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Met Office

Experiments with SEVER-FIRE: Lessons for JULES fire modelling activities

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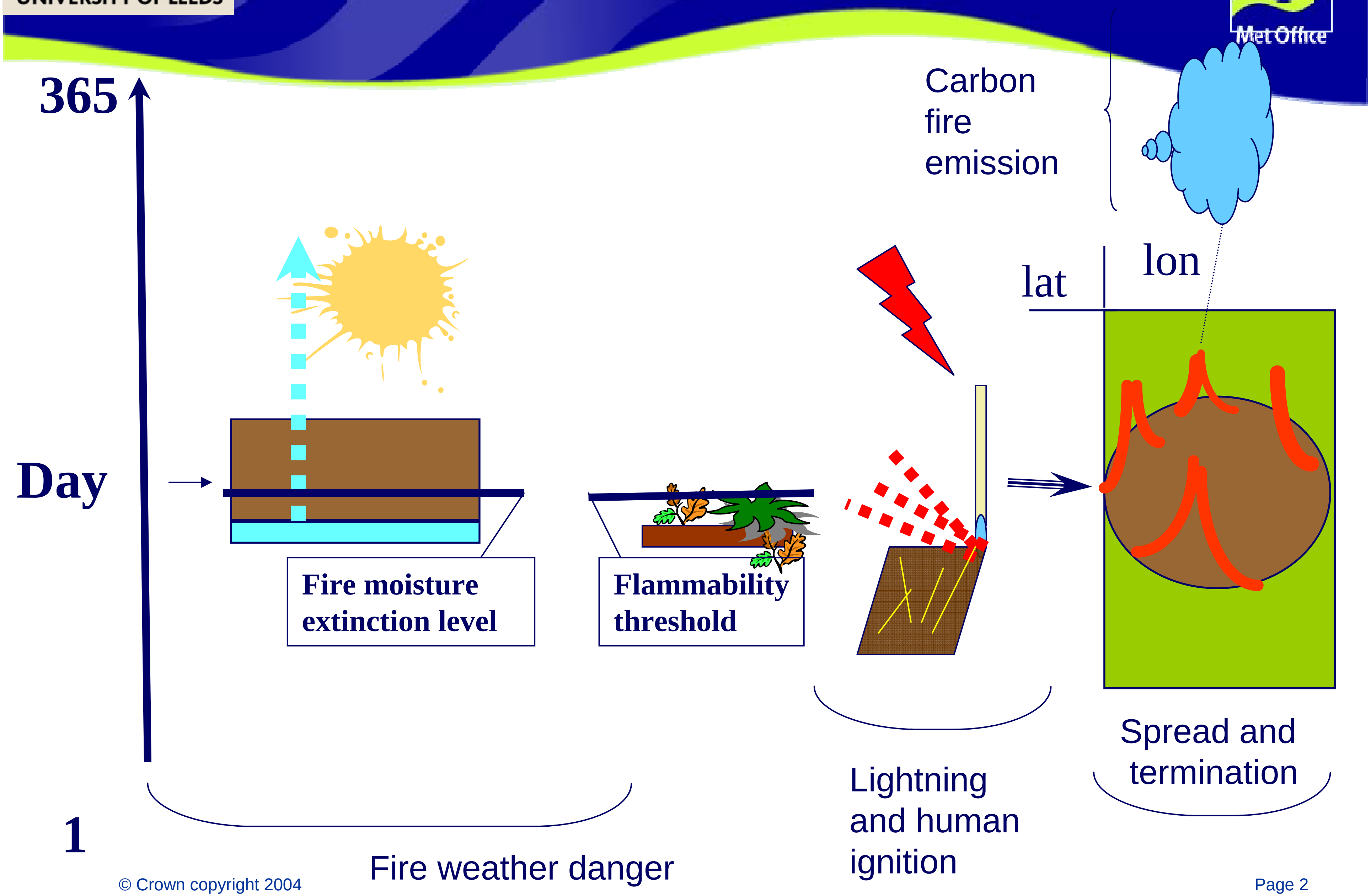
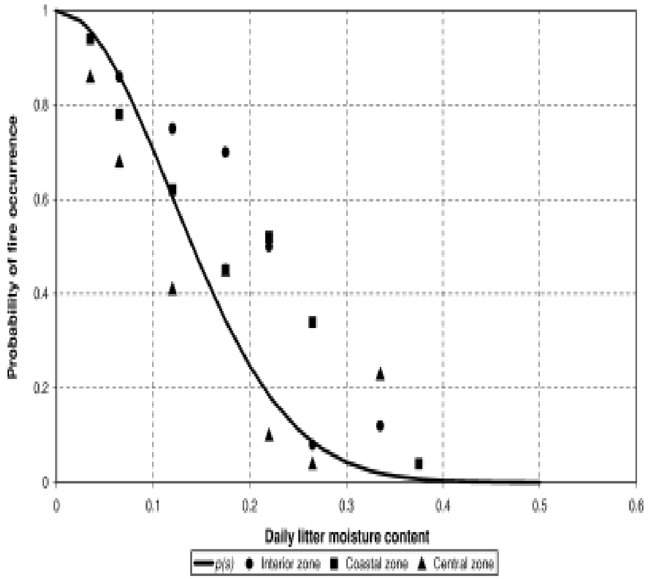
SEVER-FIRE model: Conceptual scheme

