MOSAI: Model and Observation for Surface-Atmosphere Interactions

Objective:

Use of long term measurements to highlight weaknesses of surface-atmosphere interactions schemes in numerical models.
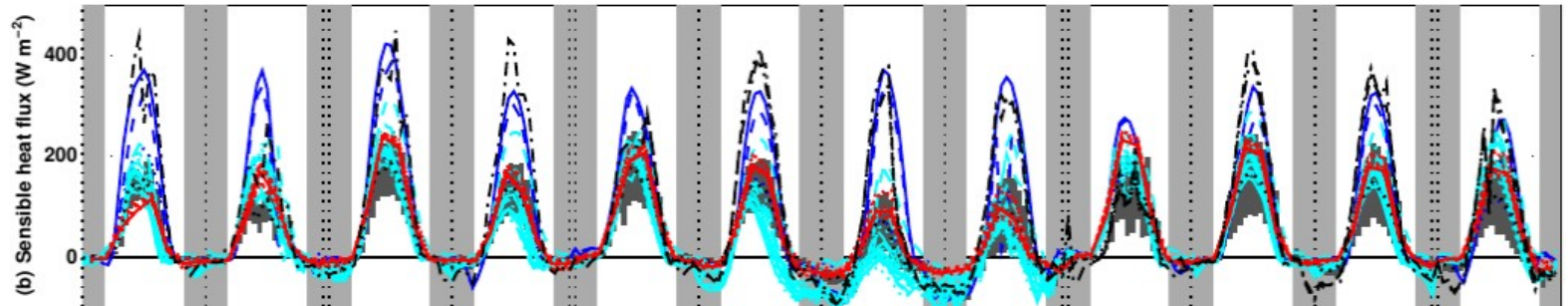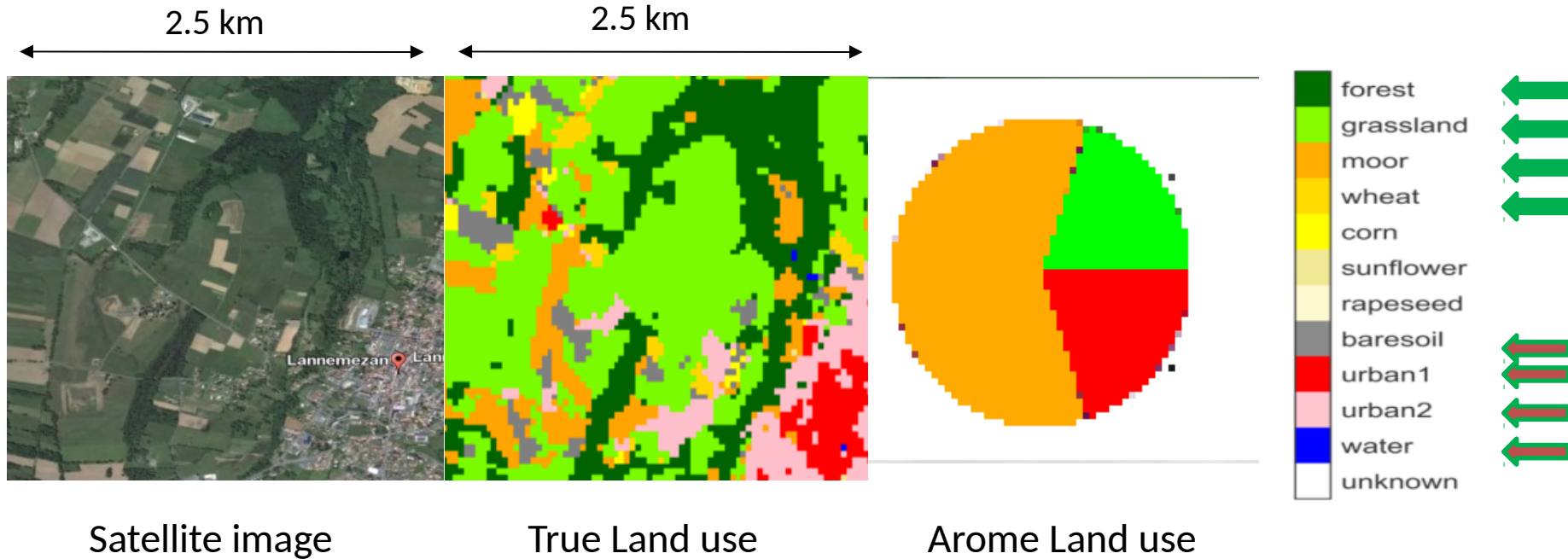
Link between Experiment and Modeling communities
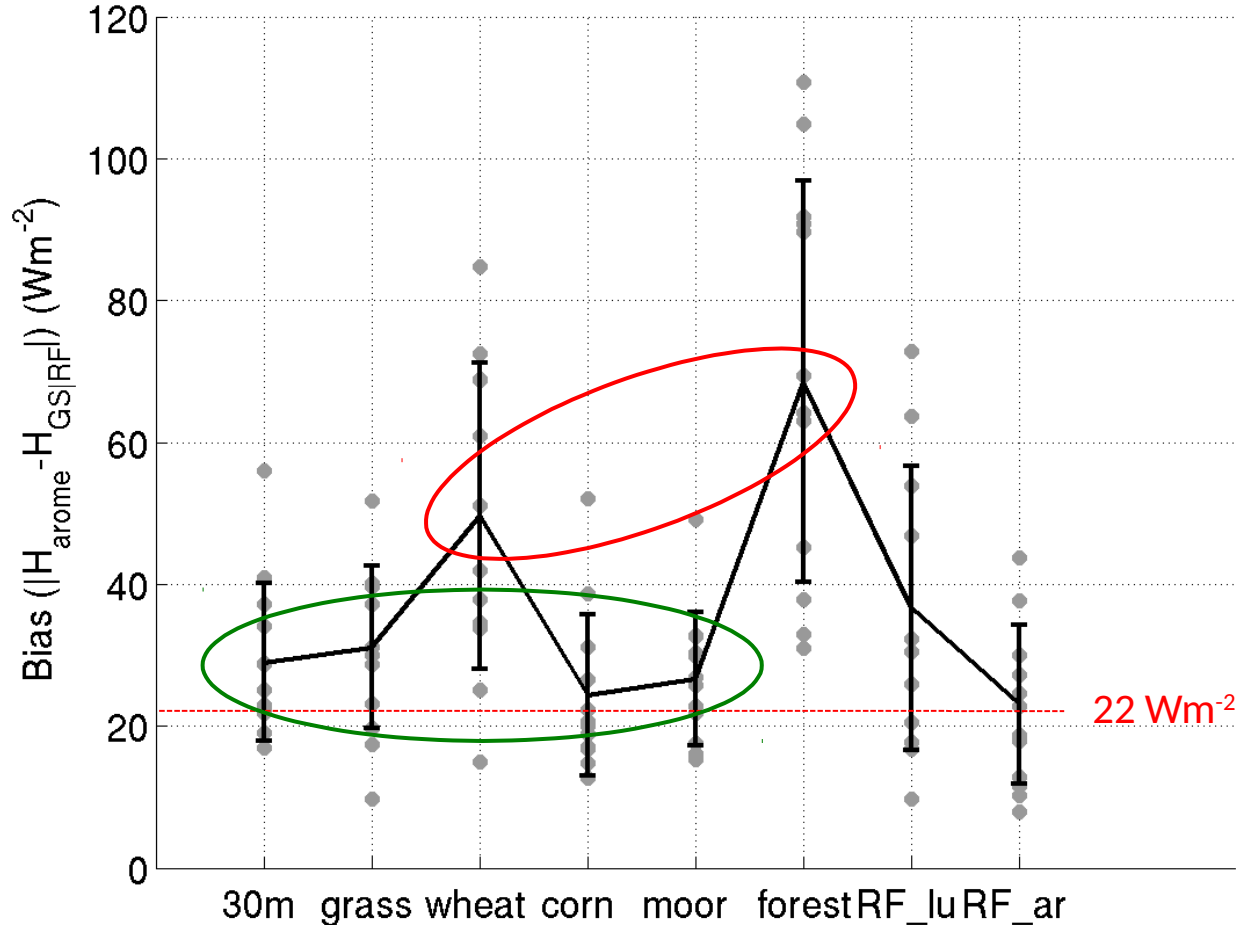
On-building Project

