Land surface Interactions with the Atmosphere over the IberianSemi-arid Environment (LIAISE): 1st modelling intercomparison

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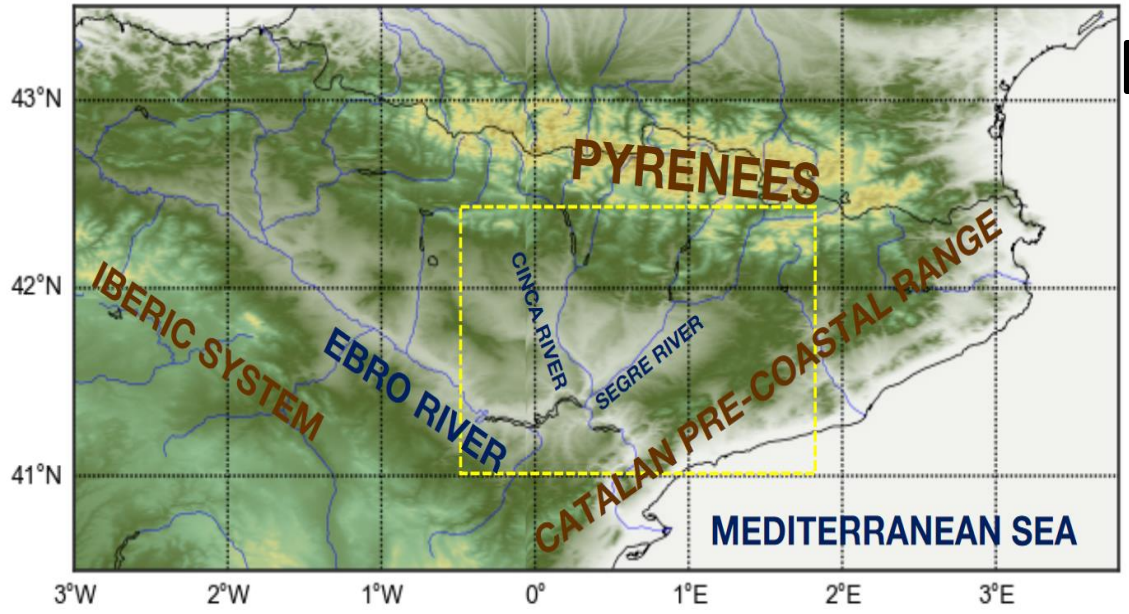


Eastern Ebro Subbasin

Complex terrain

✓Topography

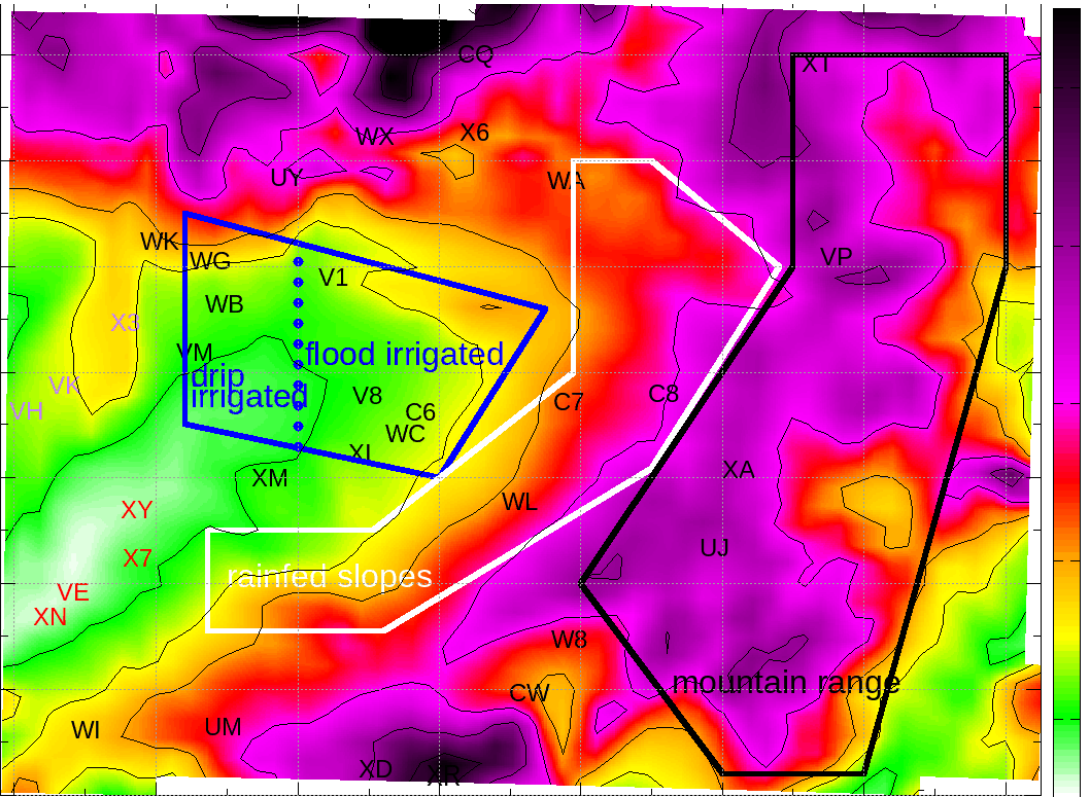
✓Soil uses

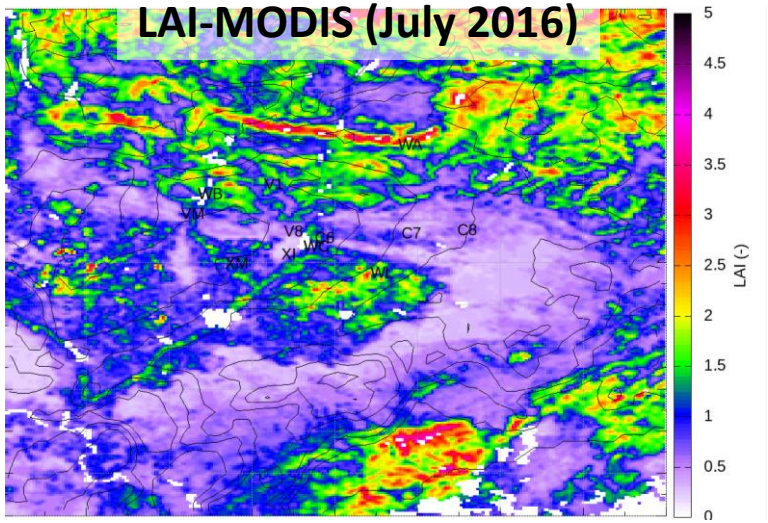
Heterogeneities

(circulations)