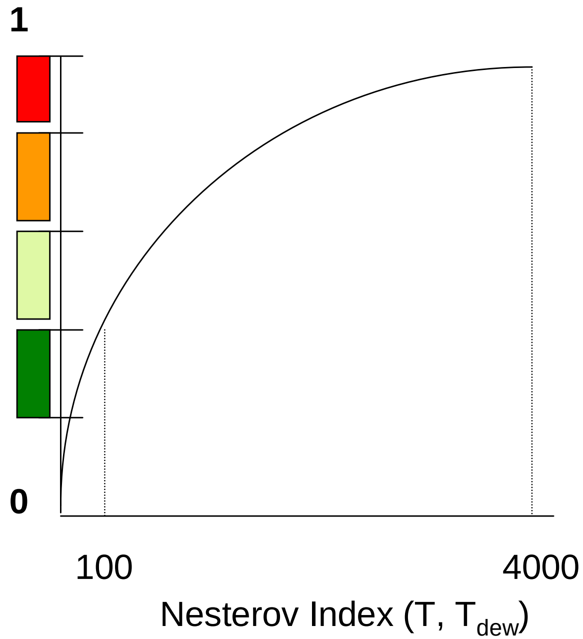


Simulation of fire weather risk

Reg_FIRM Fire weather danger index (Venevsky,et.al, 2002)

Fire Weather Risk (FWR)





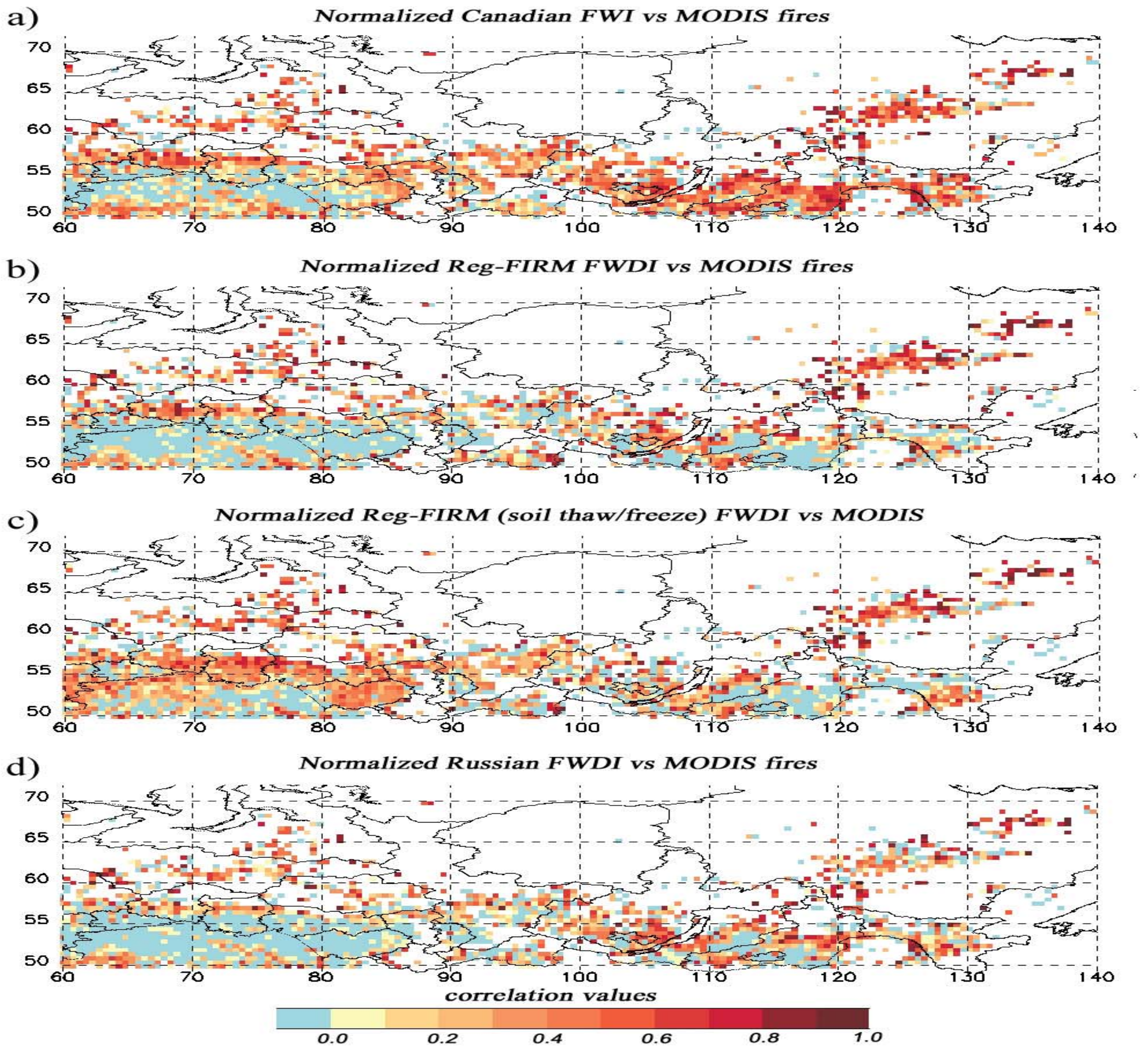
Moisture defined probability of fire * Temperature defined probability of fire

Comparison of Canadian FDWI, Nesterov Index and Reg-FIRM index using MODOS data for Siberia

- Canadian FDWI (T(°C), Rh(%), wind speed(km/h), rain (mm))
- Nesterov Index (Tair(°C), Tdew(°C), rain (mm))
- Reg-FIRM (Tair(°C) max,min and soil moisture S(m3/m3)) Tmin used for approximation of Tdew(°C).