- ✓ Motivations
- ✓ Objectives
- ✓ Partners
- ✓ Field campaigns
- ✓ Scheduling

Motivations

Satellite image   True Land use   Arome Land use

Legend:
- forest
- grassland
- moor
- wheat
- corn
- sunflower
- rapeseed
- baresoil
- urban1
- urban2
- water
- unknown

Couvreux et al. 2015

Motivations

- **scarse vegetation covers over AROME Land Use**

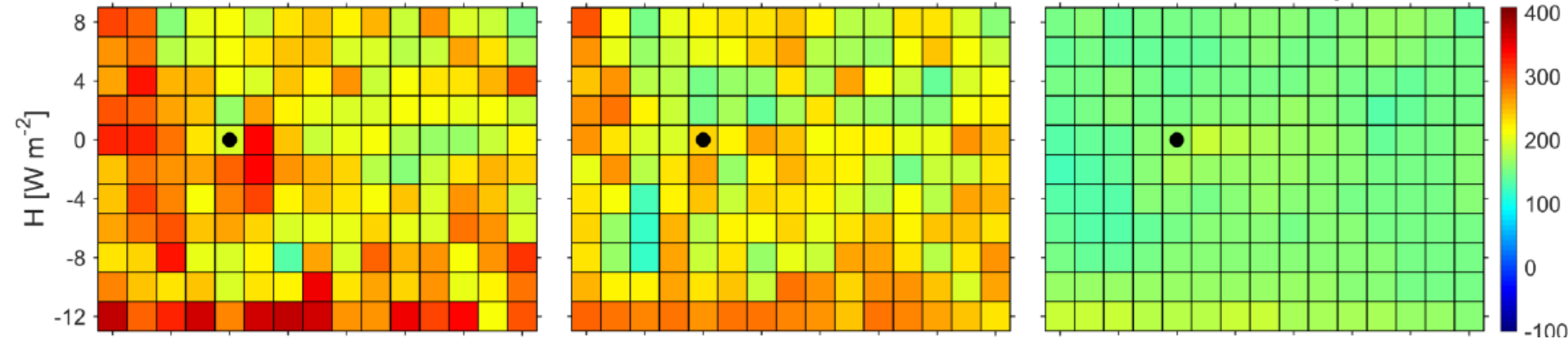- **main vegetation covers over Arome Land Use**

Lohou, 2016

Motivations

MESO-NH - 25June-IOP5 - 12:00

Measurements on True-LU · Measurements on MESONH-LU · MESO-NH output

WRF - 25June-IOP5 - 12:00

Measurements on True-LU · Measurements on WRF-LU · WRF output

Hartogensis, 2015

Motivations

MESO-NH - 2

Measurements on True-LU   Measurements on

□ homogeneous simulated fluxes on heterogeneous land use
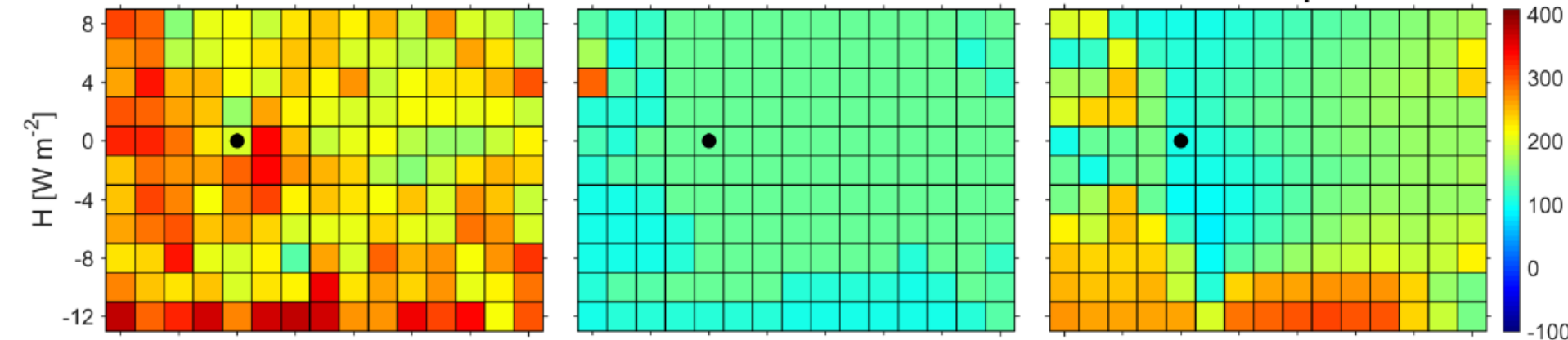
WRF - 25June-IOP5 - 12:00