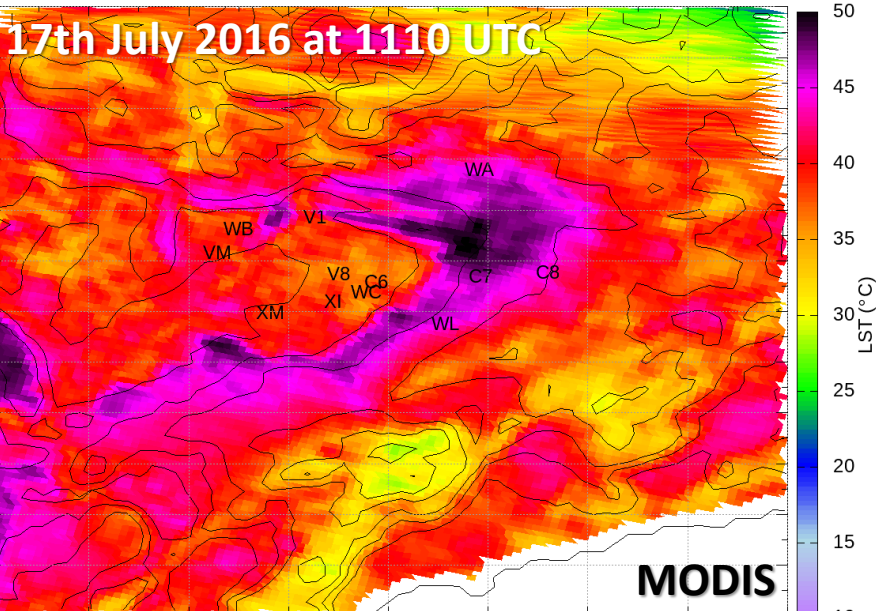
Local, basin, meso-synop

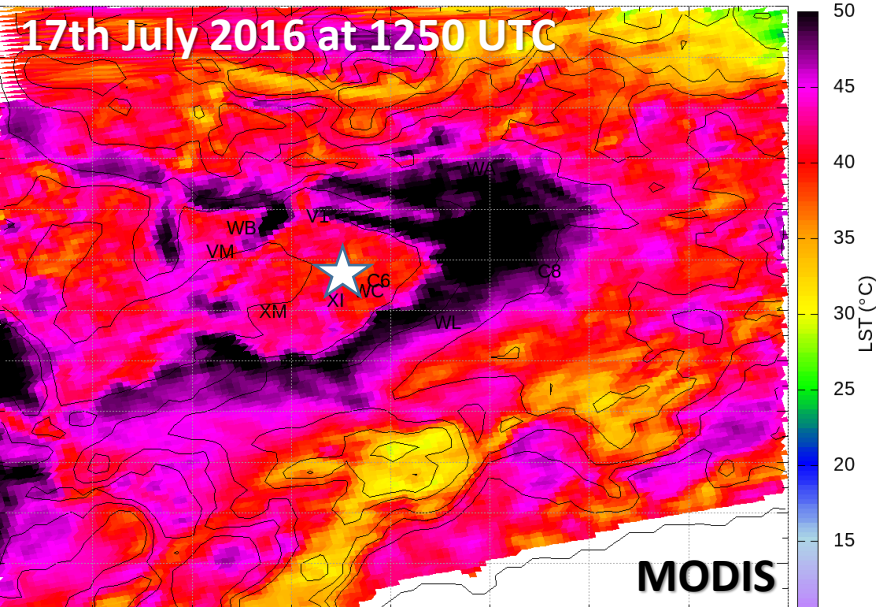
(Grau et al., 2021, JAMC)

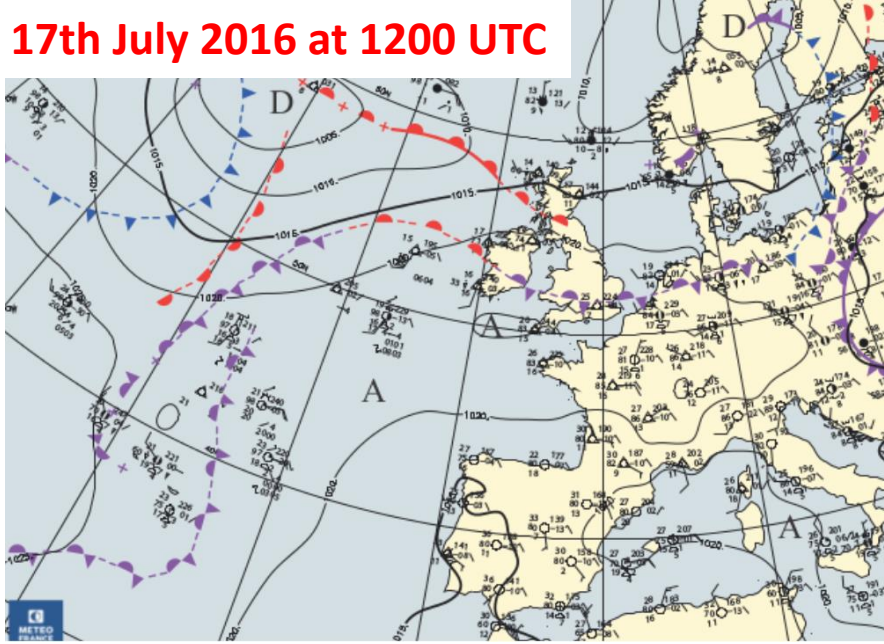


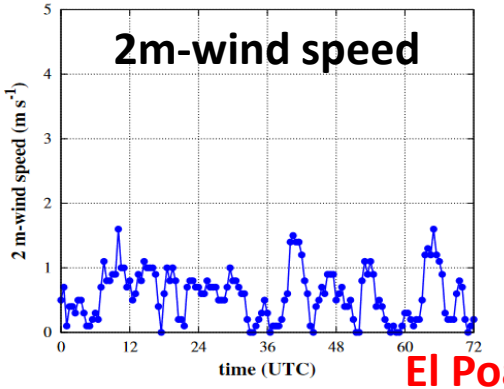


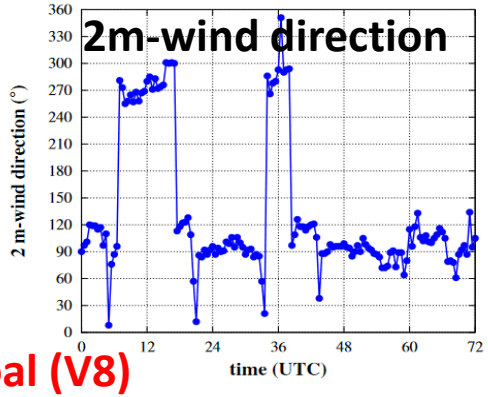
The 1st mesoscale intercomparison case



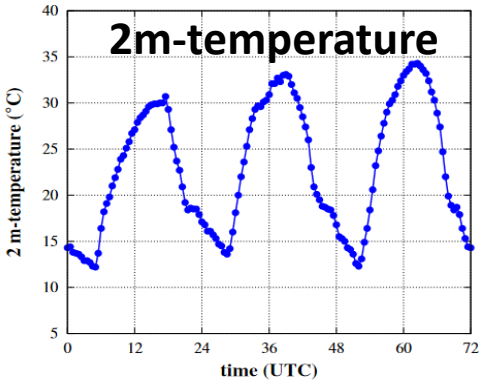


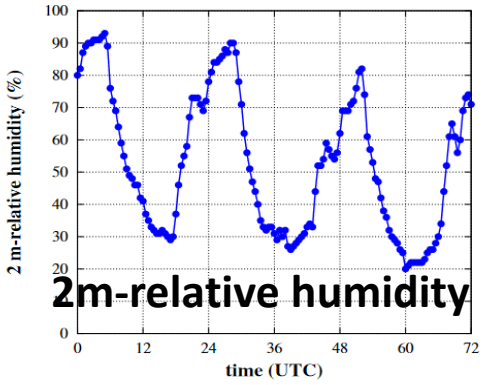






El Poal (V8)



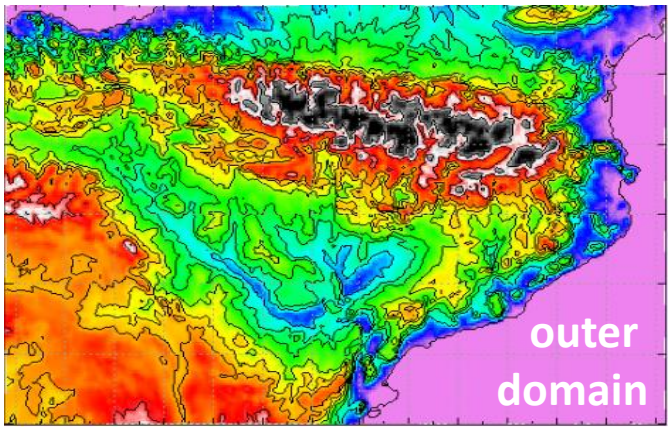


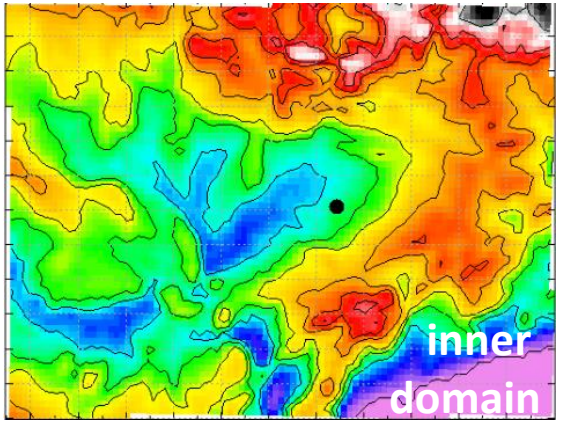
The 1st mesoscale intercomparison case

16-18 July 2016

* clear skies, A conditions
* locally/basin/mesoscale generated winds (interact)