Data: MODIS active fire data 8-days for years 2002-2005

Resulting correlations



R^2=0.44

R^2=0.38

R^2=0.42

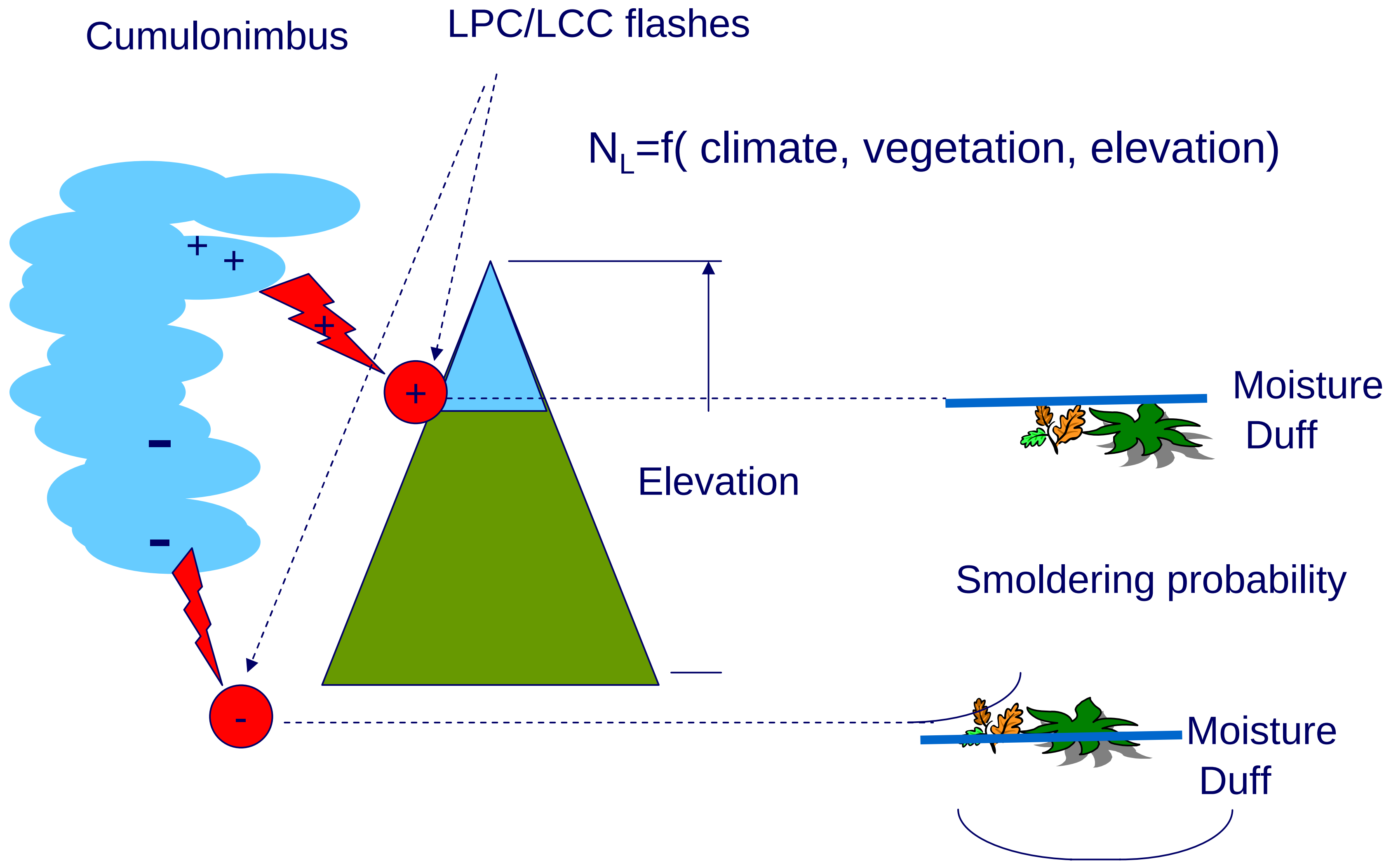
R^2=0.37

Messages for JULES fire activities:

