

Land Surface Modelling in AMMA

(EU:wp4.1.1, API:wp4.1.2)

Tools & methods relevant for integrated Wps:

- Wp 1.2 (water cycle),
- Wp 1.3 (land-atmosphere feedbacks),
- Wp 2.3 land surface processes.



Monday Sept 19 2005

WP 2.3 session (14:00-18:00)

Presentation of Land surface
models in AMMA

(P. de Rosnay)



Land Surface Modellers

14 Laboratories in France, Spain and UK:

CEH, CESBIO, CETP, Cirad, CNRM, CRC, ECMWF, ENS, HSM, ISE, LMD, LTHE, UCLM, UCPT.

AMMA-API and AMMA-EU coordinated together to address some of scientific questions of Wps 1.2, 1.3, 2.3

Coordinated use of fields observations, satellite and models.



“Land Surface Modelling” ?

Predict water, energy, vegetation and biogeochemical processes.

Different approaches, concepts and parameterizations depending on considered studied processes, spatial and temporal scales and corresponding forcing tools:

‣ **SVAT**: vertical transfert of water and energy between surface and atmosphere) ~ time step: minute to hour

‣ **Integrated LSM**: second generation of SVAT, for GCM coupling, (including lateral transfers, CO2 cycle, phenology, vegetation dynamic - ~ time step: minute to hour

‣ **Hydrological models**: at basin scale, spatially distributed, ground water - Representative Elementary Watershed – rainfall event or hourly to daily time step.

‣ **Vegetation models**: at daily time step, for vegetation phenology

‣ **Crop model**: agricultural systems



Land Surface Models

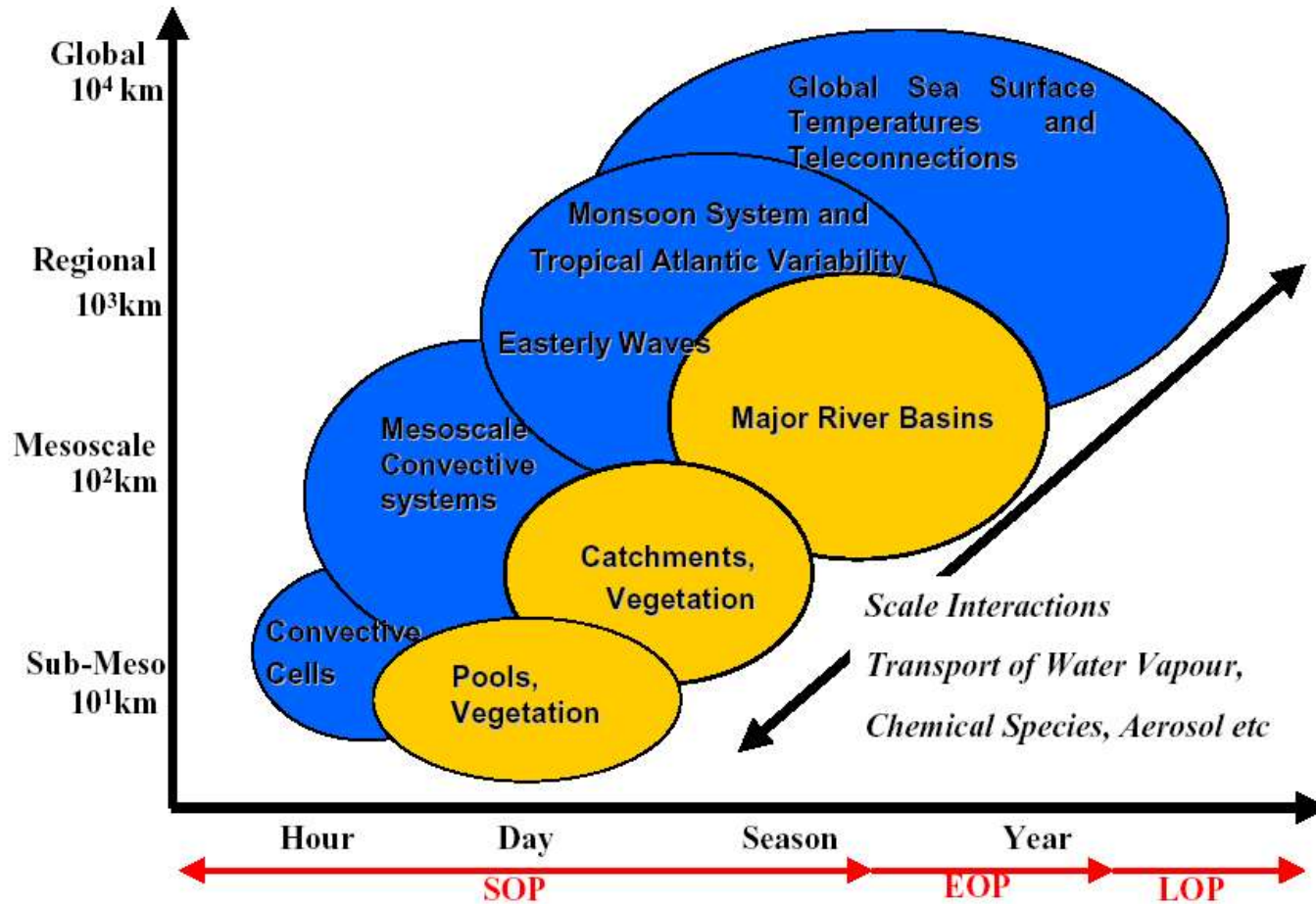
- 5 integrated land surface models (LSM): ISBA, JULES, ORCHIDEE, TESSEL IBIS
- 1 SVAT model: SETHYS
- 3 vegetation models: STEP, TGPIX, TREEGRASS
- 4 hydrological models: GR4j, Power, Rew_v4.0, ABC-rwf
- 1 crop model: SARRAH

