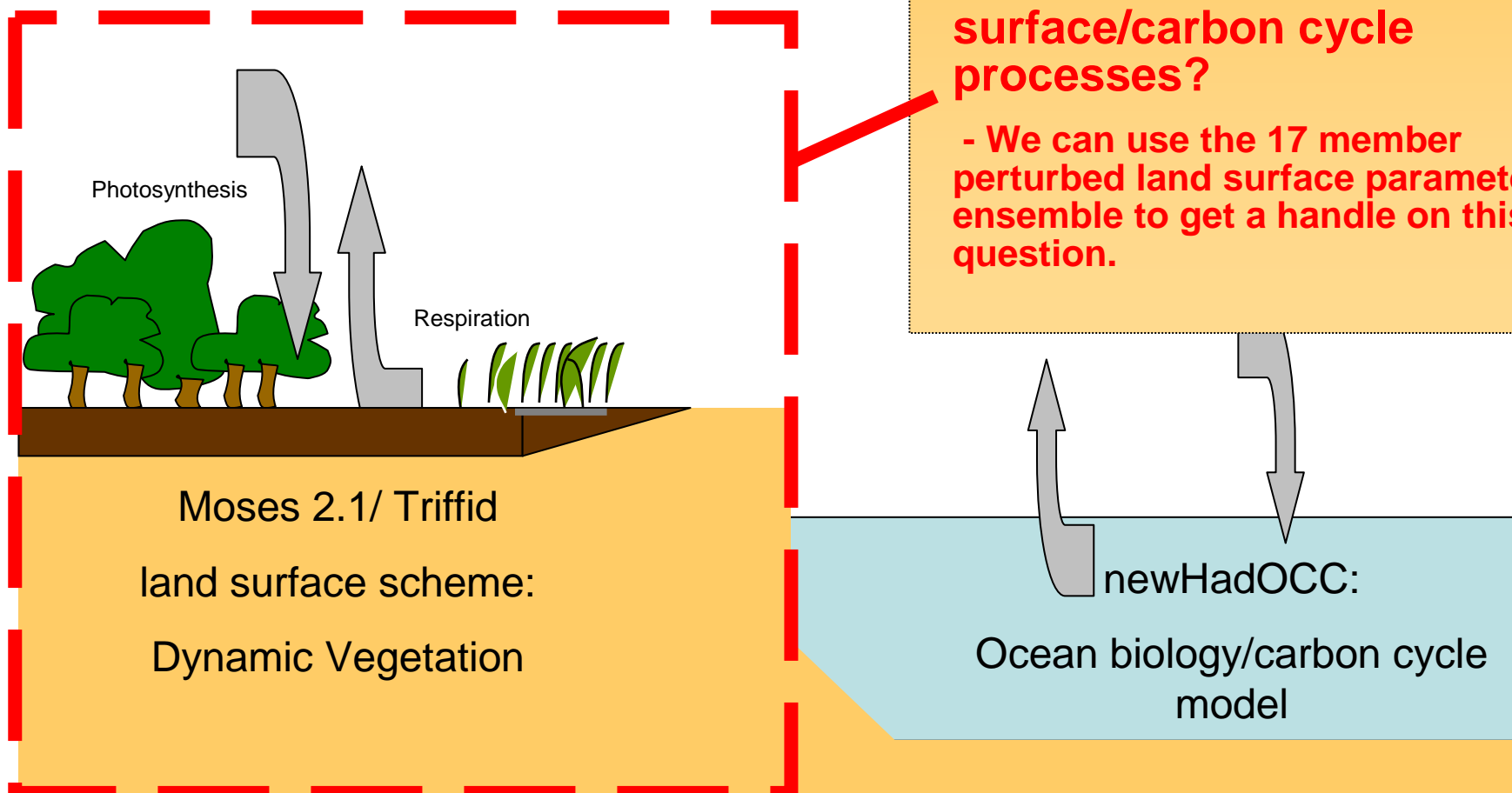


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# Impact of uncertainty in representation of the land surface processes.