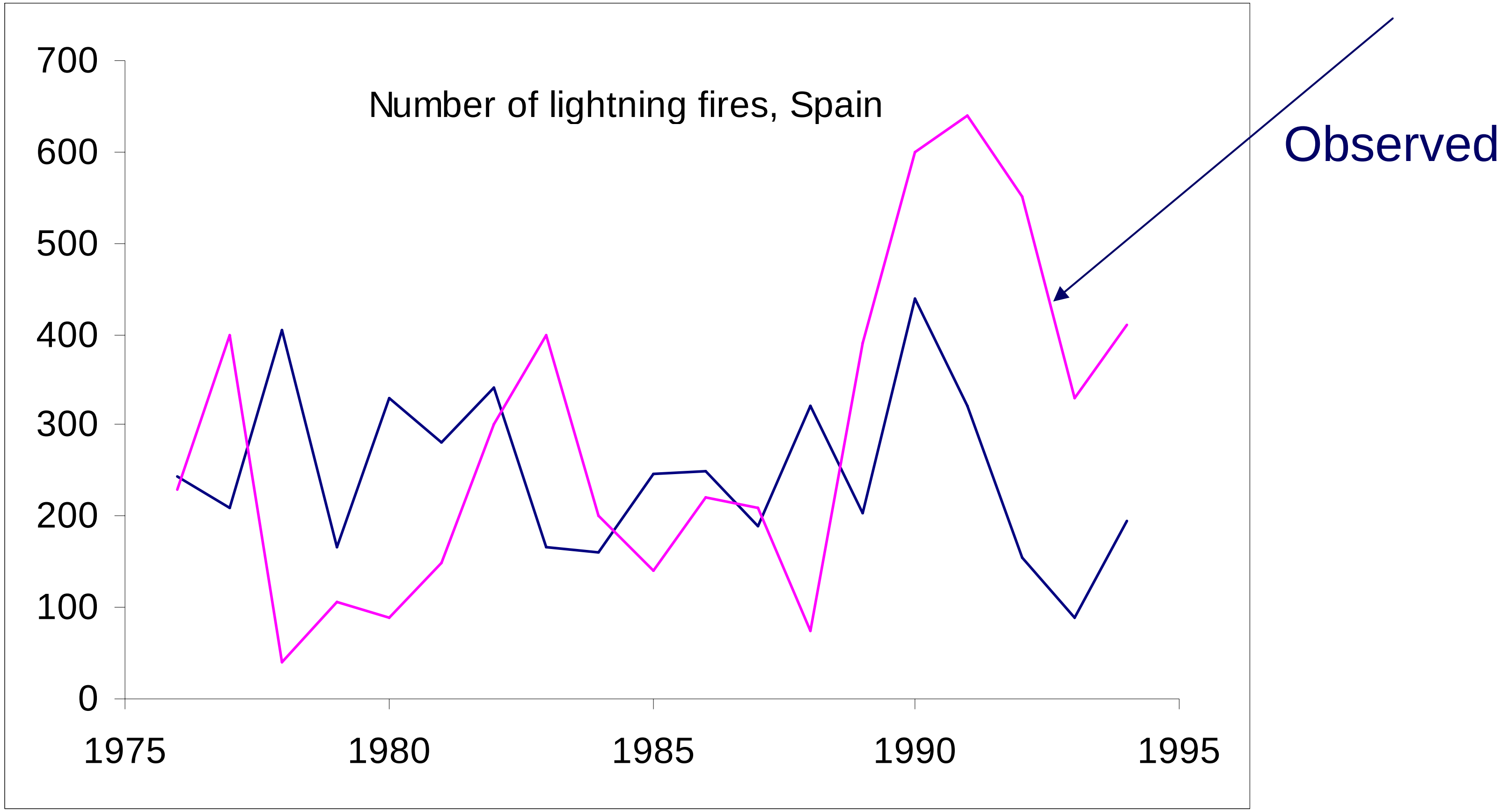
1. Fire weather indexes have similar quality for description of fires
2. They work better for vegetation types, they were tuned for
3. Thaw/freeze processes are important for fire dynamics in boreal zone

