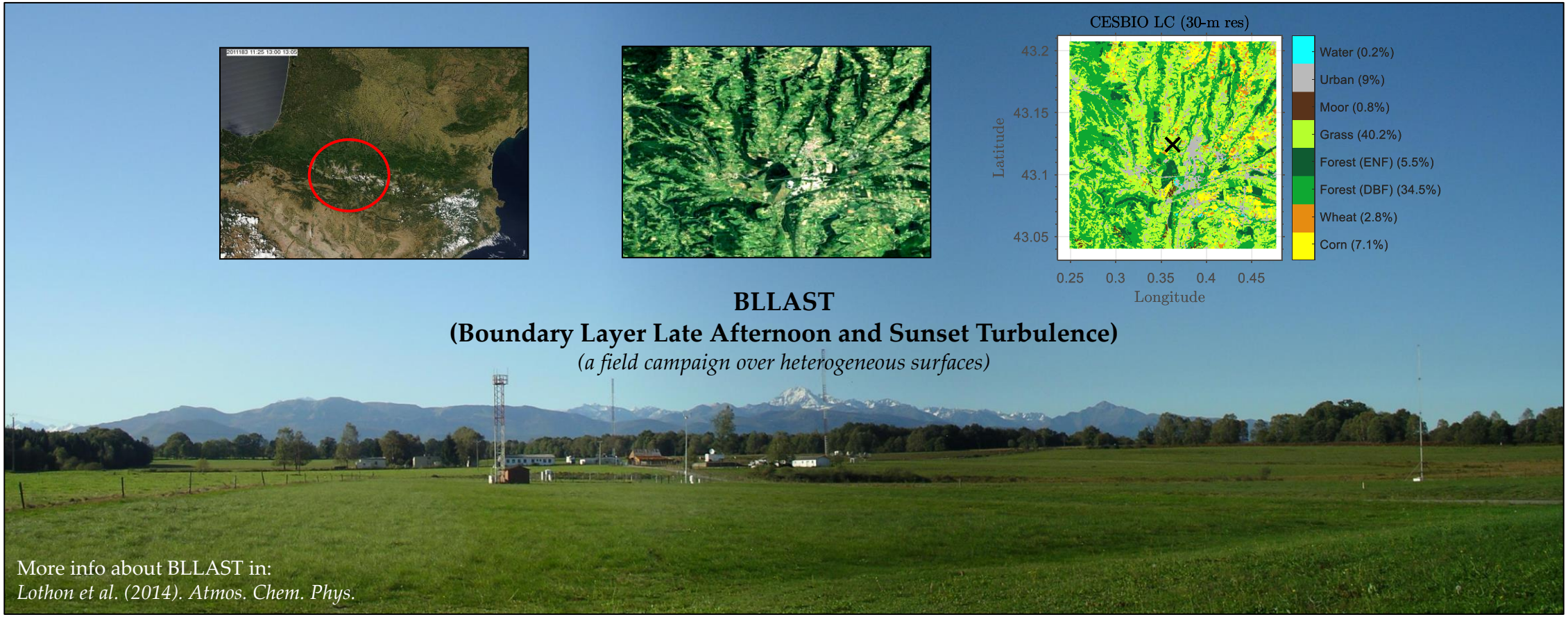
# Analysis of the land cover impact on boundary layer height from WRF and BLLAST data

