Climate Objectives and Feedback Effects on Future Emissions - COVFEFE

Eddy Comyn-Platt¹; Garry Hayman¹; Chris Huntingford¹; Sarah Chadburn²; Eleanor Burke³; Anna Harper²; Peter Cox²; Bill Collins⁴; Chris Webber⁴; Tom Powell²; Toby Marthews¹

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NERC Programme – Understanding the Pathways to and Impacts of a 1.5°C Rise in Global Temperature

• Evidence for the UK Committee on Climate Change, with regard to their statutory advice on national carbon budgets.
• Input to the International Panel on Climate Change (IPCC) special report, which is expected to have a publication submission deadline in late 2017 or early 2018.

Three projects with common methods (JULES-IMOGEN) formed an “Intra-Consortia”

**CLIFFTOP**
Climate feedbacks from wetlands and permafrost thaw in a warming world
Garry Hayman, Sarah Chadburn, Eddy Comyn-Platt, Toby Marthews, Eleanor Burke, Nic Gedney, Eleanor Blyth and Hanna Lee

**CLUES**
Climate, Land-Use, and Ecosystem Services at 1.5°C
Anna Harper, Peter Cox, Chris Huntingford, Tom Powell

**MOC1.5**
Methane, Ozone and the Carbon Budget for 1.5°C
Bill Collins, Steven Sitch, Jason Lowe, Chris Webber
Pattern Scaling of Met Data

IMOGEN$^{-1}$

Radiative Forcing Power

Atmospheric Composition

Simple Ocean Uptake Model

Permissible Anthropogenic Emissions

Cost...

ΔT x Anomaly

Prescribed Temperature Anomaly

JULES Estimates Land Carbon Exchange


Intra-Consortia Baseline Scenario

- Temperature profiles
  - Huntingford et al. (2017) formulation
- Non-CO2 Radiative Forcing Contributions
  - SSP2-RCP2.6-IMAGE

Intra-Consortia Baseline Scenario

\[ \Delta Q_{\text{non CO}_2} = m \Delta Q_{\text{non CO}_2}^{\text{SSP}} + c \]

JULES Key Features:

- 14 Soil Layers
- Layered Soil Carbon and Permafrost
  - Chadburn et al., 2015; Burke et al., 2017.
- 13 PFTs and LULUC projections
  - Anna Harper et al., 2016.
- Ozone damage
  - Scaled to CH4
- TOPMODEL (Gedney et al., 2004)
- 3 Snow Layers
CLIFFTOP Methane Feedback

• Permafrost Thaw
  • Burke et al., 2017

• Methane Feedback
  • Gedney et al, 2017 in preparation

Schuur et al., 2015
Results

Baseline Scenario

CH4 Feedback

Baseline – CH4-FB
Summary and Future work

• We have a state of the art JULES-IMOGEN configuration setup and available as a ROSE suite, available for distribution
• We need to finalise our decision on Temperature and Radiative forcing approach so we can set our finalised simulations going
• First lot of publications will be on their way out later in the year
• There will be a wealth of data to mine to study the impacts of these targets after we get our initial results out.
• This will form a new IMOGEN configuration available on the jules_doc trac.
<table>
<thead>
<tr>
<th>Project</th>
<th>Comment/Interaction</th>
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<tr>
<td>1</td>
<td>Climate feedbacks from wetlands and permafrost thaw in a warming world (CLIFFTOP)</td>
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</table>
| 2 | Climate, Land-Use, and Ecosystem Services at 1.5C  
P Cox (PI), A Harper, S Sitch, T Lenton (U. Exeter), J House (U. Bristol), Chris Huntingford (CEH)  
- All using JULES-IMOGEN  
- Agree/use common ‘baseline’ scenario  
- Hold joint project meeting(s) |
| 3 | Methane, Ozone and the Carbon Budget for 1.5 degrees (MOC1.5)  
Bill Collins (PI), S Sitch, P Cox (Exeter)  
Also involves: Chris Huntingford (CEH) and Jason Lowe  
- Use common ‘baseline’ scenario  
- Hold joint project meeting(s) |
| 4 | Quantifying the cumulative carbon emissions consistent with a 1.5C global warming (TCRE1.5)  
- Use common ‘baseline’ scenario  
- Hold joint project meeting(s) |
| 5 | Plausible policy pathways to Paris  
Neil Edwards (PI, OU), Hector Pollitt (Cambridge)  
- Econometric modelling with Climate Emulator. ENTS DVGM (with 1 pft, 1 crop, 1 soil reservoir and water bucket)  
- Focus on |
| 6 | CURB CO2: Carbon Uptake Revisited - Biases Corrected using Ocean Observations  
P Halloran (PI), A Watson, Alice Lebehot (U. Exeter)  
- Explore bias in air-sea exchange of CO2  
- Any link through scenarios |
| 7 | ADJUST1.5: Defining ADJUSTable (emission) pathways to 1.5 degrees C warming, and assessing their feasibility, physical consequences and impacts  
Philip Goodwin (PI), I Haigh, J Matter, R Nicholls, Sally Brown (U. Southampton)  
- Simple terrestrial C cycle  
- Any link through scenarios |
| 8 | Sea level rise trajectories by 2200 with warmings of 1.5 to 2 degree C  
Svetlana Jevrejeva (PI), F Mir Calafat (NOC), DF Hendry, Luke Jackson (Oxford),  
- Any link through scenarios |
| 9 | Thresholds for the future of the Greenland ice-sheet  
Jonathan Gregory (PI), R Smith, Steve George (Reading), AJ Payne (U. Bristol)  
- Any link through scenarios |
| 10 | Implications of the Paris Agreement for Biodiversity and Conservation Planning (IMPALA)  
Rachel Warren (PI), Jeff Price (UEA)  
- Biodiversity  
- Any link through scenarios  
- Involved in AVOID programme |
Baseline Scenario

Intra-Consortia Baseline Scenario

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