Simulation of ignitions

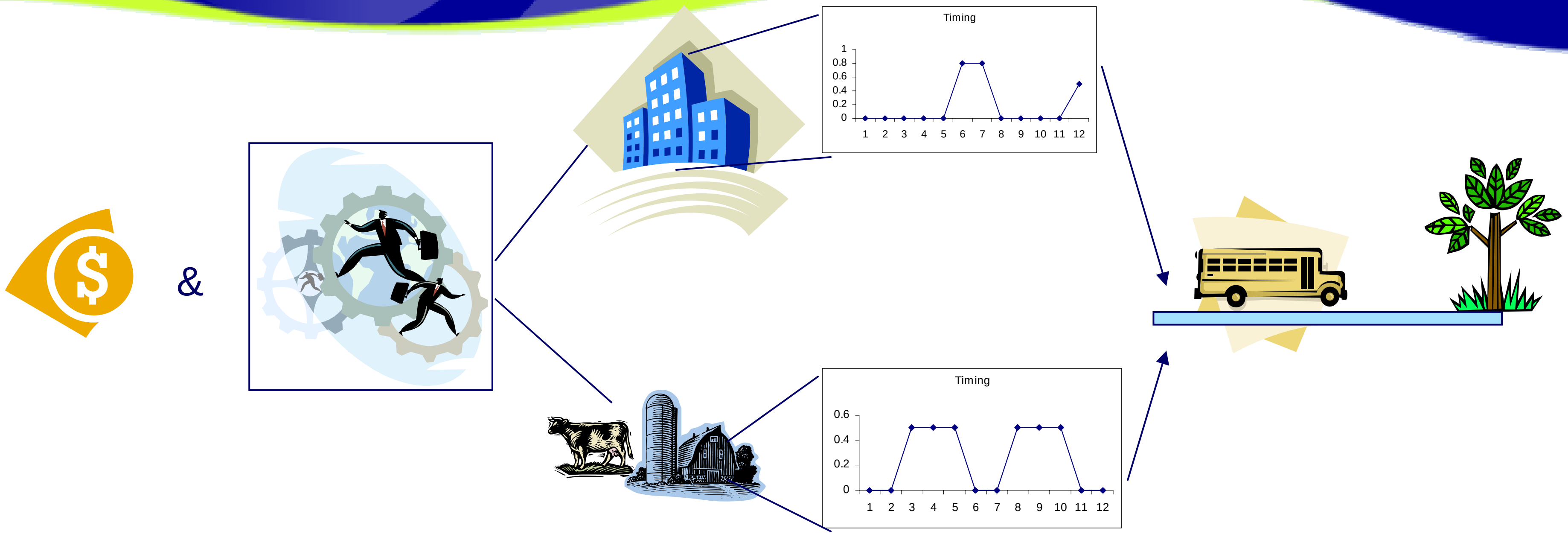
Lightning ignitions: conceptual scheme



Comparison with on-ground data



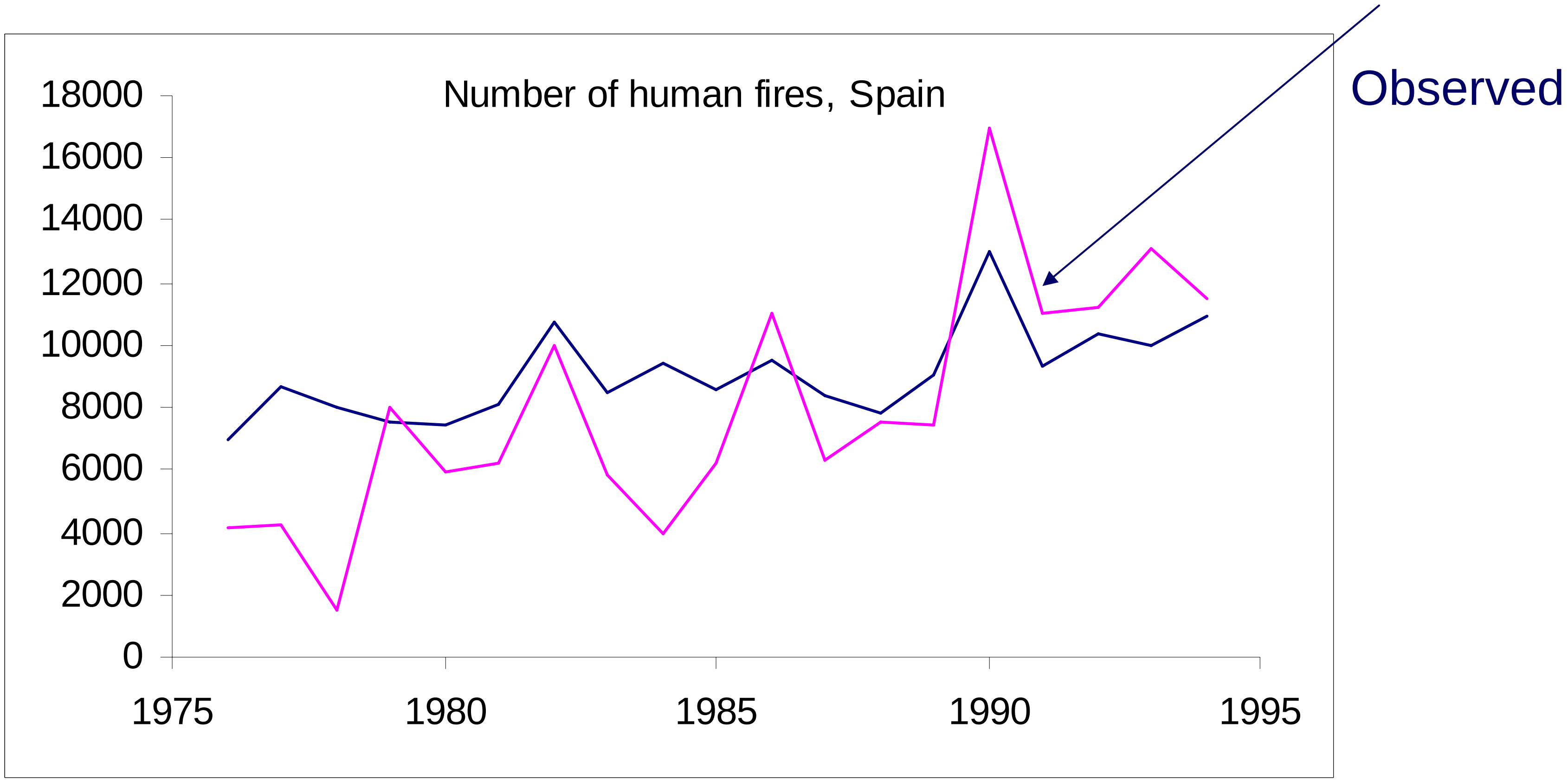
Human induced ignitions: conceptual scheme



Wealth status * Population density * Urban/ rural * Timing * accessibility

N_h=f(human population, land use)

Comparison with on-ground data



Simulated global carbon fire emission during 1981-2002 (human and lightning cases)

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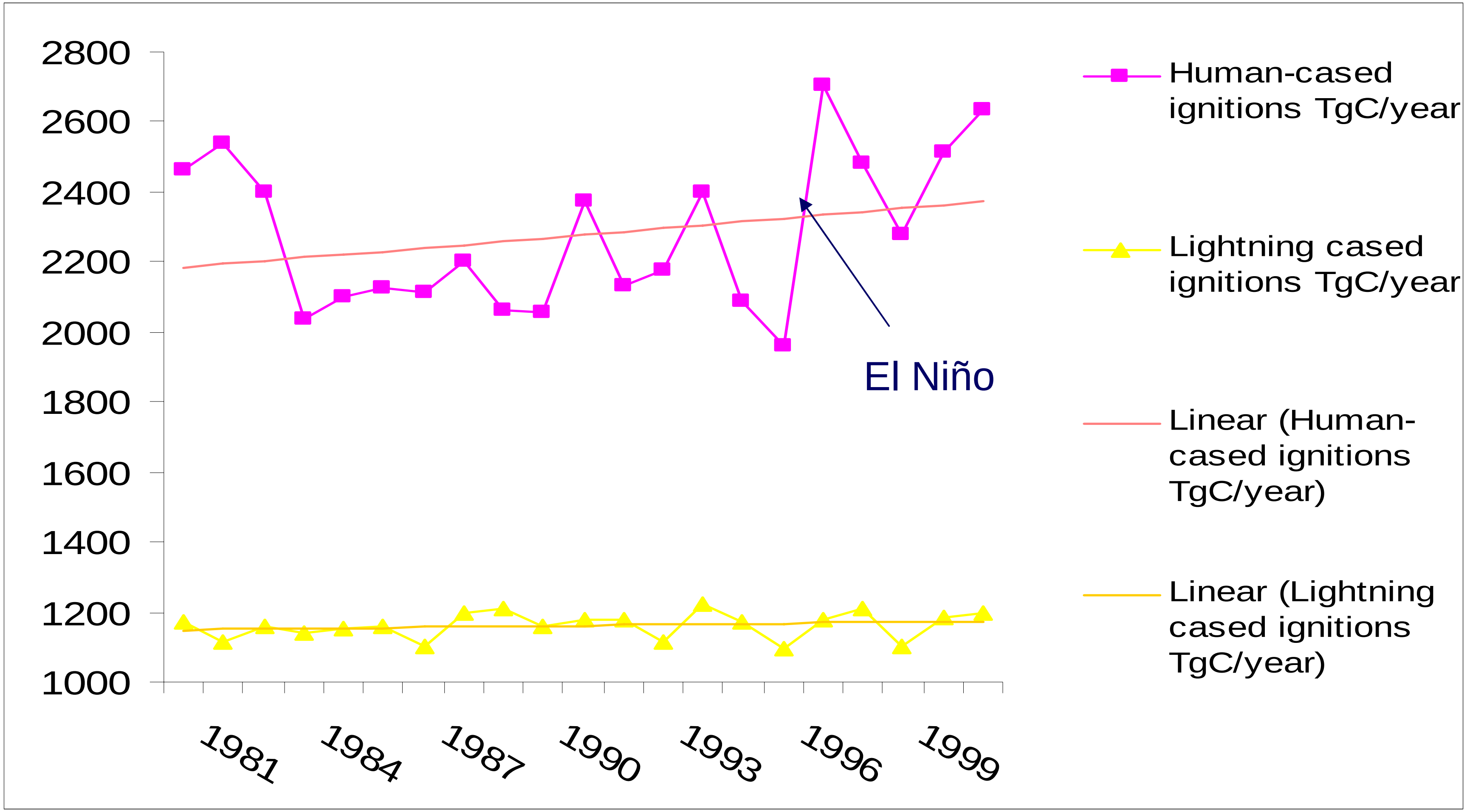