Models
MesoNH (MNH)
MOLOCH (MOL)
Unified Model (UM)
WRF





Model setup

- **36h run** (from 16 July at 1800 UTC to 18 July at 0600UTC)
- **2 nested domains** (1-way): 2km x 2 km and 400m x 400m resolution (540 x 450 gridpoints)
- **Vertical resolution** (2m and stretched above, 85 levels)
- **Initial/Lateral BC**: ECMWF
- **Differences**: Turbulence, Radiation (5min), Surface

10 m (agl) wind vectors (MesoNH)

17th July 0600 UTC

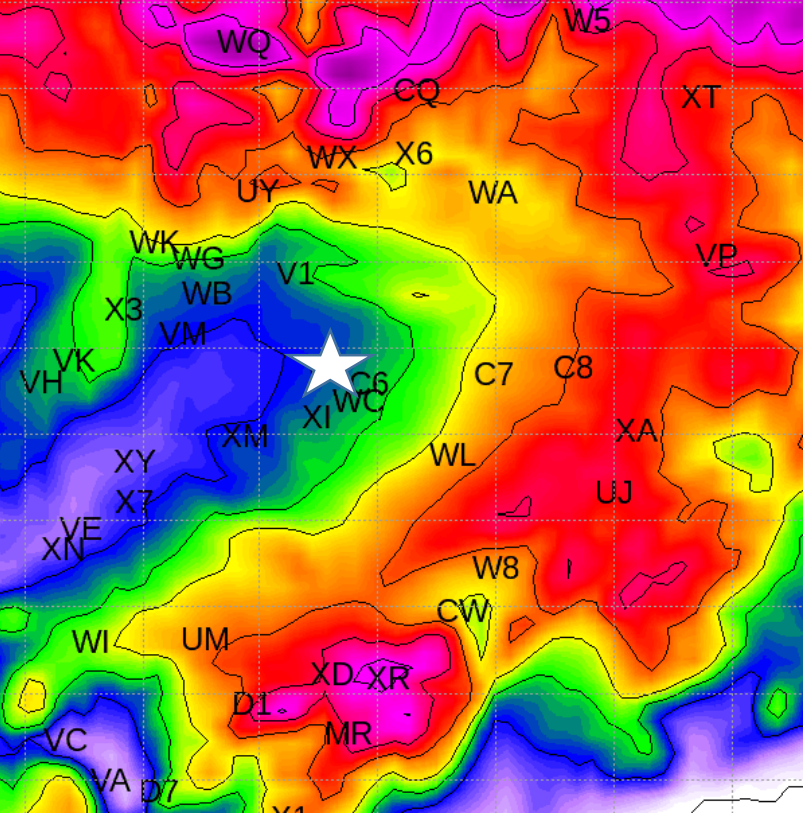
E-wind prevail

17th July 1500 UTC

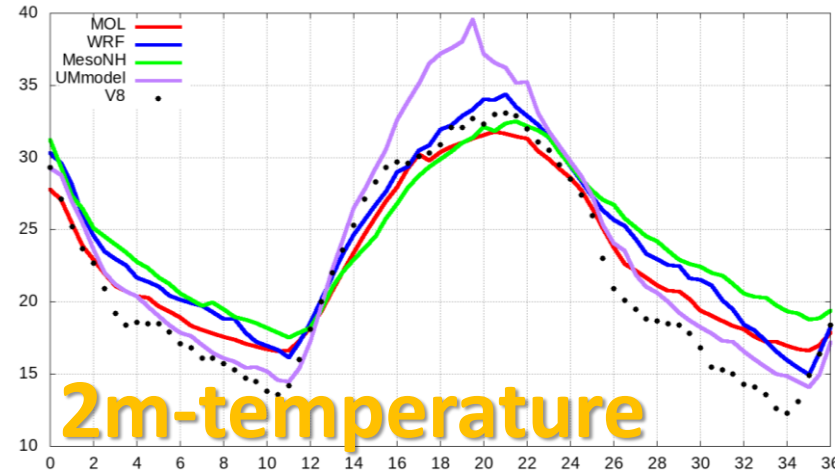
SB front interacts with local winds