A lot of Models are used. They focus on different processes, work on different temporal and spatial scales, on different domains and sites.

HOW modelling activities are organized to address scientific questions (WP 1.x & 2.3) pointed out in AMMA ?



Space and time scales

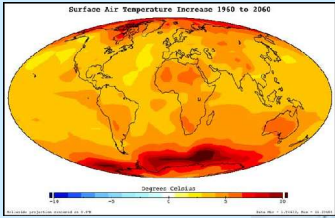


Scale interactions controls

- Processes (WP2.3)
- Water budget (WP 1.2)
- Land-atmosphere feedbacks (WP 1.3)



Domain of applicability and coupling



GCMs

ARPEGE
LMDZ
ECMWF
Met Off
CCM3
MM5

ISBA
ORCHIDEE
TESSEL
JULES
IBIS
SETHYS
Noah LSM ?

VIS, PIR, MW

VIS, TIR

MW

Meso to basin to local:

STEP

ABC Treegrass, TGPIX

POWER, REW, GR4j



Global, Regional to meso and local



Modeling Strategy

- Difficulty: extreme diversity of spatial scales involved in land surface processes.
- Interaction between processes at different scales critical to modeling activities

Strategy is to use the diversity of models to coordinate efforts through:

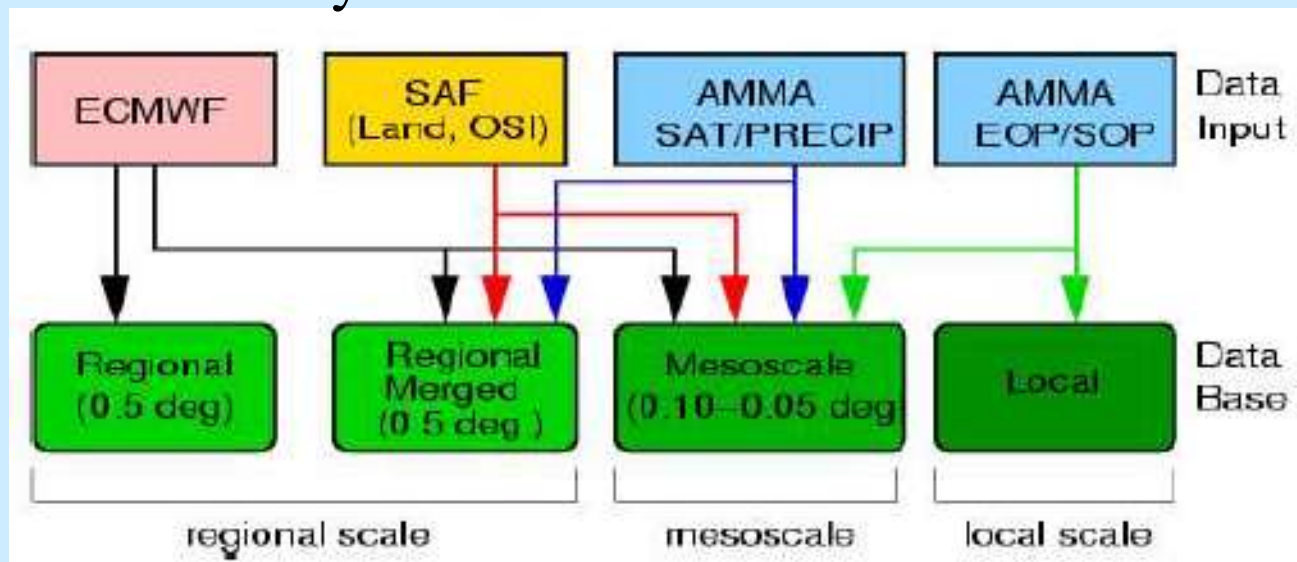
- Multiscales forcing data base (A. Boone, CNRM)
- ALMIP: AMMA LSM Intercomparison Project (CNRM), link with GSFC's LIS (land Information System)
- ALDAS system (ECMWF)