C. Román-Cascón, M. Lothon, F. Lohou, O. Hartogensis, J. Vilà-Guerau de Arellano, D. Pino, C. Yagüe, E. Pardyjak

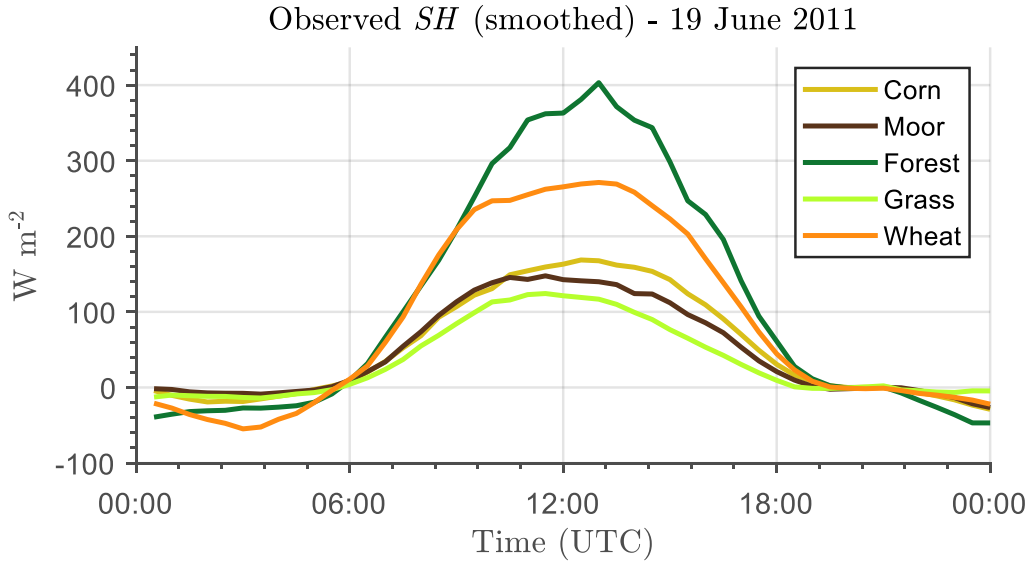


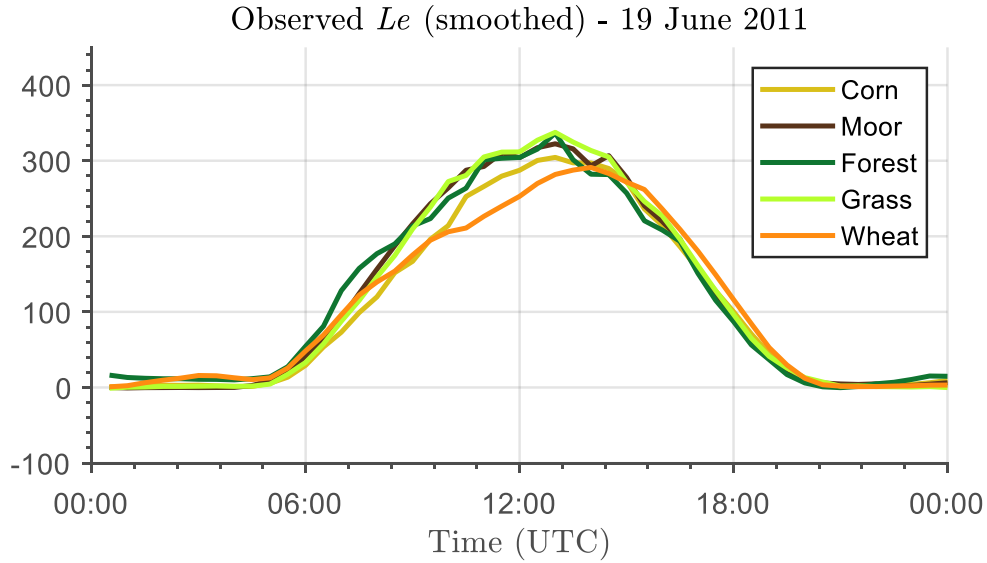

@bllast

# Study motivation



Moor (1%) | Corn (7%) | Grass (40%) | Forest (40%) | Wheat (3%)