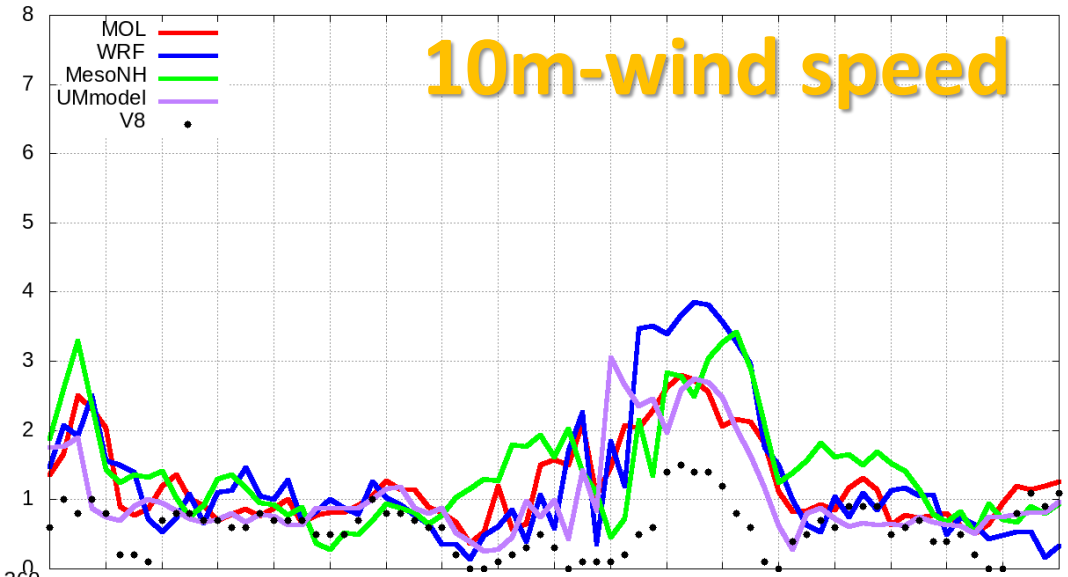
Validation using AWS

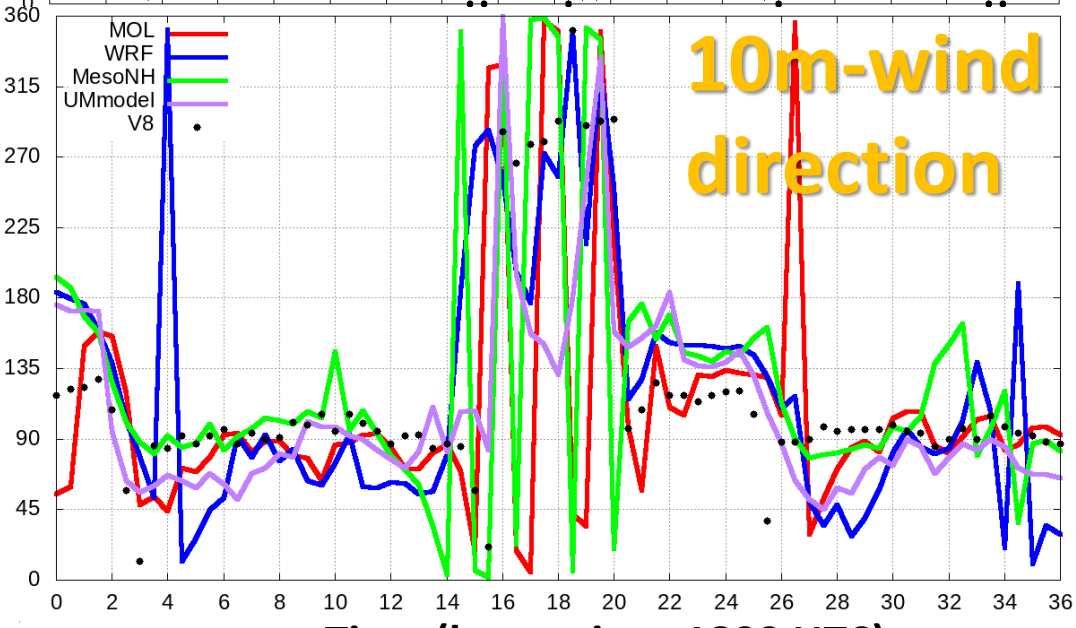
Moloch WRF MesoNH UM



El Poal (V8) - FLOOD







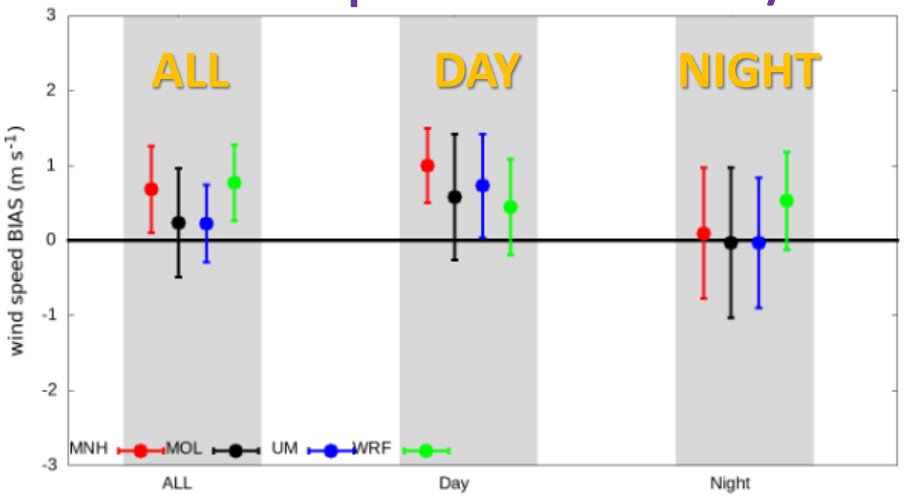
Mean BIAS (model-obs)

Validation using AWS

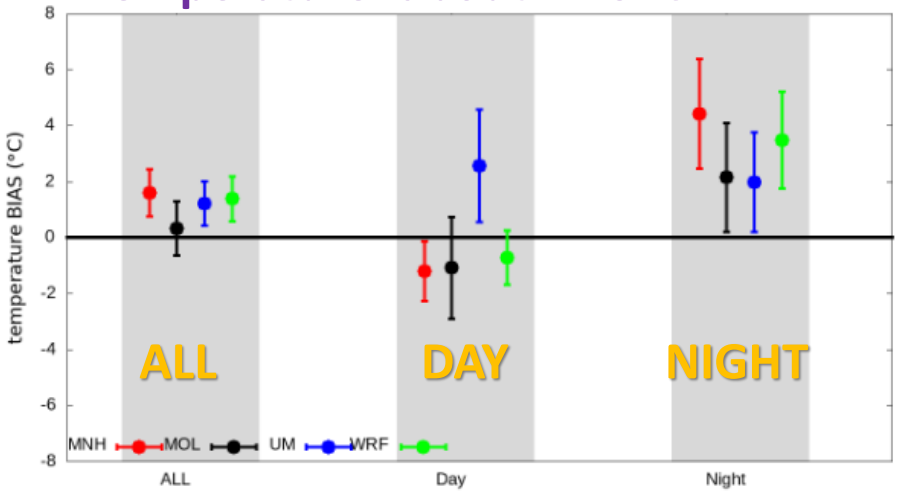
MesoNH
Moloch
UM
WRF

ALL run,
DAY (1000-1400 UTC), NIGHT (0000-0400 UTC)

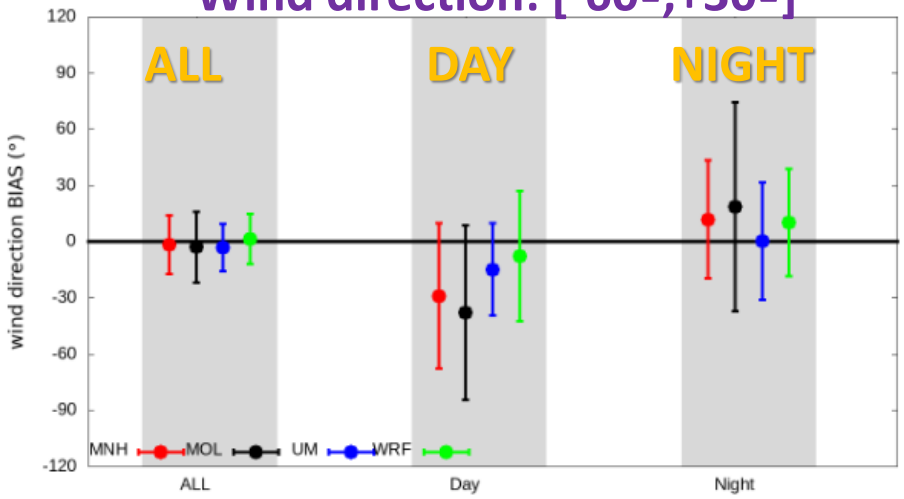
Wind speed: about +0.5m/s



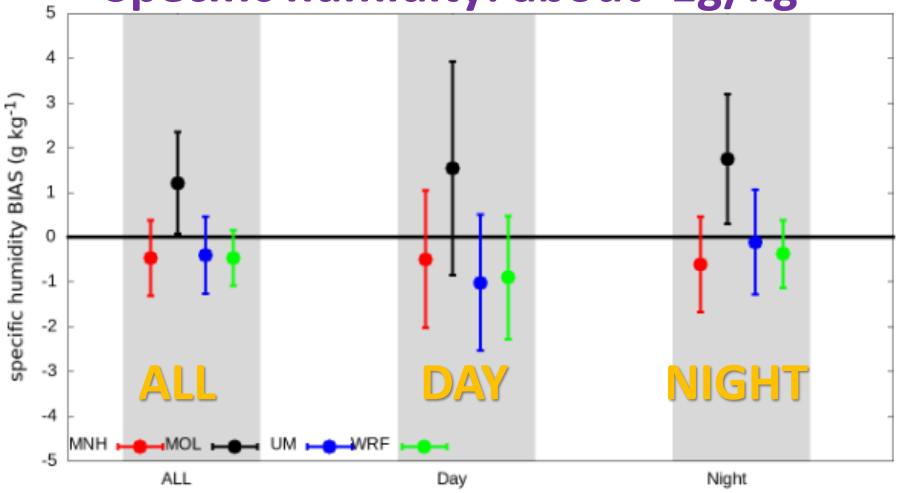
Temperature: about +1.5ºC



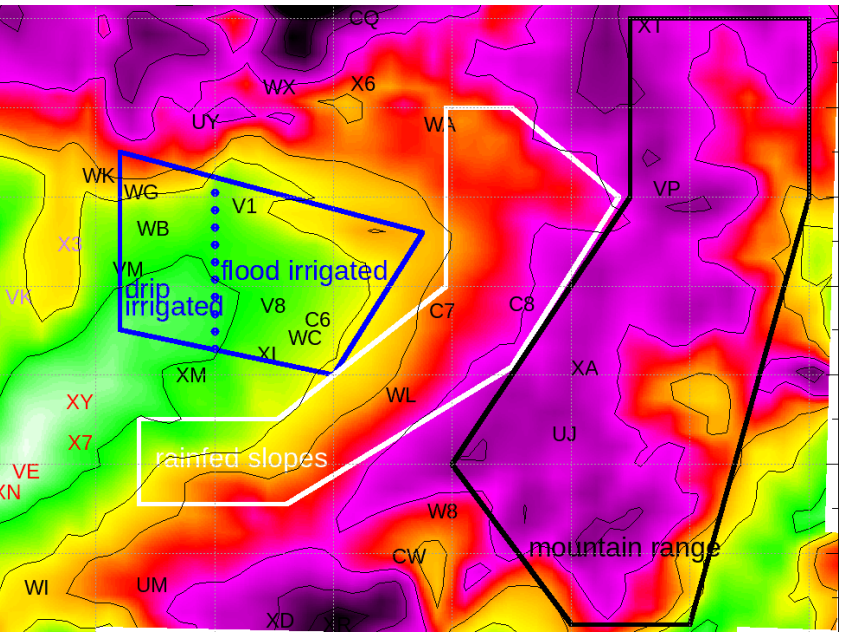
Wind direction: [-60º,+30º]