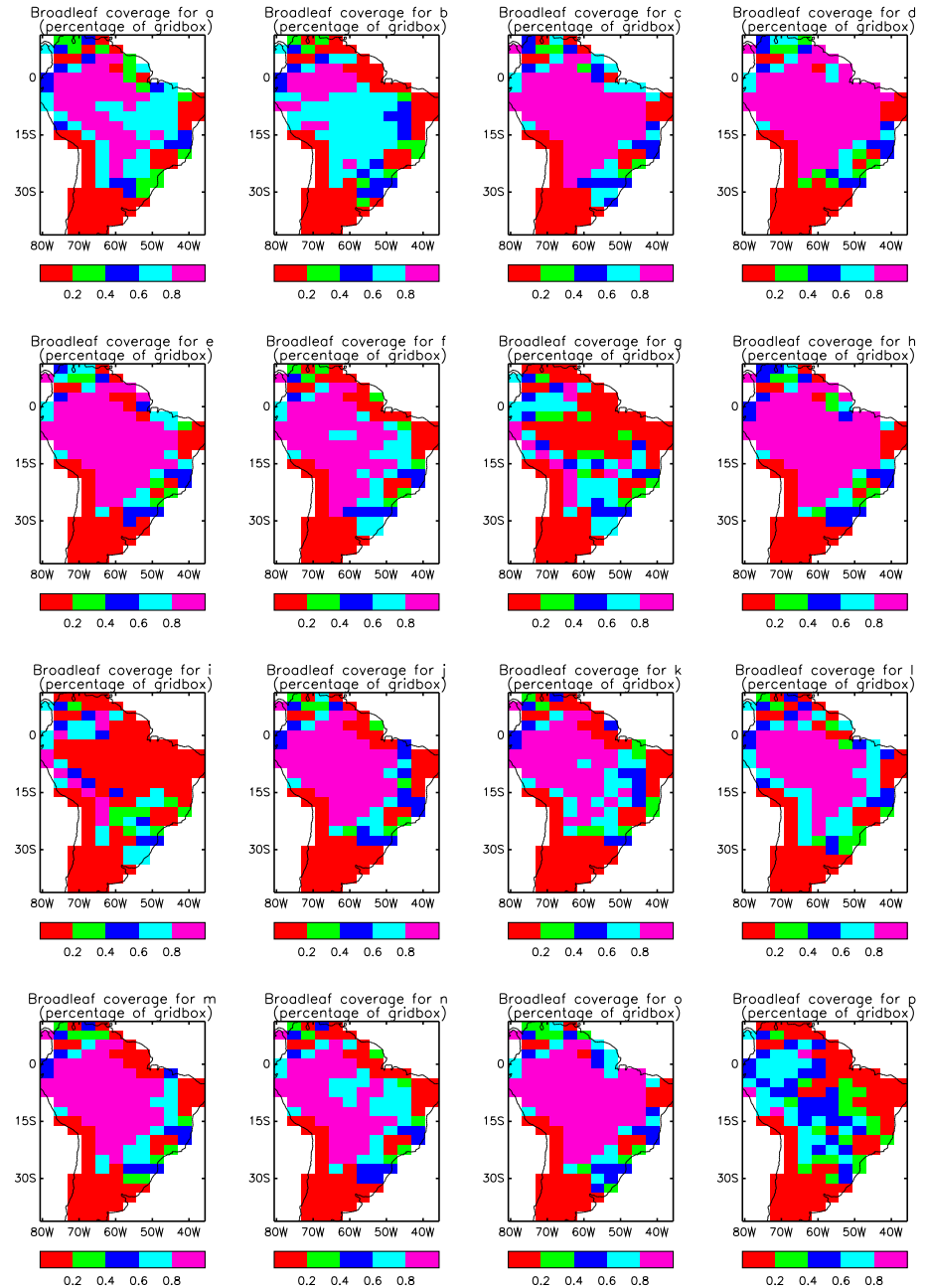
# Impact of carbon cycle uncertainties on the Amazon