Heterogeneous fluxes

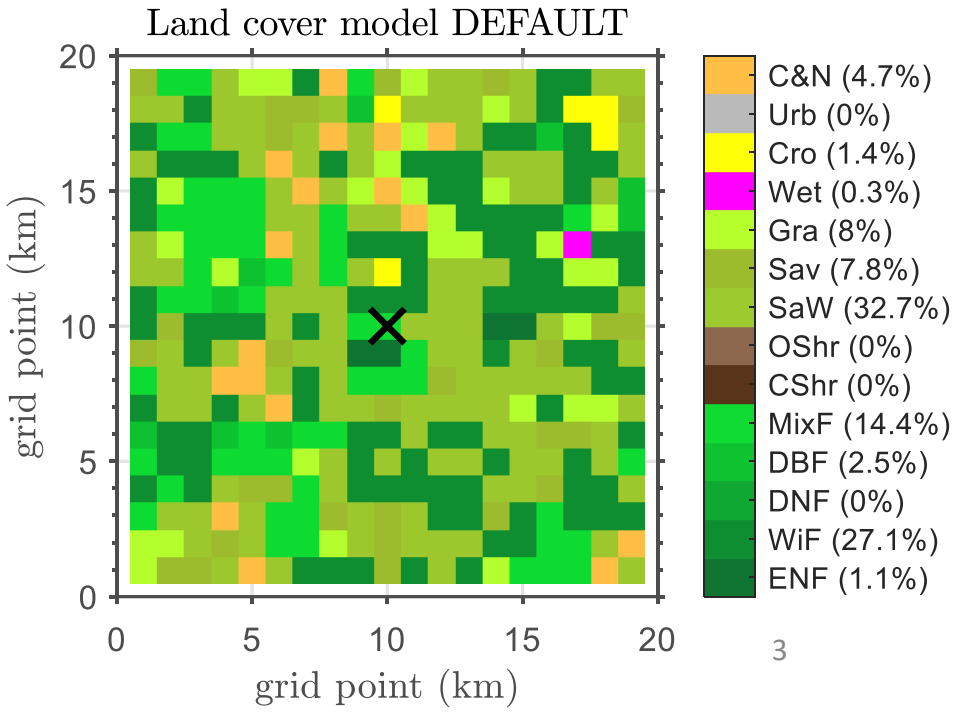
**Is this correctly represented in the WRF model?**

# Study motivation



Satellite image

© Google Earth




Heterogeneous fluxes

**Is this correctly represented in the WRF model?**

Land cover
**NOT well represented**
by default in WRF
(the first thing was wrong!)