Measurements on True-LU   Measurements on WRF-LU   WRF output

Hartogensis, 2015

Motivations

MESO-NH - 2

Measurements on True-LU

Measurements

□ homogeneous simulated fluxes on heterogeneous land use

WRF - 25June-IOP5 - 12:00

Measurements on True-LU

Measurements

□ heterogeneous simulated fluxes on homogeneous land use

Hartogensis, 2015
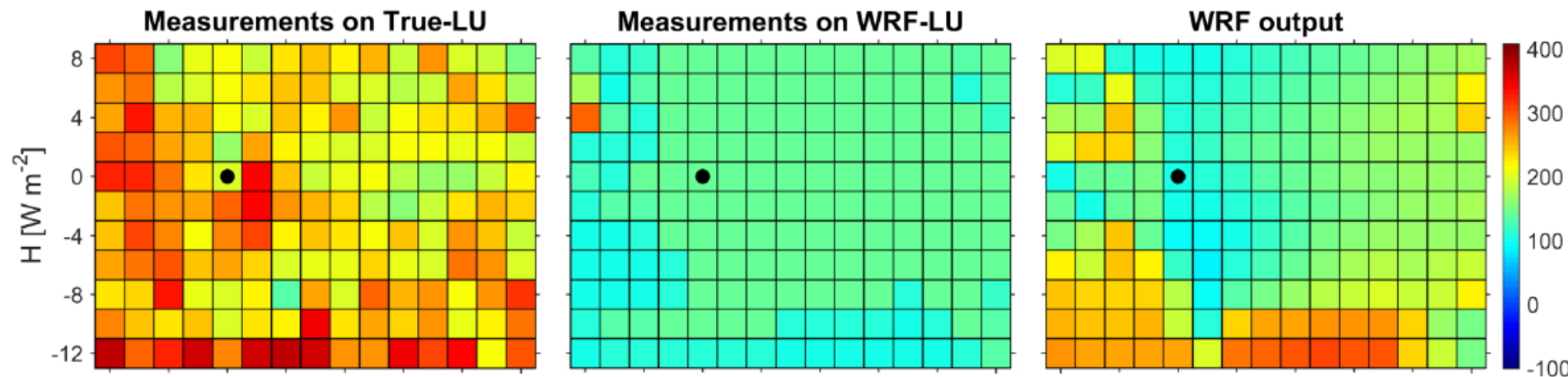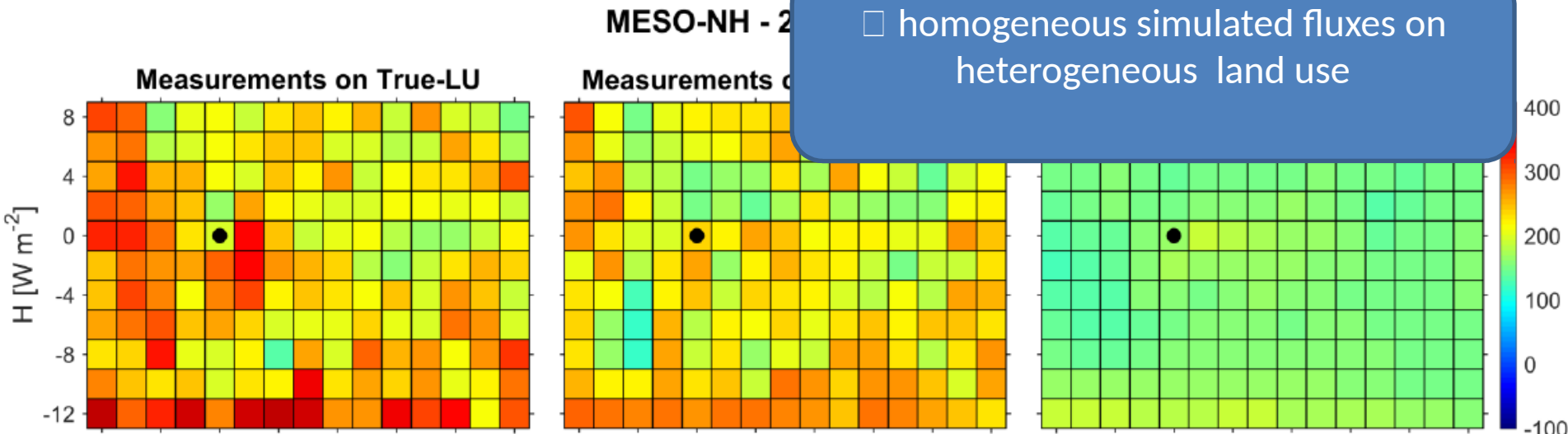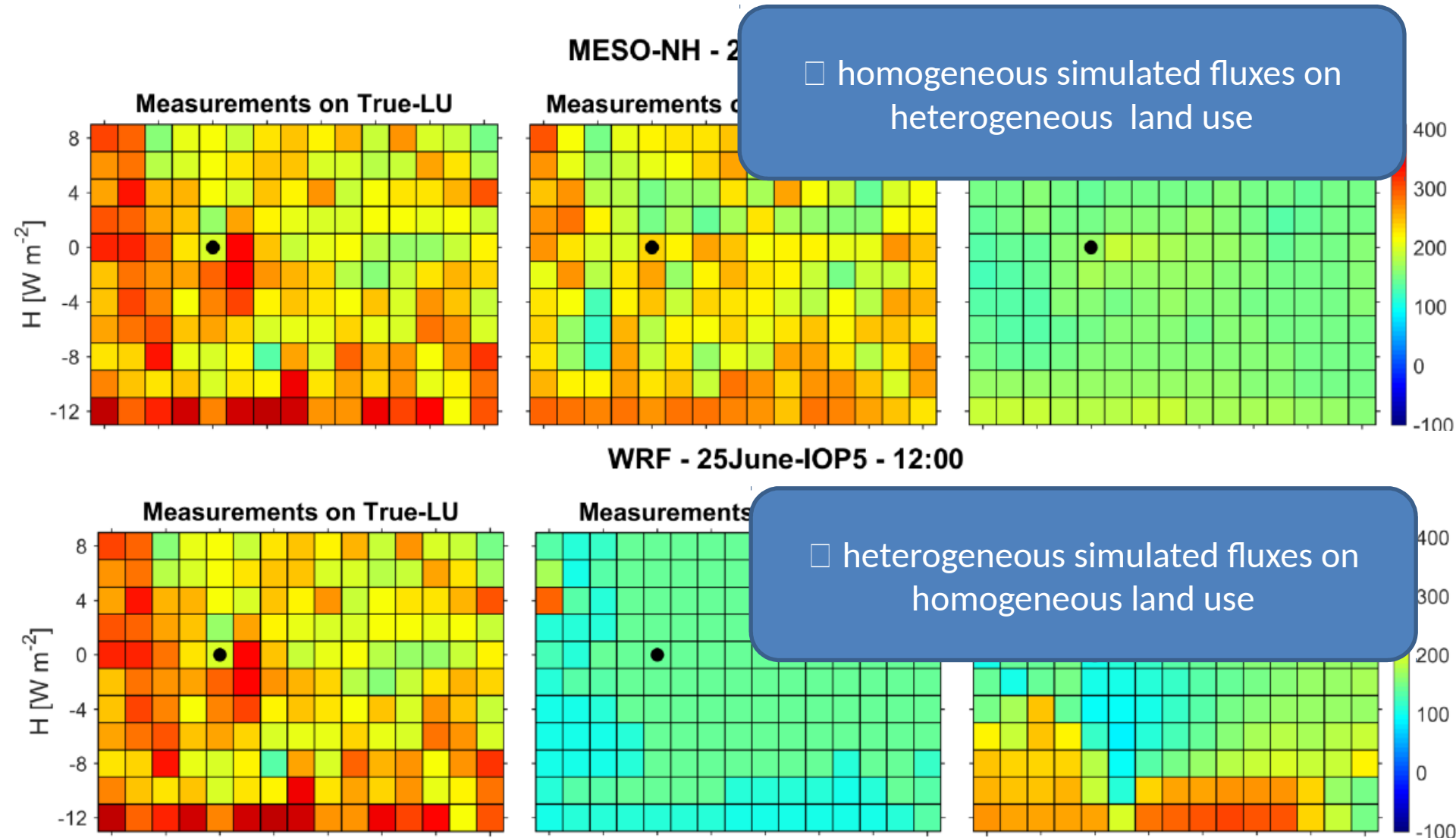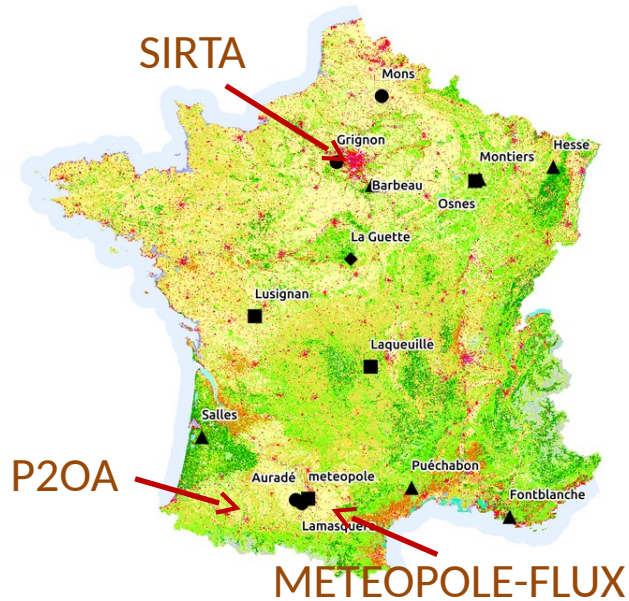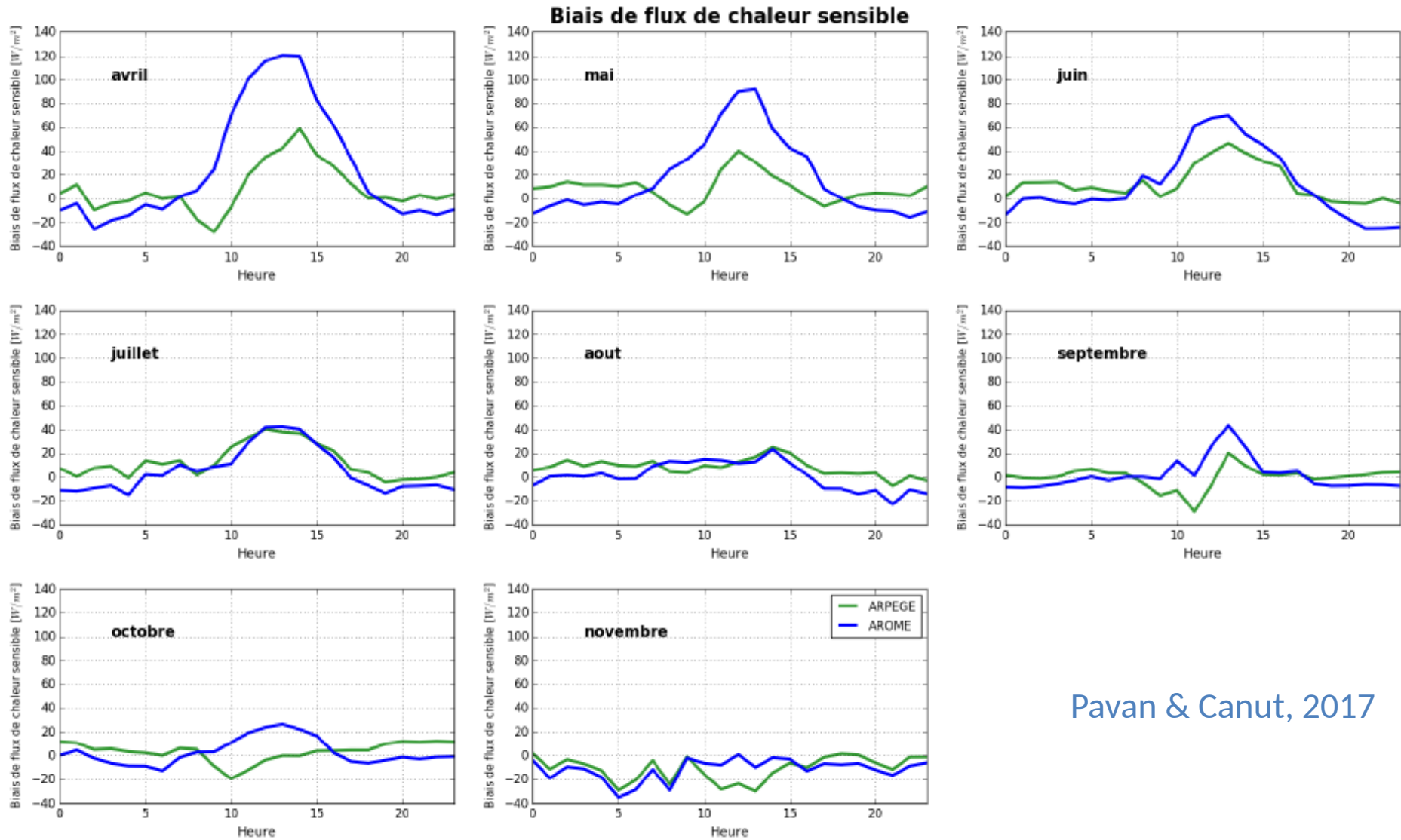
Motivations

