



# Plant Physiology, Vegetation Dynamics and Crop modelling

Stephen Sitch, Met Office (Hadley, JCHMR),

Ian Woodward, (Univ. Sheffield), Tim Wheeler (Univ. Reading)

First JULES Science Meeting, 28 June 2007

# Where are we in JULES ?

```

jules --
  -- init --
  -- allocate_arrays
  -- init_output
  -- init_vars_tmp
  -- init_parms --
  -- tilepts
  -- sparm--|
  |         |-- pft_sparm
  -- freeze_soil
  -- calc_baseflow
  -- calc_fsat
  (top of timestep loop)
  -- control --
  -- zenith
  -- ftsa
  -- tile_albedo --|
  |         |-- albpft_fapar
  |         |-- albsnow
  -- sf_expl --|
  |         |-- tilepts
  |         |-- physiol --|
  |         |         |-- albpft_fapar
  |         |         |-- root_frac
  |         |         |-- smc_ext
  |         |         |-- raero
  |         |         |-- sf_stom --|
  |         |         |         |-- qsat
  |         |         |         |-- leaf_limits
  |         |         |         |-- leaf
  |         |         |-- soil_evap
  |         |         |-- leaf_lit
  |         |         |-- cancap
  |         |         |-- microbe
  -- next_con
  -- sf_exch --|
  |         |-- qsat
  |         |-- sf_orog
  |         |-- sf_resist
  |         |-- sf_rib_sea
  |         |-- sf_rib_land
  |         |-- sf_orog
  |         |-- fcdch_sea --|
  |         |         |-- phi_m_h_sea
  |         |-- fcdch_land --|
  |         |         |-- phi_m_h_land
  |         |-- sf_resist
  |         |-- dustresb --|
  |         |         |-- vgrav
  |         |-- sf_flux_sea
  |         |-- sf_flux_land
  |         |-- stdevl_sea
  |         |-- stdevl_land
  |         |-- sf_orog_gb
  |         |-- sfl_int_sea --|
  |         |         |-- phi_m_h_sea
  |         |-- sfl_int_land --|
  |         |         |-- phi_m_h_land
  
```

PLANT  
PHYSIOLOGY  
(sub-daily timestep)

PHYSIOL: Calculates surface  
conductances and carbon fluxes

SF\_STOM: Calculate Stomatal  
Resistance, Photosynthesis and  
Transpiration

Boundary Layer Scheme:  
Soil Thermal Conductivity,  
Surface turbulent exchange

## Boundary Layer Scheme

## Hydrology Routine

Layer soil moisture content, drainage

## Veg2

## Phenology

**TRIFFID (10-day timestep):**

carbon allocation,

vegetation growth,

Plant competition,

updates soil carbon content.

## VEGETATION STRUCTURE

```

-- sf_impl --
-- im_sf_pt
-- sf_evap
-- sf_melt
-- screen_tq --|
-- sice_hrf
-- grat
-- hydrol ---|
-- sfsnow
-- surf_hyd --|
-- frunoff
-- sieve
-- pdm
-- calc_baseflow
-- soil_hyd --|
-- hyd_con(_vg)
-- darcy(_vg) --|
-- hyd_con(_vg)
-- gauss
-- calc_fsat
-- soil_htc --|
-- heat_con
-- gauss
-- ice_htc
-- soilmc
-- soilt
-- ch4_wet1
-- veg2 ---|
-- tilepts
-- phenol
-- triffid --|
-- vegcarb --|
-- growth
-- lotka --|
-- compete
-- soilcarb --|
-- decay
-- tilepts
-- sparm --|
-- pft_sparm
-- veg1 ---|
-- tilepts
-- phenol
-- sparm --|
-- pft_sparm
-- output
(bottom of timestep loop)
-- deallocate_arrays
  
```

- **CROP Modelling**
  - Roots, shoots and leaves: The origin of GLAM-JULES, Andrew Challinor (Univ Leeds)
  - Incorporating crop growth modelling into JULES, Tom Osbourne (Univ Reading)
- **Vegetation Dynamics**
  - ED vegetation dynamics, implications for physiology, Rosie Fisher (Univ Sheffield)
- **Plant Physiology**
  - Vegetation response to drought, David Galbraith (CEH Edinburgh)
  - Determining biome level phenology module using NDVI, Joerg Kaduk (Univ Leicester)
  - Modelling Plant Nitrogen: Uptake, Fixation & Allocation, Josh Fisher (Univ Oxford)

- Raise awareness of current activities
- With the help of an active discussion, to promote collaboration and avoid duplication in the future
- In general, stimulating discussion act as a catalyst towards advancing our representation of plant structure and function in JULES.