Multiscales Land Surface Forcing Data base (A. Boone)

Appropriate input data to run LSM. Two types of input:

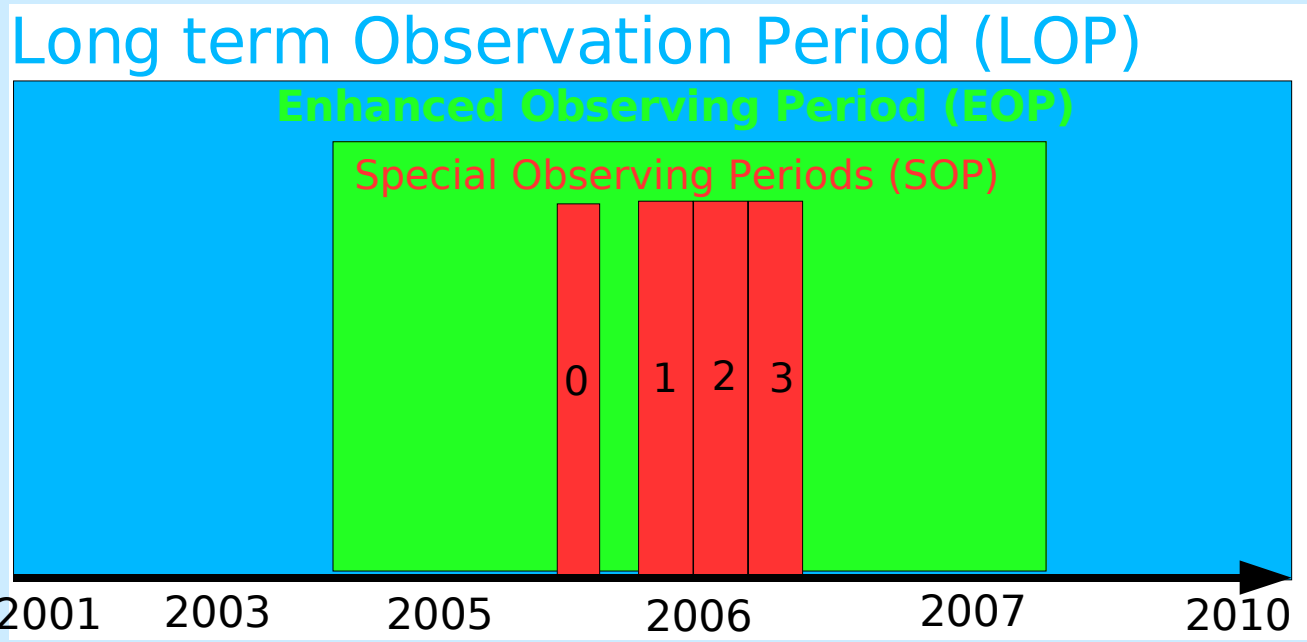
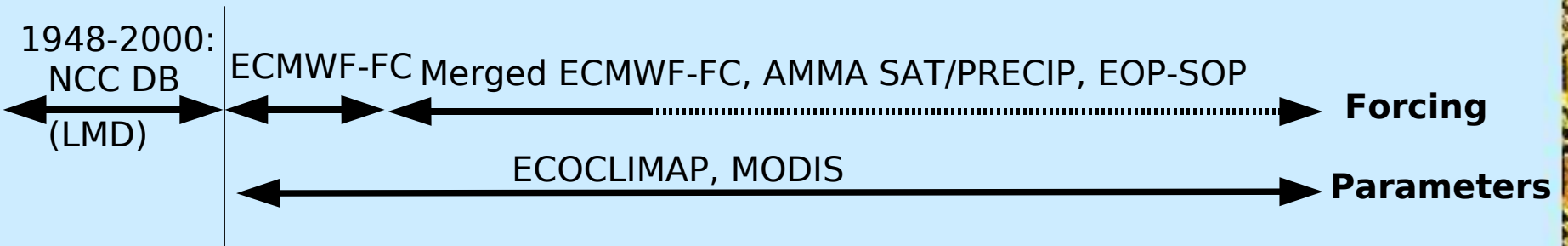
- **Parameter data:** Properties of the land surface that change on timesteps of a day or longer, e.g., soil, land cover, topography
- **Forcing data:** Atmospheric inputs to the land surface models, including precipitation, radiation, and surface winds, temperature, pressure and humidity.