Réseaux ICOS-ecosystem
Réseaux ACTRIS-FR

☐ Start of systematic comparisons between long-term measurements and weather forecast (Arpege & Arome) and climate (LMDZ) models.

Motivations

Biais de flux de chaleur sensible

Pavan & Canut, 2017

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Objectives

Variability / Climatology of heat fluxes in France

Vegetal cover, large scale forcing, soil humidity,..

Surface measurements representativity

Soil conditions, surf. meteorology, fluxes.

Error bars on surface/flux measurements

Instrumentations technical questions

What method to compare long-term measurements with model output.

Link the bias to the weak parameterizations

- **Bulk method adapted to flux in models**
- **Lewis number**
- **Roughness length**

☐ **> 5 years measurements over 15 sites.**

☐ **3 field campaigns**

☐ **Statistical approach, Artificial intelligence / point to point, history,...**

☐ **Tests of different parameterizations schemes**

Partners / Models

PARTNERS

➢ **Research Infrastructure ACTRIS**
  Experimental sites SIRTA (PARIS), Météopole (Toulouse) and P2OA (Lannemezan)

➢ **Research Infrastructure ICOS**
  15 sites in France

➢ **Research Group DEPHY**
  Modeling group working on physical parameterization in models.

➢ **Other French Laboratories: IGE (Grenoble), LATMOS (Paris), ONERA (Toulouse),…**

MODELS

➢ **Arome (1.3 km)**
  Météo-France forecast model
➢ **Arpège (2.5 km)**
  Météo-France forecast model
➢ **LMDZ**
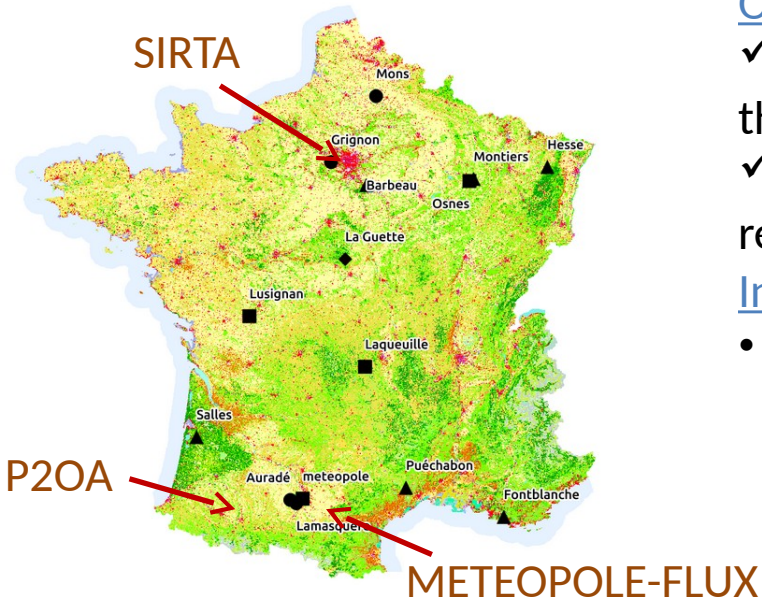 Climate model from LMD.
➢ **WRF**
➢ **LES models**
➢ **???**

Three Experimental Campaigns

Réseaux ICOS-ecosystème
Réseaux ACTRIS-FR

1/ P2OA, SIRTA & Météopole ACTRIS sites: ~ 1 year measurements (drying and moistening periods, stable conditions)

Objectives

✓ Accuracy of the measurements : Saisonnal variation of the surface energy balance closure
✓ Surface heterogeneity : measurement horizontal representativity

Instruments:

• network of SEB and meteo surface stations

2/ P2OA : Intensive Observation Period

Additional Objectives

✓ Roughness length heterogeneity
✓ Soil humidity and temperature (satellites)

Instruments:

• scintillometers, UAV, aicraft.

Scheduling

➔Meeting with all partners: 29 May 2018

➔ Applications for french fundings: September 2018

➔ Field Campaigns :   2019-2021