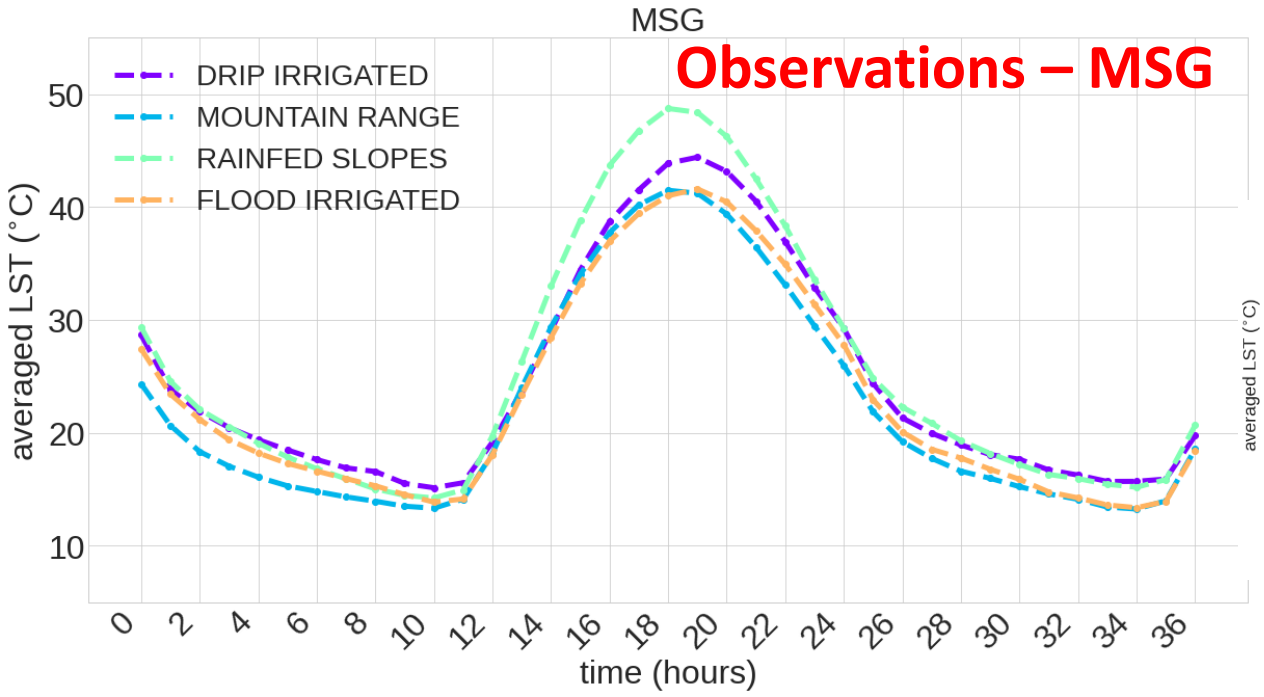
Specific humidity: about -1g/kg

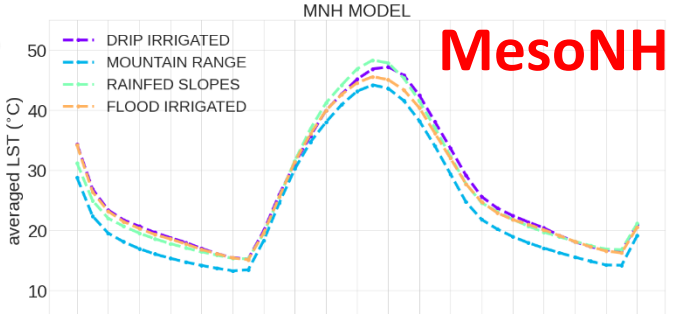


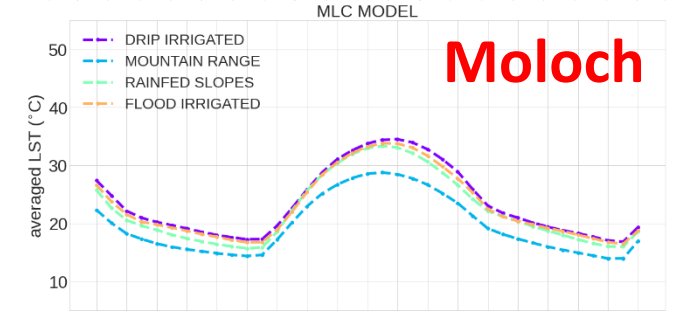
Averaged temperature over the regions

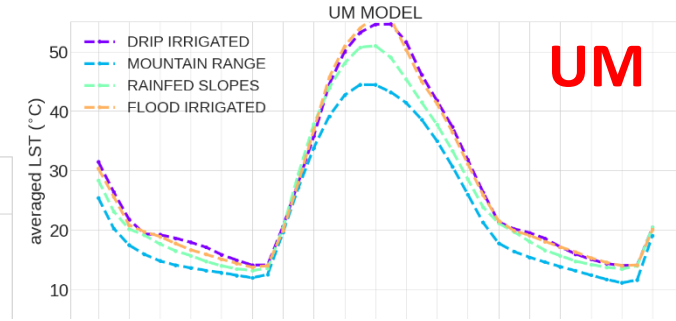


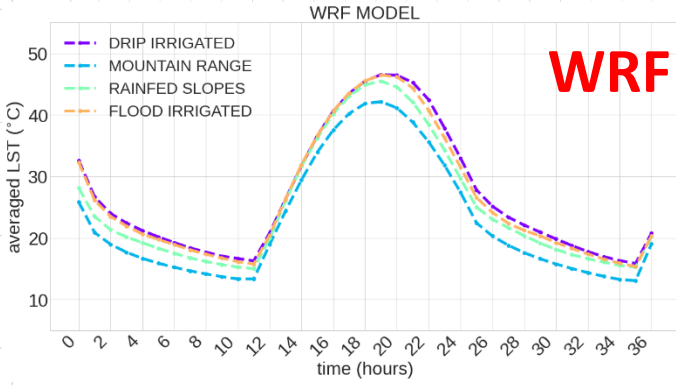
- ✓ Spatial resolution
- ✓ Soil features





