IMOGEN – A QUICK UPDATE

Chris Huntingford and many others including Peter Cox, Przemek Zelazowski, Mark Lomas, Matt Pryor, Lina Mercado, Stephen Sitch, Doug Clark, Nigel Arnell, Andy Wiltshire...

(Jules meeting, 12th January 2012).
IPCC assessment – 22 GCMs submitted
Radiative forcings to present

[Diagram showing various radiative forcings and their values, spatial scales, and LOSUs]
Atmospheric Greenhouse Gas Concentrations

OCEAN

LAND

Meteorological forcing variables

Fluxes: CO₂

Anthropogenic emissions

Atmospheric Greenhouse Gas Concentrations

20th C Climate + Anomaly Patterns × global ΔT

CLIMATE

IMOGEN as a tool to emulate GCMs
\[ \Delta X(i,j,k) = \Delta T(k) \times P(i,j) \]

\( X = \text{Variable of interest} \)
\( \Delta T = \text{Global warming} \)
\( i = \text{geographical position} \)
\( j = \text{month} \)
\( k = \text{decade} \)

Forced with common CO\(_2\) and non-CO\(_2\) radiative forcing – based on SRES A2 and Bern model mapping for CO\(_2\) concentrations.

CRU initial conditions (so GCM biases removed).

Variables needed to force MOSES/TRIFFID (now JULES) land surface model:
- Temperature
- SW down
- LW down
- Precip
- Windspeed
- Humidity
- Pressure

Dark respiration peaks, and not as \( Q_{10} \).
At the start of IMOGEN development, we thought that it would be mainly used to extrapolate away from the few GCMs runs.

In reality, it’s been used for impacts assessments and/or testing new things before implementation in full GCMs.
Typical IMOGEN output – here +1 W/m$^2$
SRES scenarios assume mainly CO$_2$ up

Amazon results: 22 GCMs.
Africa results: 22 GCMs

Africa Vegetation Carbon

Mg/Hectare

Year

Pre-industrial

2000 2050 2100 Committed

ncar_ccsm3_0
bccr_bcm2_0
miroc3_2_medres
csiro_mk_3_0
cnrm_cm3
mri_cgcm2_3_2a
giss_e_r
mirocm3_2_hires
ipsl_cm4
ccma_cgcm3_1
mpi_echam5
ukmo_hadcm3
A new capability!

“IMOGEN in the CLOUD”

• 60K from DECC to test buying CPU in the cloud, to run IMOGEN.
• Test new land surface configurations/parameterisations.
• Can run multiple DGVMs for multiple climate drivers.
• Implications of new process understanding.

• So it is wide open as to how we might use this capability.

• (Thank you to Bridget Emmett, CEH, for securing these monies).
IMOGEN immediate tasks

• Check reproduces roughly the old IMOGEN-MOSES-TRIFFID framework.

• Check no “spin-up” issues.

• Make sure has the most recent JULES version in it.

• Sweep up a few other queries that have been raised.

• Aim for release in a month or so.
JIM & also is anyone interested in:

Who is JIM, and is he a good partner for my IMOGEN!

We plan to write a “Part C” for JULES documentation, with Przemek as the lead. All welcome to help. This will focus on the 22-patterns and associated EBM vs GCM parameterisation.

Would anyone like to make the initial steps of pattern-scaling for CMIP5? Bribes are available.

Then long-term ideas – (1) merge with CRU, (2) patterns of extremes, (3) does IMOGEN work for long-term stabilisation/”overshoot”? – grateful for Hadley for picking things apart.
Finally:

If it’s OK, please just wait a few weeks before using current IMOGEN version released with JULES – until it has been checked thoroughly!

Thanks for listening