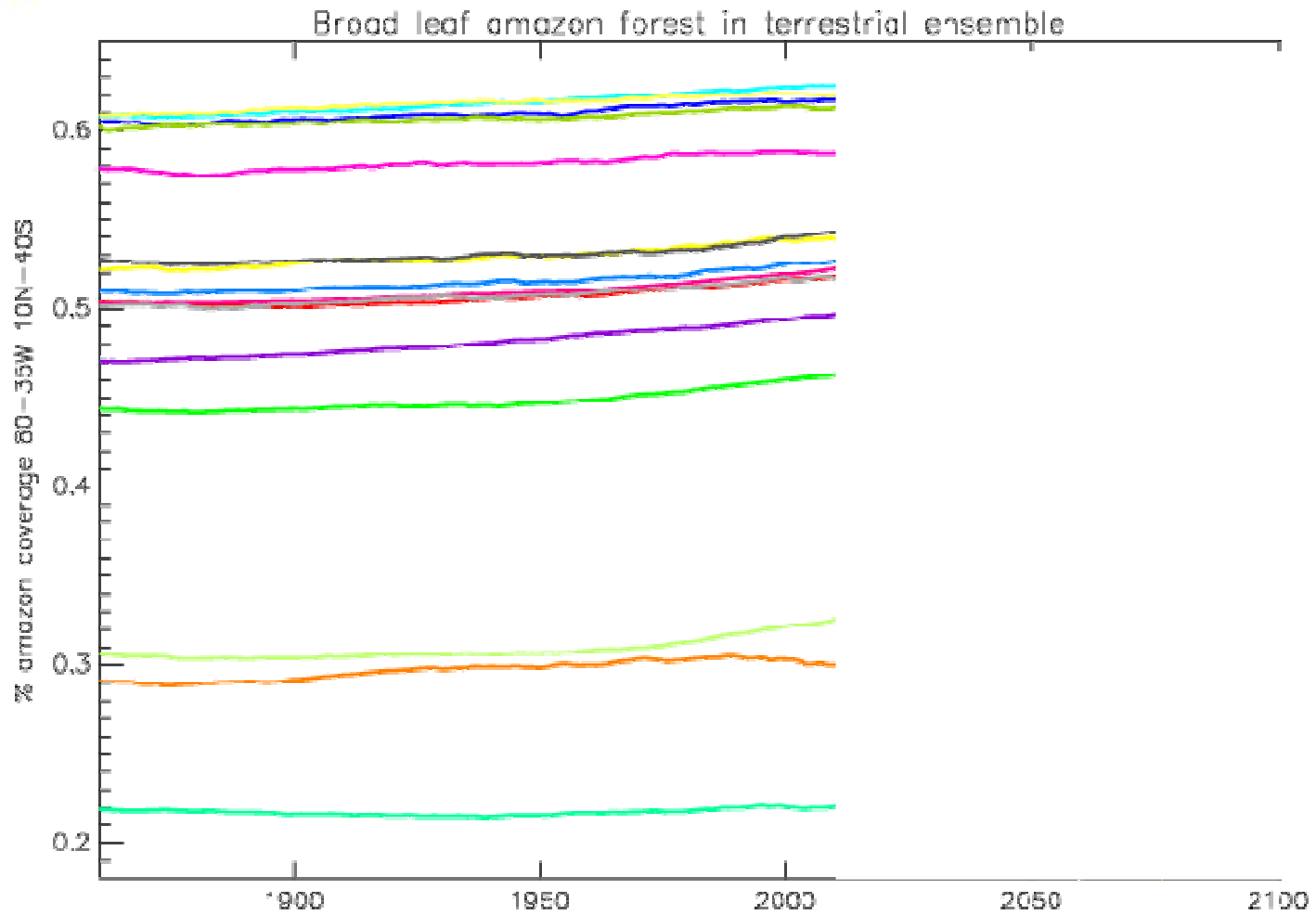
**How robust is the dieback in the Amazon Rainforest to uncertainties in how we formulate the land surface/carbon cycle processes?**