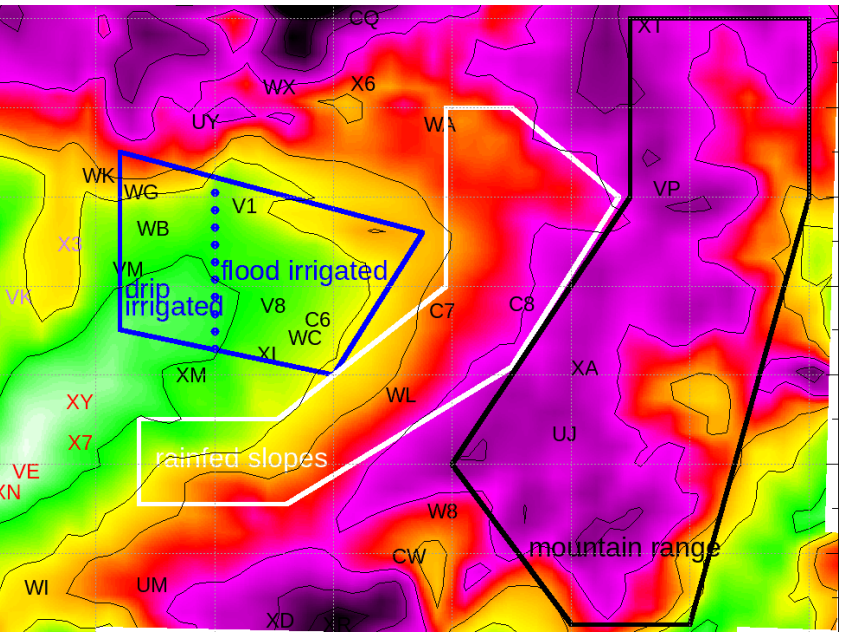


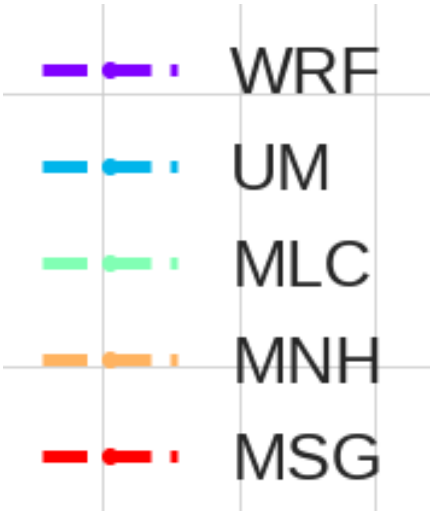


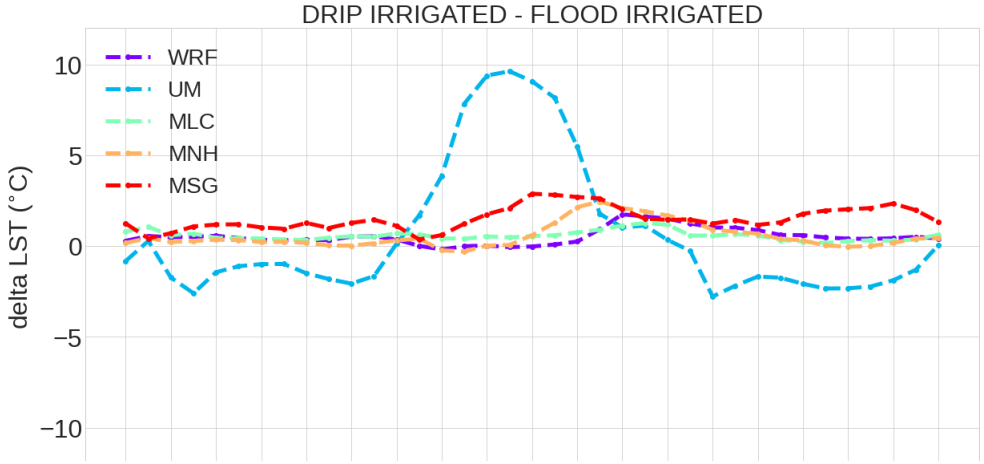


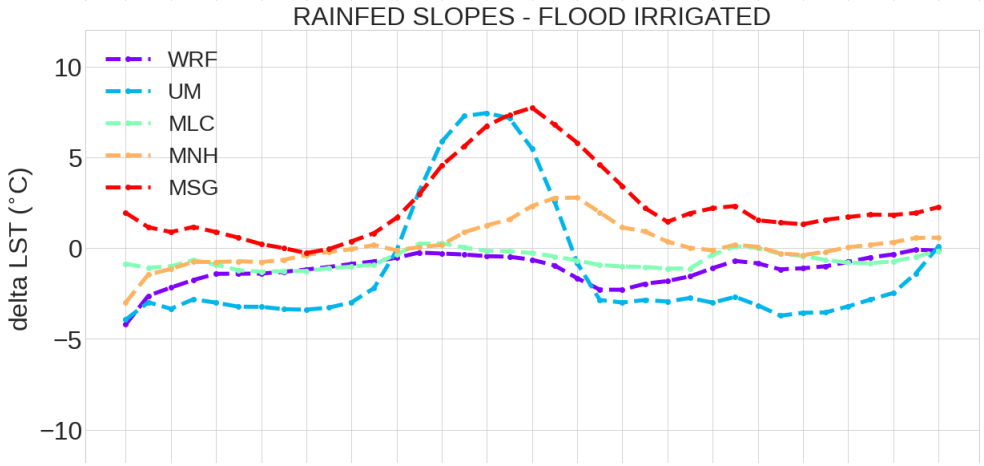
Validation using LST

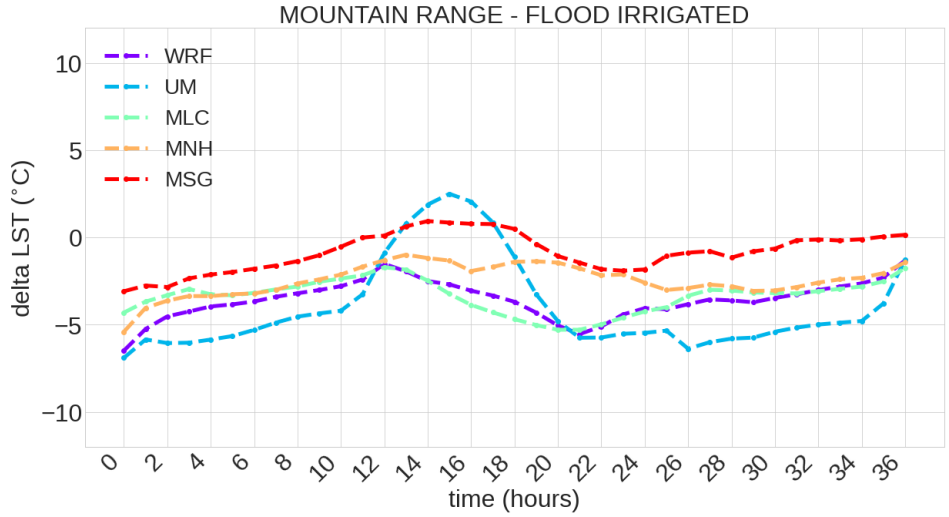
Surface thermal gradient





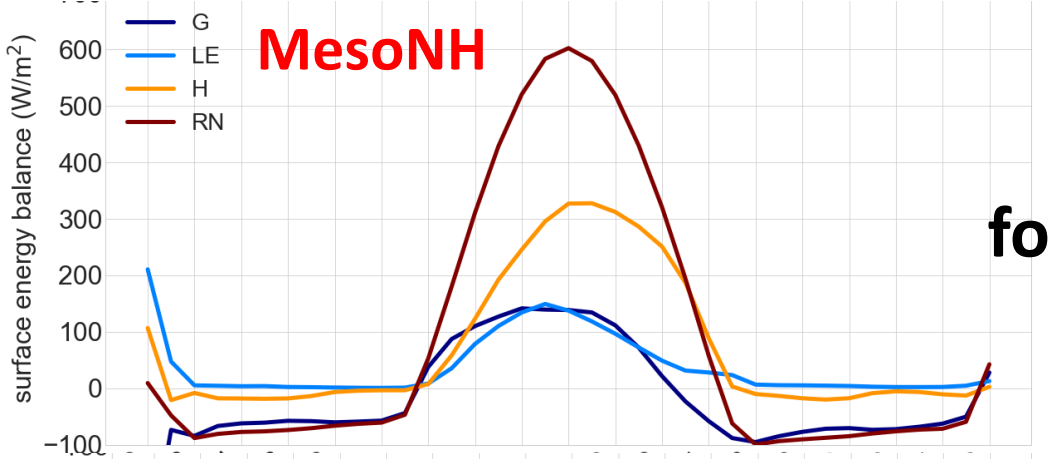