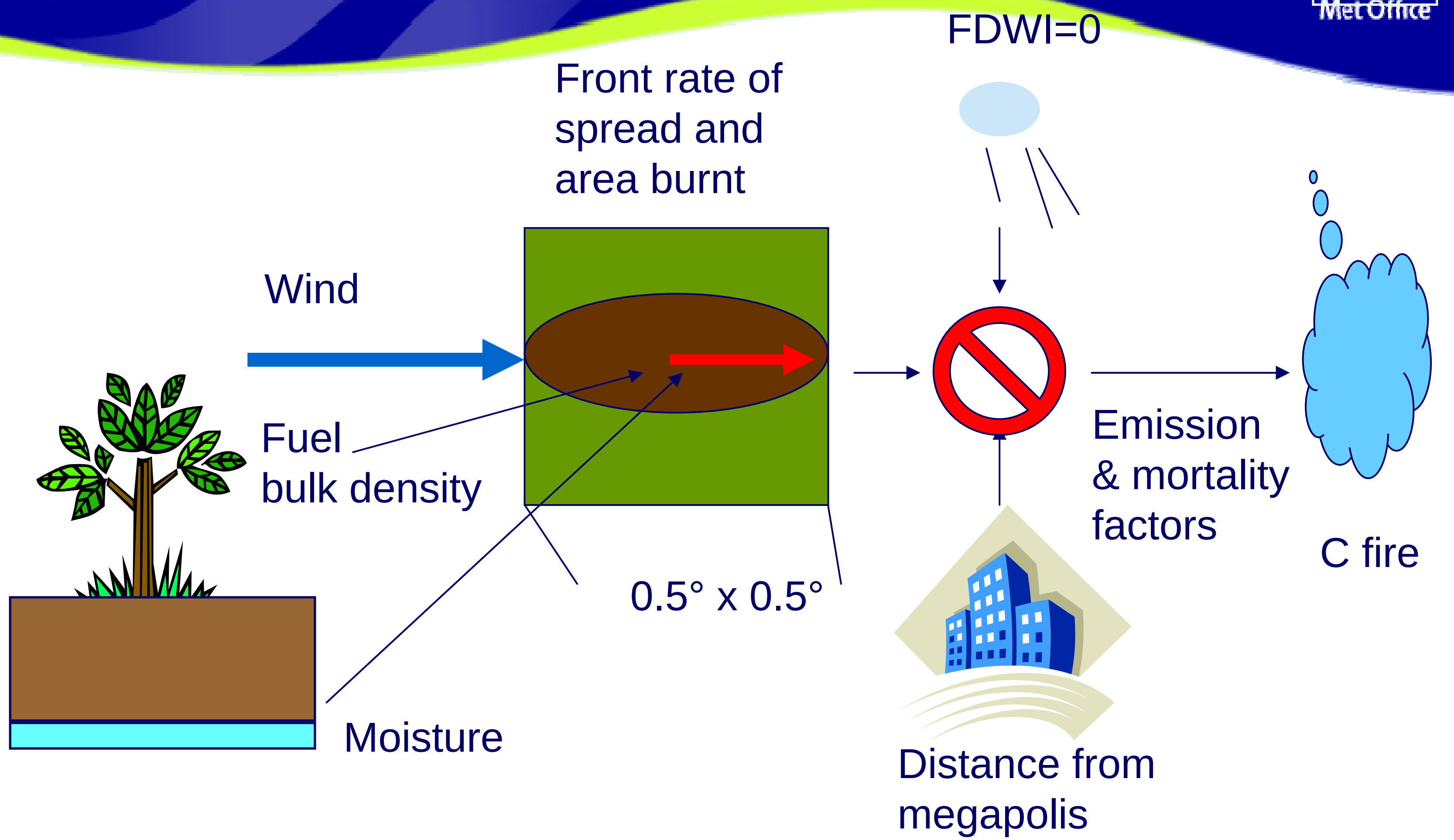
Total averaged for 1971-2002 annual fire emissions 3581 TgC (3530 TgC for 1997-2001,van der Werf et.al, 2004)