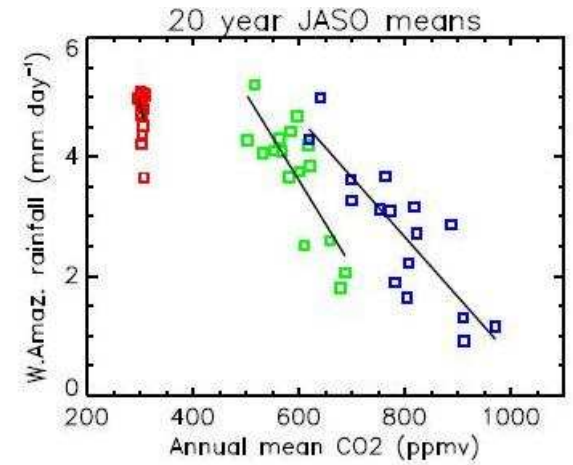
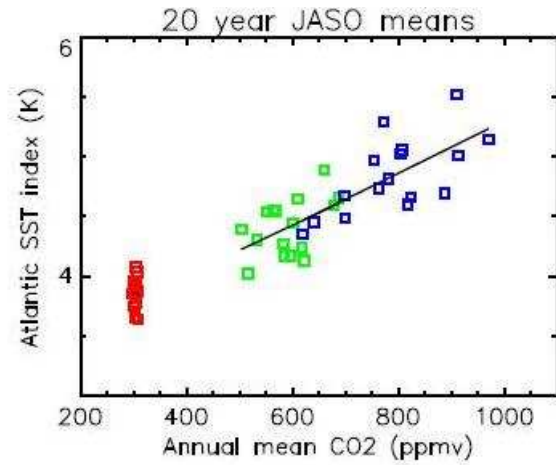
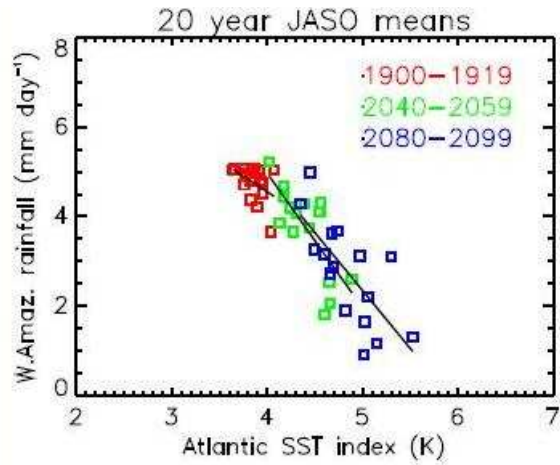
**- We can use the 17 member perturbed land surface parameter ensemble to get a handle on this question.**

# Initial state of broadleaf forest in each ensemble member (when spun up for 1860 climate state)



# Response of Amazon: Historical and A1B scenario







# Amazon rainforest stability

- Uncertainties in the wider climate feedbacks impact the timing but not the long term stability of the Amazon forest extent.
- There is no simple relationship between initial forest extent and subsequent collapse.
- Uncertainties in the response of terrestrial land surface influence both the long term stability and the timing of any collapse.
  - Some models retain a stable forest extent.
  - Land surface uncertainties influence Amazon stability both directly (rain forest response to climate drivers) and also indirectly (via i) carbon cycle feedbacks which effect atmospheric CO<sub>2</sub> levels and hence climate response and ii) impacts on the hydrological response.)
  - Represents a framework to understand which mechanisms contribute to the Amazon forest collapse or stability.