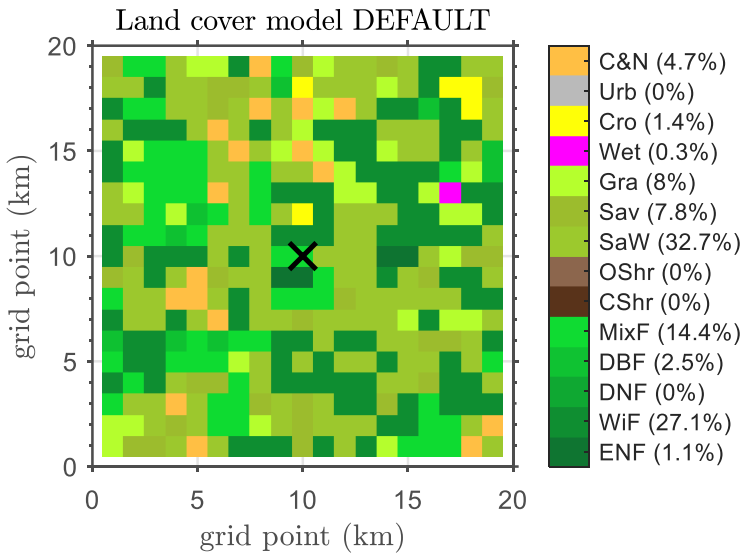
# Study design



## DEFAULT

Default land cover

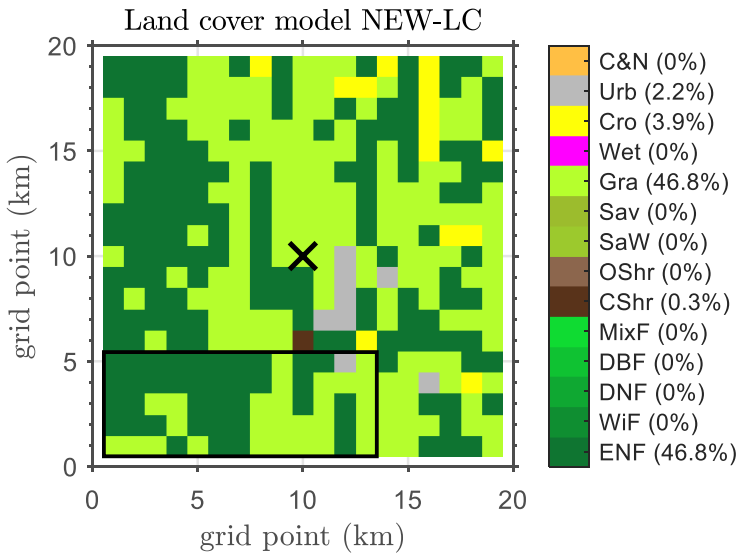
*dominant* approach




## NEW-LC

Improved LC

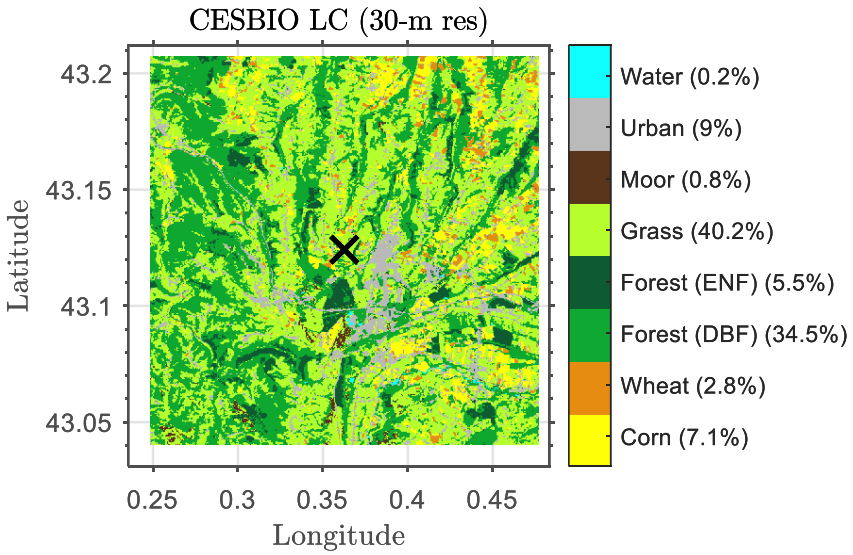
*dominant* approach




## MOSAIC

Improved LC +

*mosaic* approach



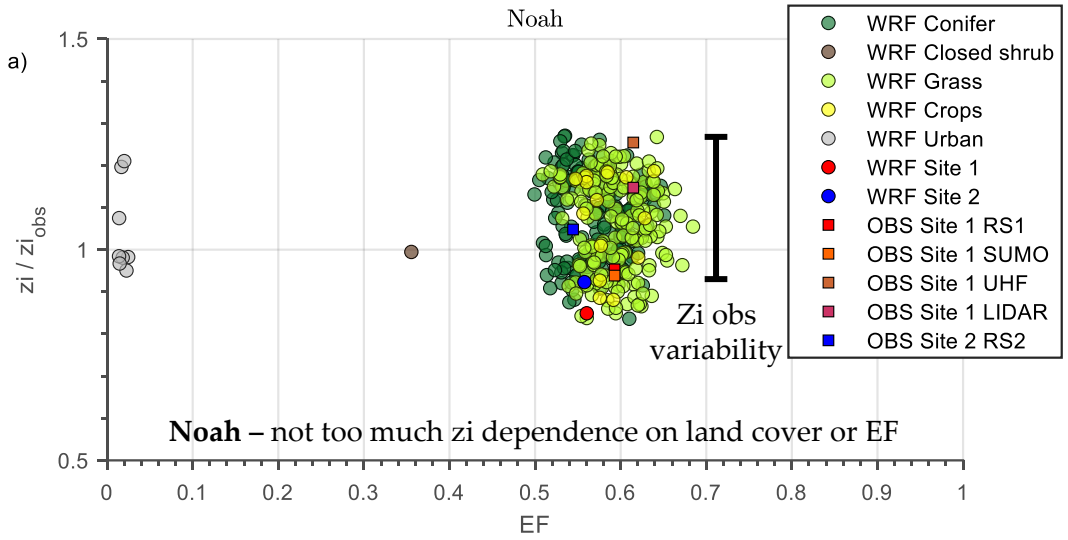

*Surface representation impacts on turbulent heat fluxes in the Weather Research and Forecasting (WRF) model (v.4.1.3)*
**Román-Cascón et al. (2021),** ***Geosci. Model Dev. 14, 3939–3967***