Messages for JULES fire activities:

1. Lightning ignitions can be simulated using environmental data, which are already in JULES
2. Human ignitions can be simulated using additional socio-economic data
3. Human ignitions are very important for description of recent fire emissions

Simulation of fire spread and emissions

Fire spread and emissions: conceptual scheme



Area burnt =f (climate, vegetation, human population)
Emissions =g (area burnt, vegetation)

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Comparison with global MODIS data

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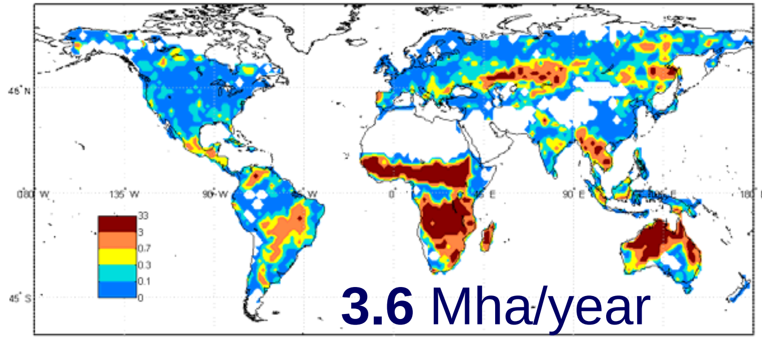
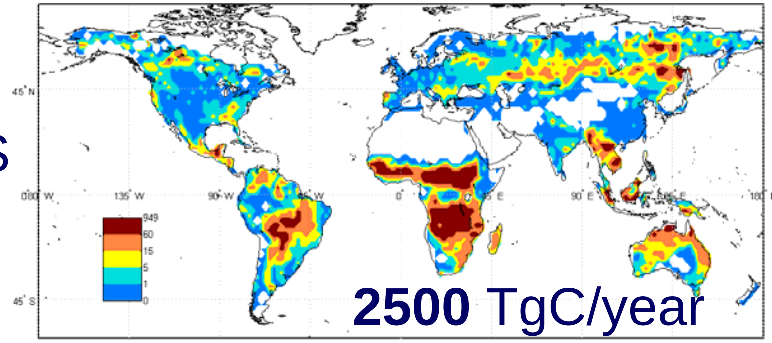
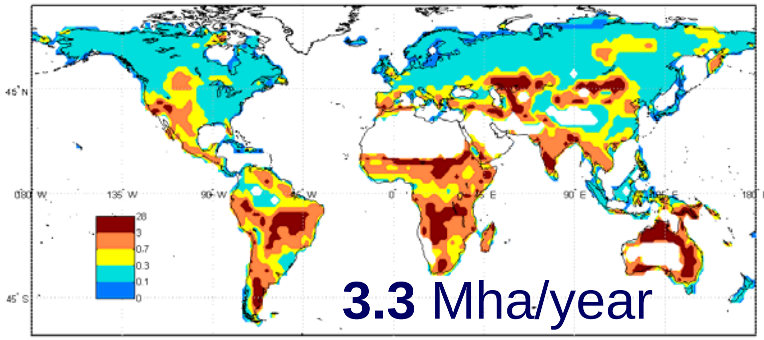
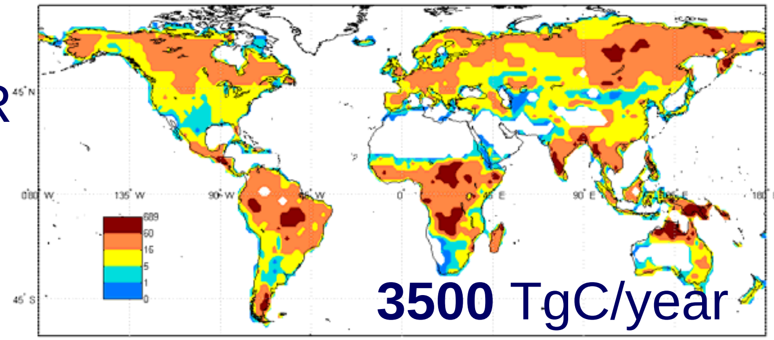


