JULES and the Met Office: Future plans

JULES launch meeting – 2 October 2006

Met Office activities

- Short-term weather forecasting
  - global, NAE and UK models
  - land surface processes important across all scales
  - data assimilation (snow, soil humidity)
  - boundary conditions (e.g. surface albedo, roughness length)
- Seasonal forecasting
  - land surface processes

  (soil humidity, vegetation and lakes as slow-varying processes)
  - initialisation and prediction
- Climate prediction
  - HadGEM2 (MOSES 2.2 + TRIFFID + RothC)
  - HadGEM3 (link to QUEST-ESM)

Met Office activities

Weather forecast
(strong operational constraints)
Skill scores + Resilience
(resolution, robustness, no bug)
+ Version control

QA

Hydrological applications.

Climate applications.

Impact studies.

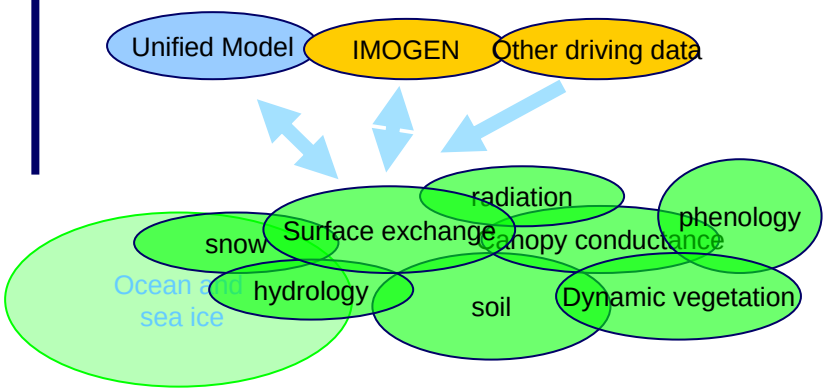
QA

Climate prediction

On-line

Off-line

Test and calibration.



Code structure

- Flexible tile structure
  - Currently not enough for Carbon Cycle?
  - Currently too many for NWP applications?
  - Will be able to set number and definition of tiles

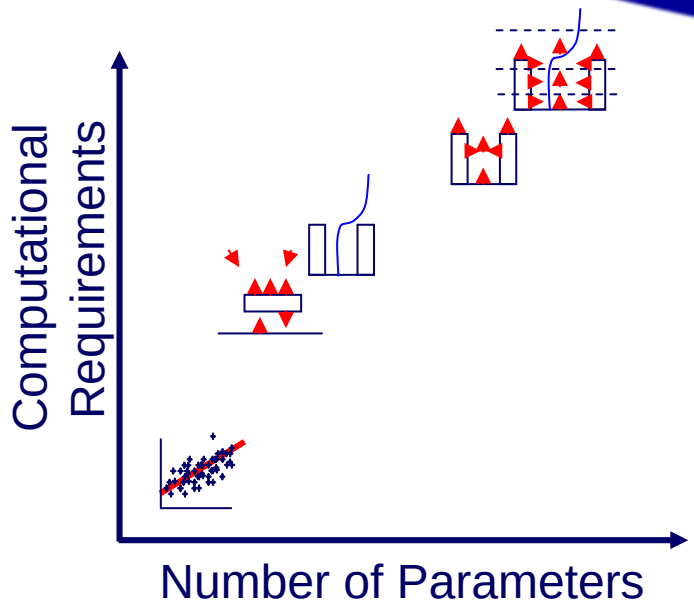
    tall and short vegetation, age classes, elevation bands, urban, …

- Sub-surface decoupled from surface exchange
  - Sub-surface (soil, sea-ice, ocean, …) can be on different grid
  - Sea-ice and ocean can be owned by ocean groups
  - Can easily include new lake model

Snow processes

- Heterogeneity
- Multi-layer model
- Include forest canopies
- Elevation bands
- Ponding
- Melting and re-freezing
- Aerosol snow-albedo effect
- Suitable for both land surface and sea-ice

Urban areas



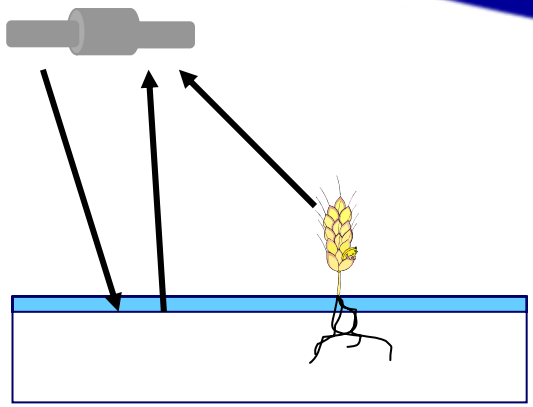
- Identify complexity requirements for urban model intercomparison
- Improved heat and moisture fluxes
- Carbon fluxes
- Assessments of climate chance in cities
- Include momentum flux and wind distribution within canopy
- Improved turbulence information for dispersion studies

Water cycle

- Modelling of river flow and flooding
- Improved treatment of permafrost regions
- Inclusion of wetlands
- Groundwater model
- Human impact on water cycle
  - Irrigation
  - Dams
- Melting of glaciers

==> Forthcoming WATCH FP6 project

Data Assimilation



- Snow
  - Mass
- Soil moisture
  - Combination of direct and indirect
  - Indirect coming from directly related, not indirectly related!
- Vegetation
  - Seasonal variation in “greenness”.
  - Phenology model with observations used to nudge model state
- Brightness temperature
  - Used to correct surface and sub-surface temperatures
  - Give better first guess for satellite retrievals

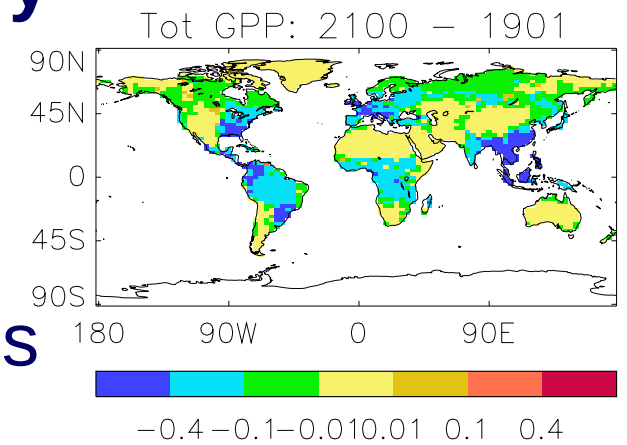
Ancillary information

- High resolution
  - Higher than model resolution to give heterogeneity information
- Good quality
  - Need to be validated and compared to other data sources
- Up-to-date
  - Should represent current situation
  - Data sources that can be updated

Climate developments (in collaboration)

Link between surface and chemistry

- Methane emissions
- Ozone impact on vegetation
- BVOCs
- Nitrogen for both vegetation and soils
- Aerosol emissions from fires
- Dust emissions



Terrestrial carbon cycle

- New Dynamical Global Vegetation Model
- Crop models
- Carbon emissions from fires
- Organic soils

END

Land surface heterogeneity

- Tile scheme
  - Appropriate for high horizontal resolution?
  - Multiple source tiles?
- Connection to boundary layer
  - Implicitly coupled to first model level
    - Assumes blending height below first model level
  - Implicitly coupled to a variable model level