# Land cover impact on PBL height (zi)

2022 EGU General Assembly
23-05-2022. Vienna

Mean Zi obs = 836 m (used to normalize)

$$EF = \frac{Le}{SH + Le}$$

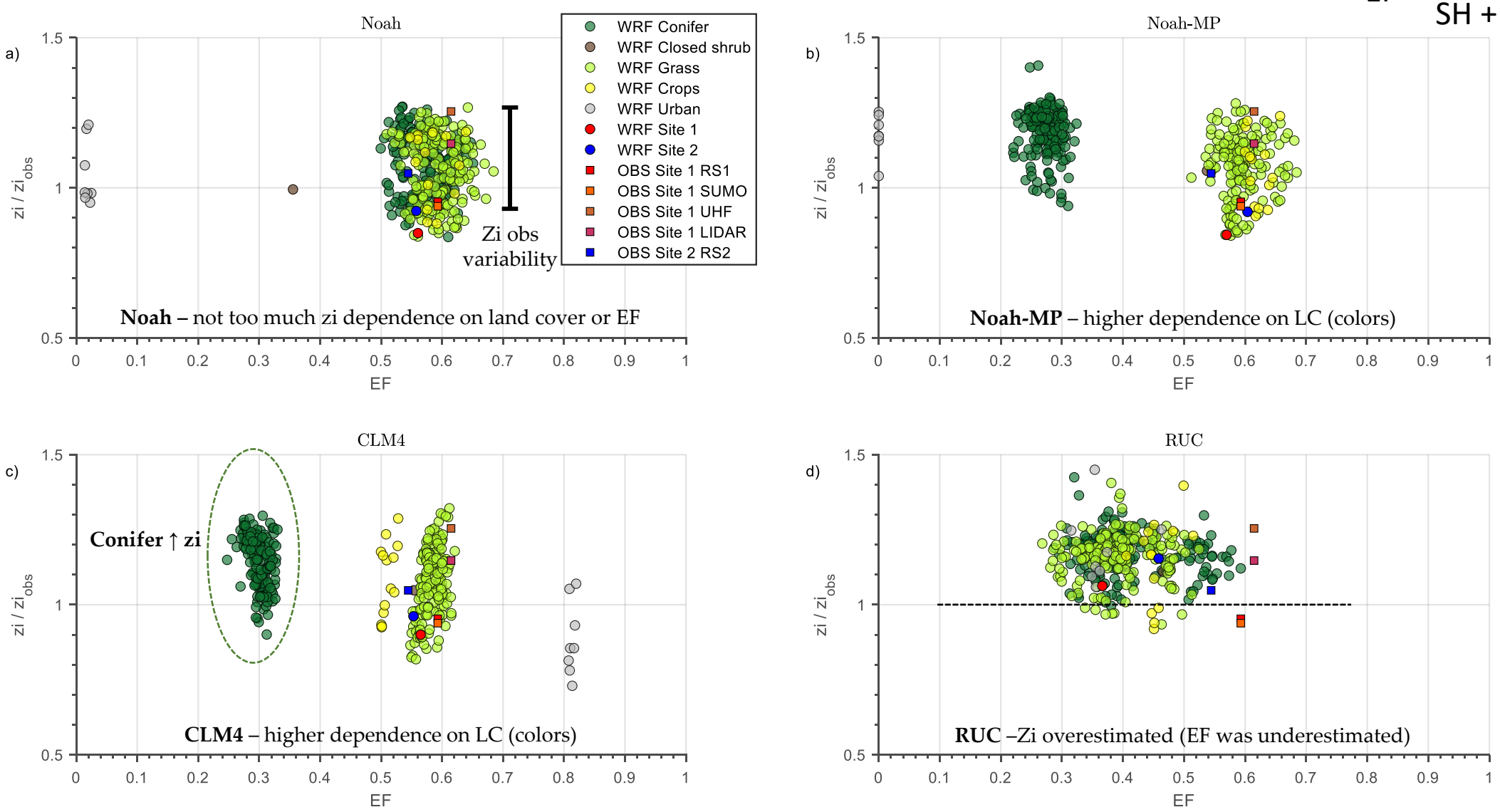


# Land cover impact on PBL height (zi)

2022 EGU General Assembly
23-05-2022. Vienna

Mean Zi obs = 836 m (used to normalize)

$$EF = \frac{Le}{SH + Le}$$



# Thanks!

**Acknowledgements**
**BLLAST field campaign funding & participants**
**LATMOS-i project (PID2020-115321RB-I00)**
**JdC-I - IJC2020-043767-I**