Various sources for each of the spatial scale of the database



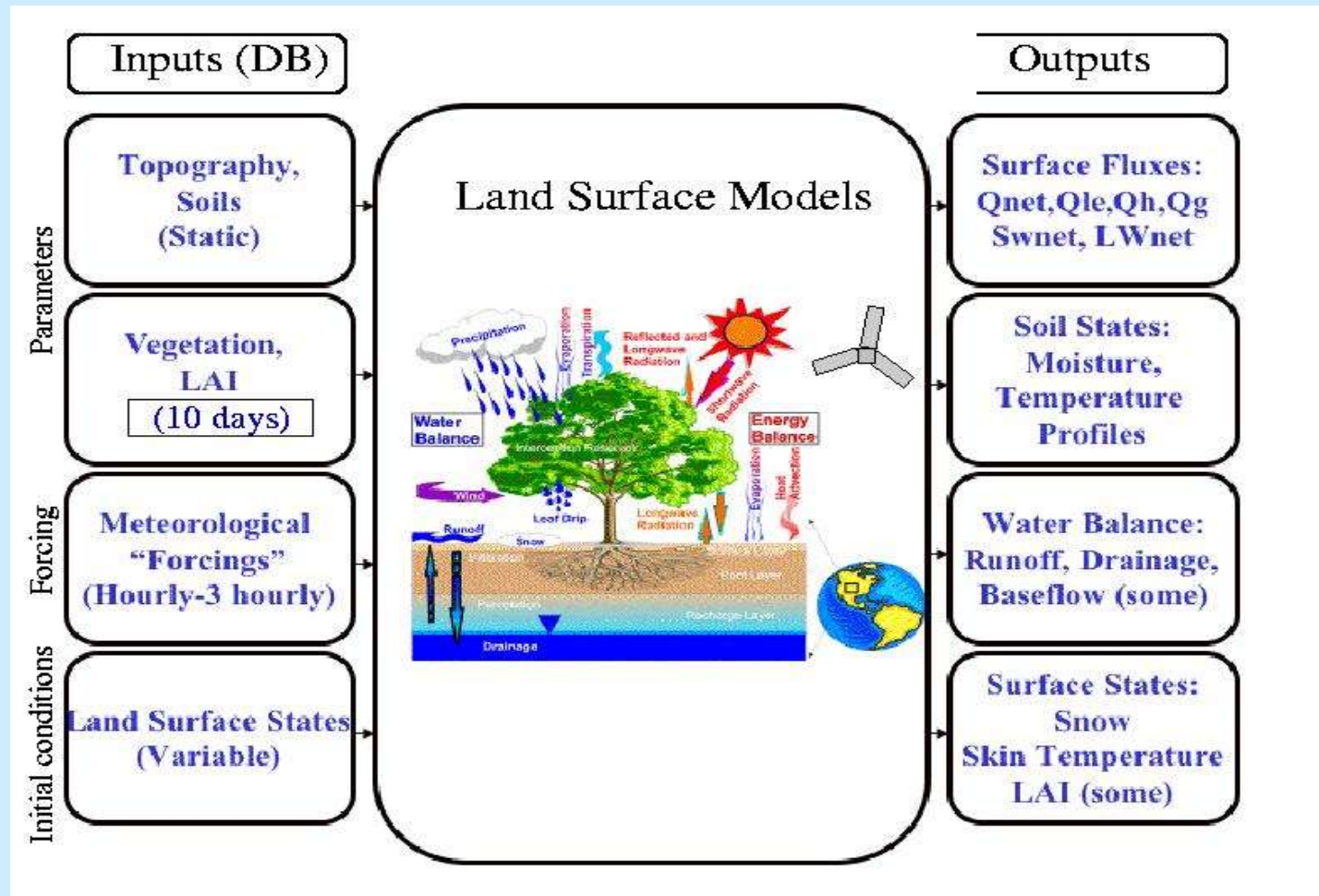
Multiscales Land Surface Forcing Data base (A. Boone)



- On going:**
- AMMA LSM DB for 2001-2004--- (CNRM)
 - Analysis of the models sensitivity to the forcing DB (LMD)



Use of Multiscales Data base for Modelling activities



Analysis of the output: surface fluxes, soil states, water balance, surface state on the studied domain (temporal and spatial).



ALMIP

AMMA LSM Intercomparison Project (A. Boone)

- Simulation forced by the multiscale database at different scales:
Regional, meso and local scale,
- with different models:
ORCHIDEE, ISBA, SETHYS, JULES, TESSEL, IBIS,
Noah, others ? (STEP-SETHYS, POWER, ABC-TREEGRASS ?)
- Output analysis of surface fluxes, water balance, soil states to
address water budget, land-atmosphere interaction and land surface
processes issues, including upscaling.
- Cross analysis at different scales and different types of models
(hydrological, LSM, vegetation) to identify key processes ?



Questions

- Link with mesoscale data base
- Specific field measurements of models parameters with a coherent inter-site approach
- Upscaling methods
- Participants to ALMIP