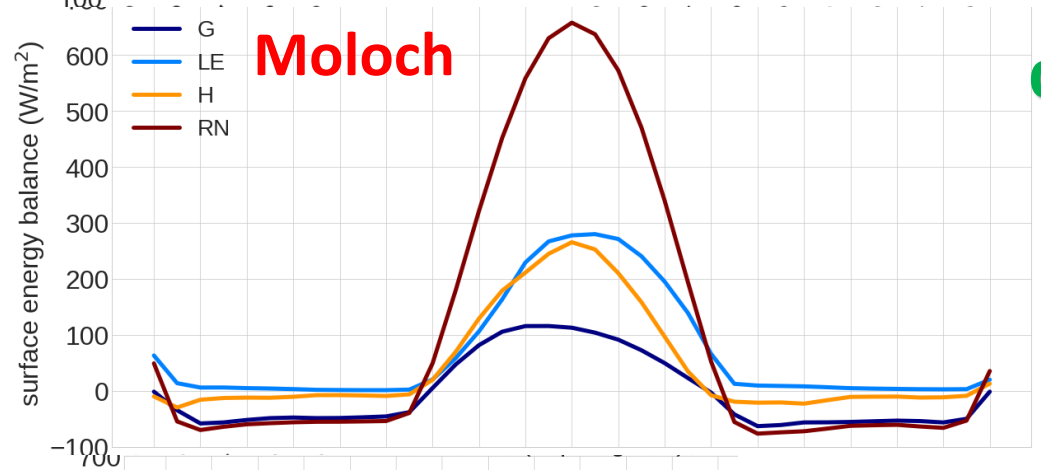


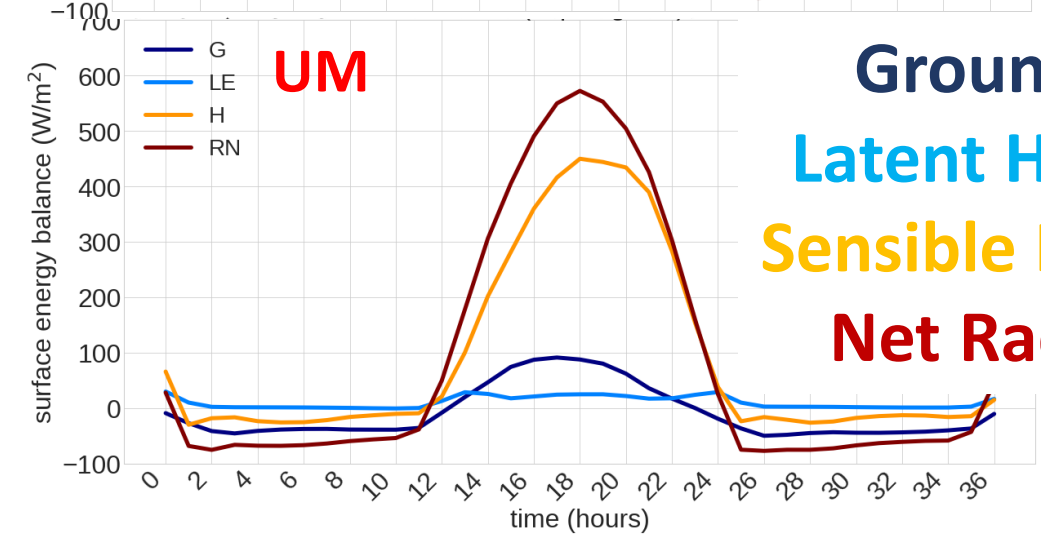


Validation using LST

SEB terms averaged for each region (drip irrigated)







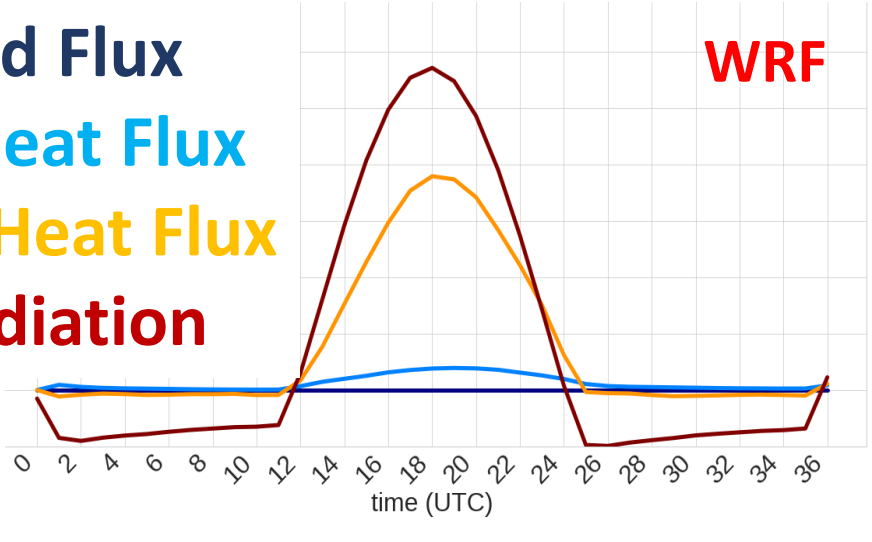
All the models do not present significant differences in the SEB terms for each region