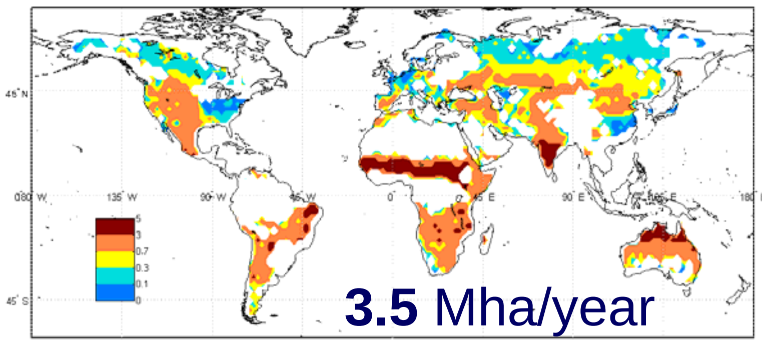
MODIS





SEVER





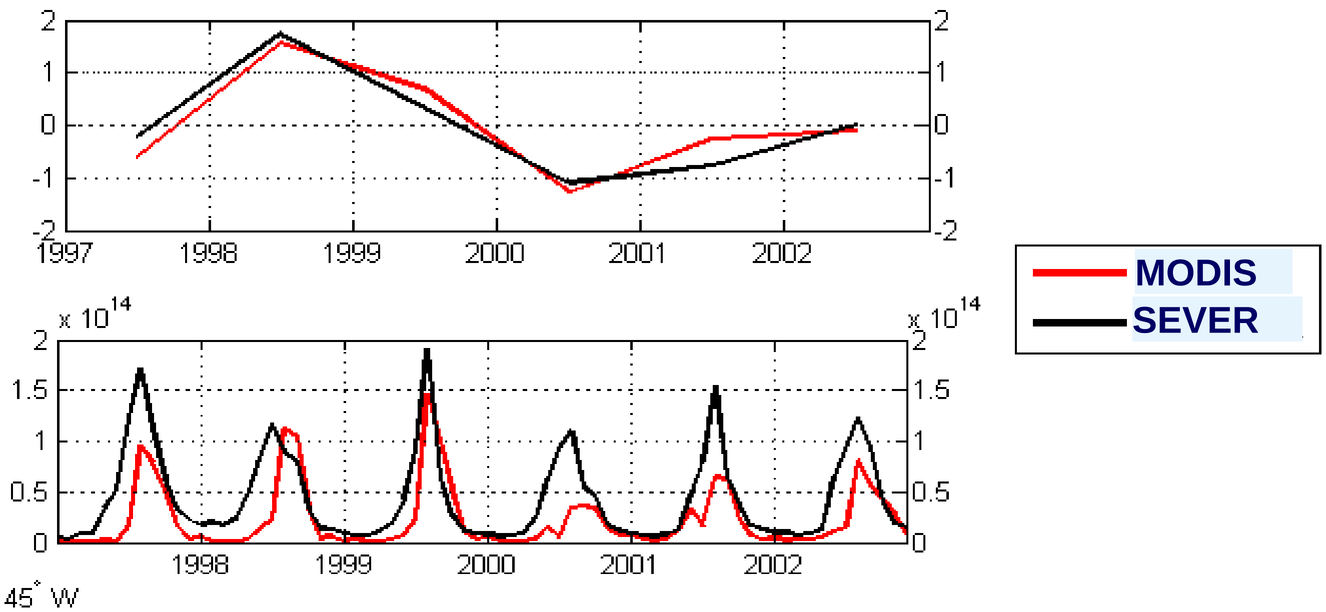
MC1

Closer look at some regions

South America

Burned area anomaly

Monthly



Closer look at some regions

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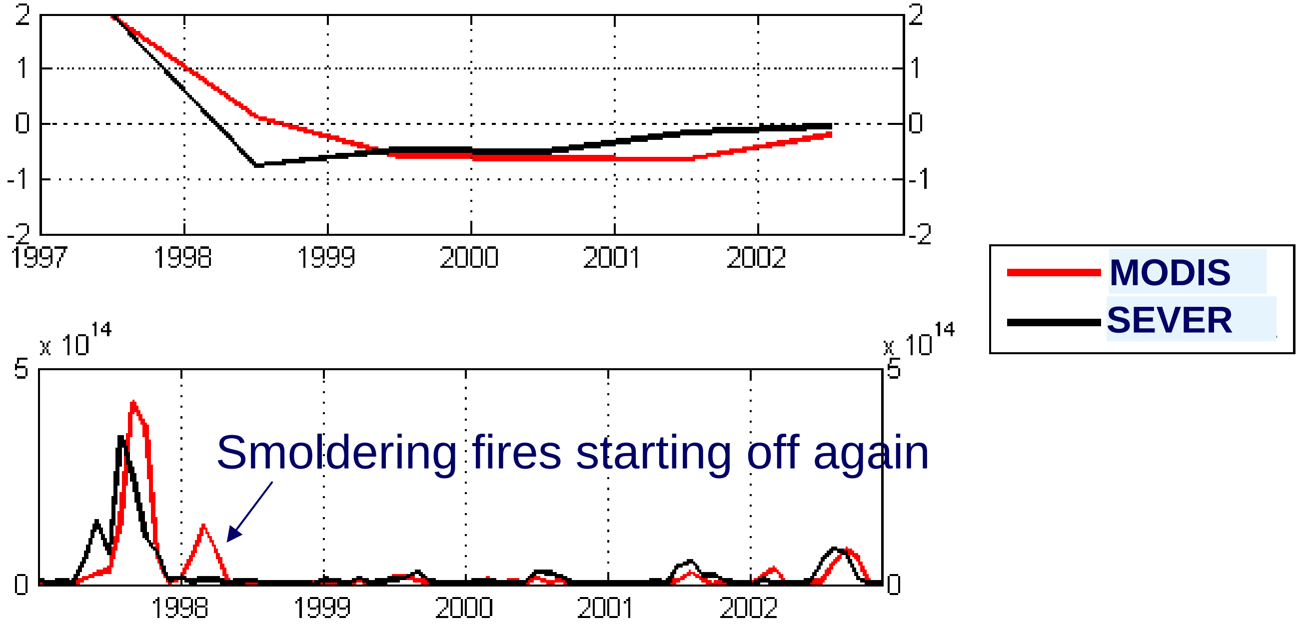

Messages for JULES fire activities:

1. Areas burnt and emissions can be estimated realistically if number and location of fires are known
2. Smoldering peat fires in tropics should be described and included in a model

THANK YOU !

Messages for future JULES fire activities:

- Fire weather indexes have similar quality for description of fires
- They work better for vegetation types, they were tuned for
- Thaw/freeze processes are important for fire dynamics in boreal zone
- Lightning ignitions can be simulated using environmental data, which are already in JULES
- Human ignitions can be simulated using additional socio-economic data
- Human ignitions are very important for description of recent fire emissions
- Areas burnt and emissions can be estimated realistically if number and location of fires are known
- Smoldering peat fires in tropics should be described and included in a model