Ground Flux

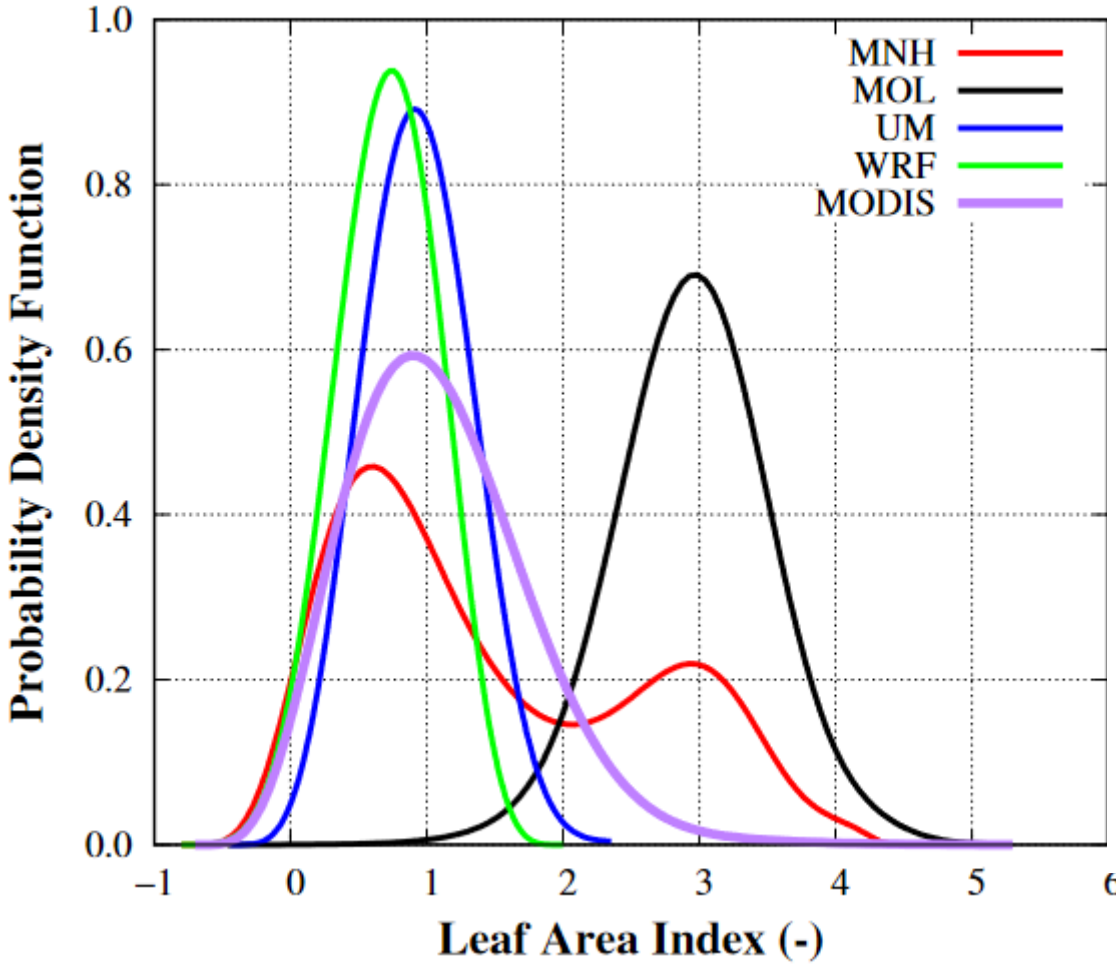
Latent Heat Flux

Sensible Heat Flux

Net Radiation



Variability of the surface cover

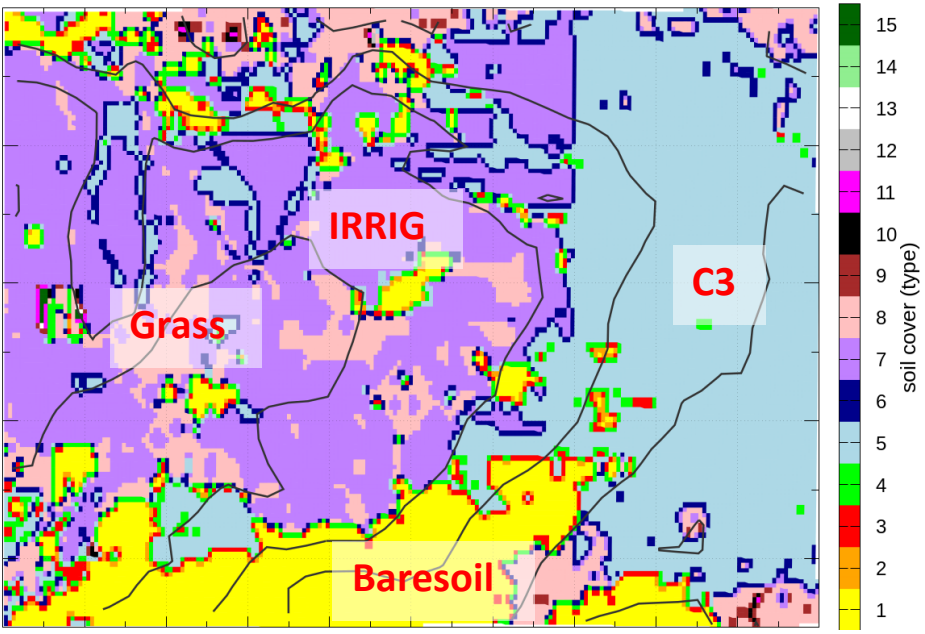


Model	soil covers
MesoNH	Irrigated crops C3 cultures types Bare soil Grassland
MOLOCH	Cropland Grassland Closed shrubland Wooded grassland
Unified Model	C3 cultures types Shrubs inland water
WRF	Closed Shrublands Savannas

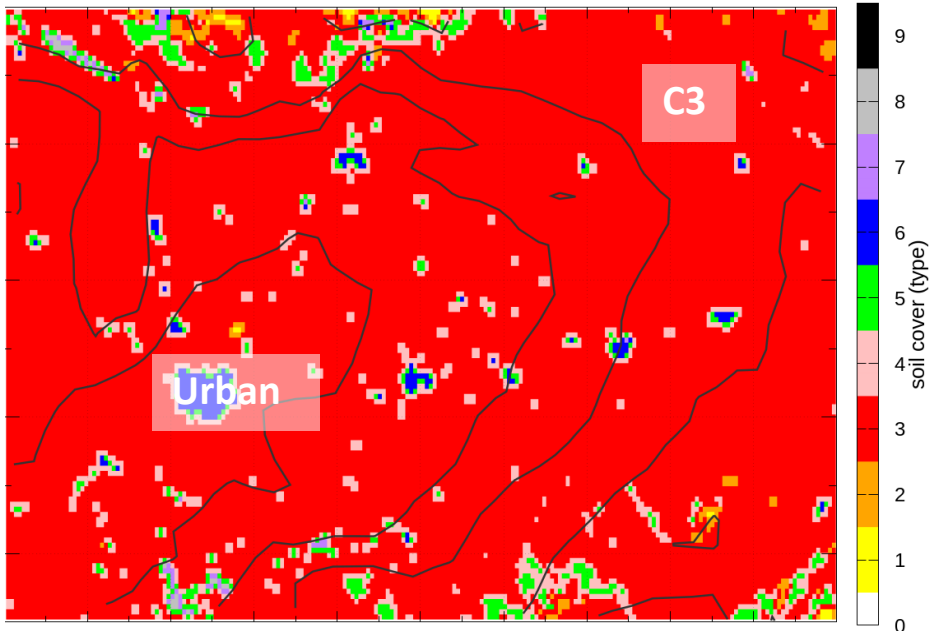
✓ **Models present differences in the surface parameters (LAI, fveg, albedo, ...)**

Variability of the surface cover

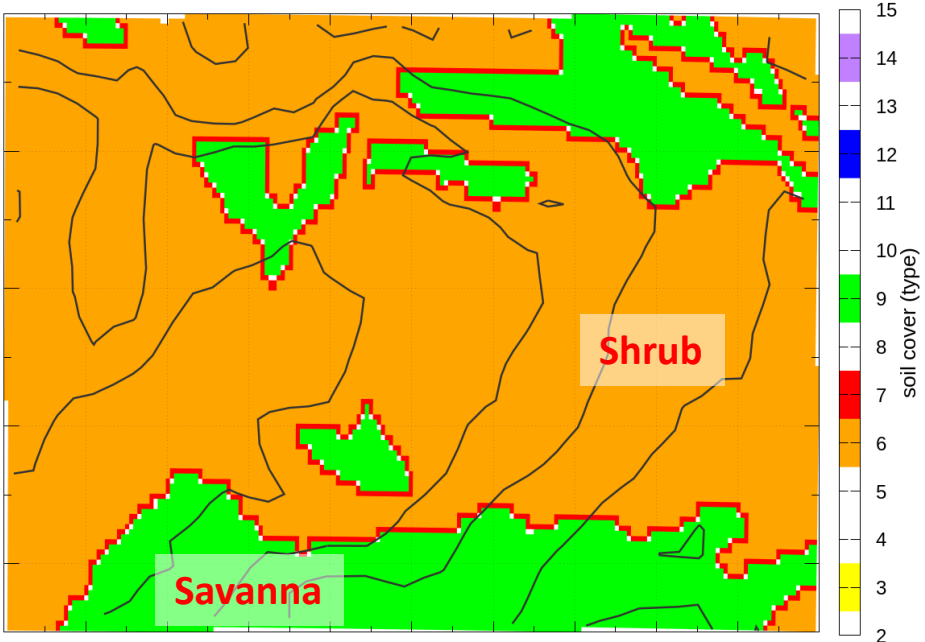
MesoNH



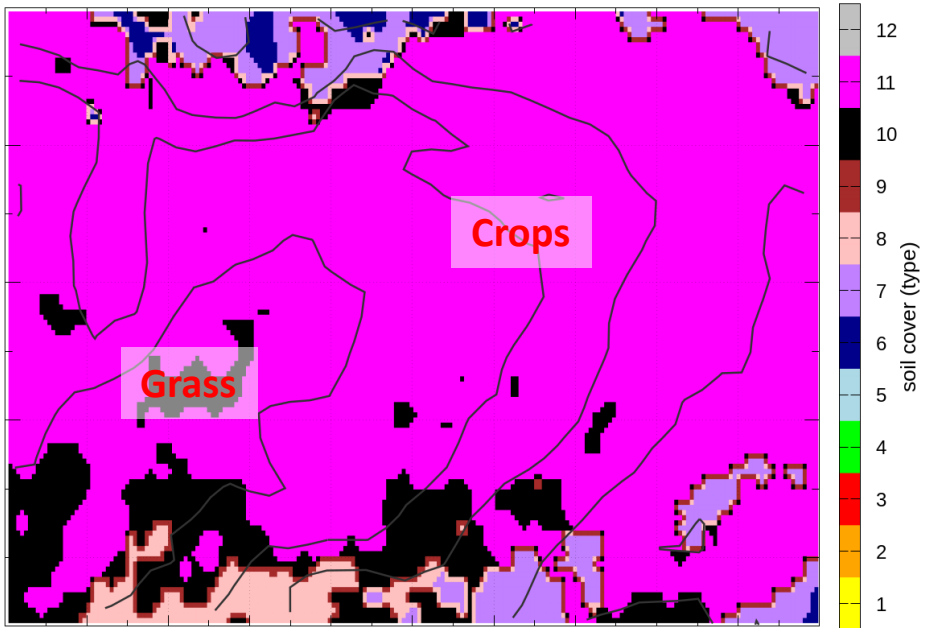
UM



WRF



MOLOCH



Summary

- The case 16-18 July 2016 is taken for the 1st mesoscale intercomparison.

✓ **Locally-generated circulations**
(interaction between local, basin, mesoscale)

- **Results (known features):** models are able to reproduce the general patterns of the region **BUT**:

✓ **Models tend to overestimate wind speed** (daytime)
✓ **Difficulties in reproducing nocturnal nearly calm conditions**
✓ **Temperatures are overestimated** (specially during night-time)

Summary

- Models are not able to reproduce the heterogeneities:

✓**Surface model** (processes included, irrigation)

✓**Surface parameters & initialitation**
(irrigated, rainfed,… zones)

✓**Parameterizations** (turbulence, advection, radiation)

- **Sensitivity tests (work in progress)**

✓**Initial and lateral BC** (GFS, NCEP)

✓**Surface features**
(soil moisture, vegetation, surface model...)

✓**Spatial resolution**

- **After testing models + LIAISE campaign:** possible future (GEWEX) intercomparison based on IOPs?