@bllast

# WRF configuration

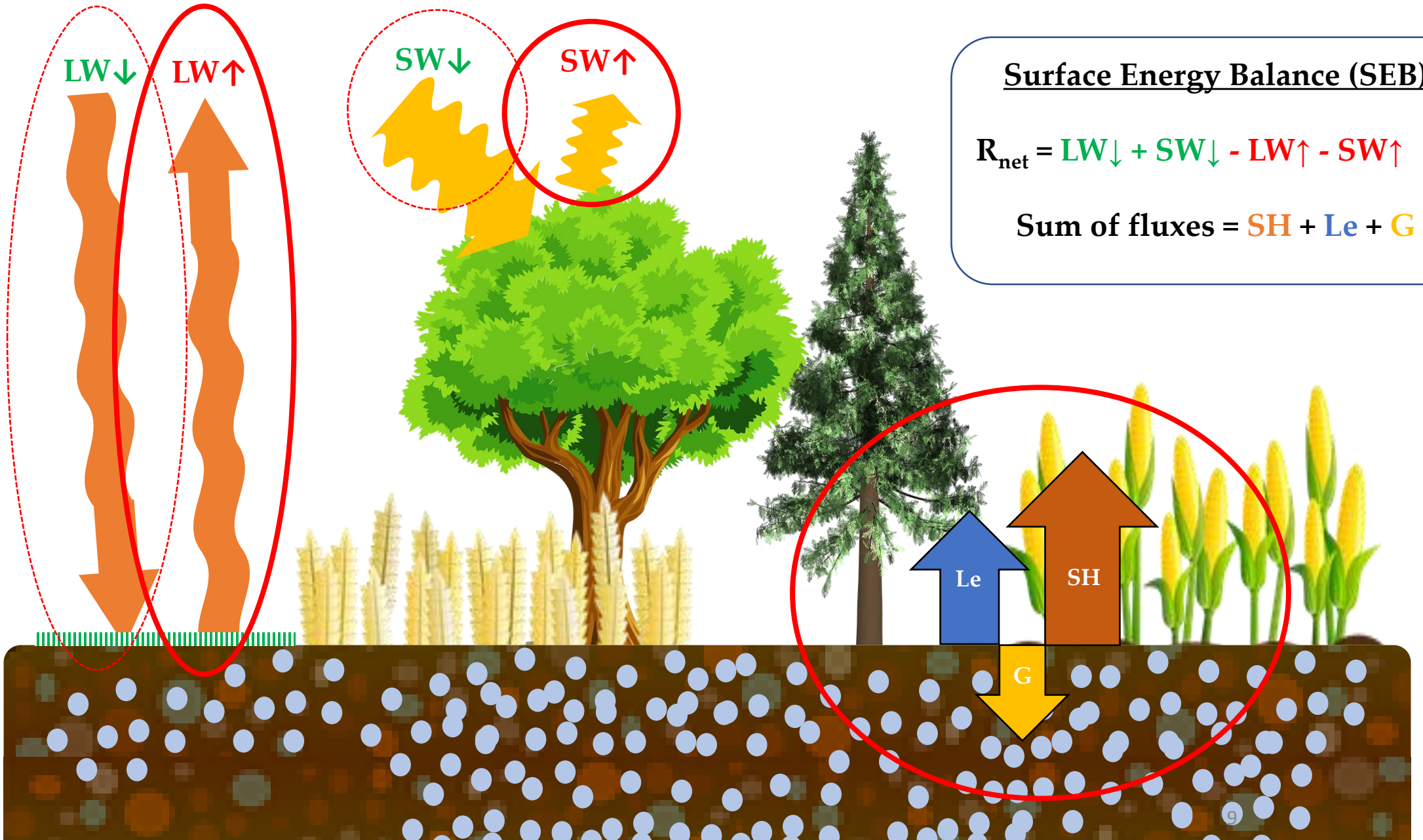


| Model version | WRF-ARW v.4.1.3 |
|---|---|
| Number of domains | 4 |
| Resolution of domains | 27/9/3/1 km |
| Initial and boundary data | NCEP-FNL* data (1°), each 6 hours |
| PBL scheme | Yonsei University (YSU, Hong et al. (2006)) |
| Surface-layer scheme | MM5 similarity (Jiménez et al., 2012) |
| **Land-surface models** | **Noah / Noah-MP / RUC / CLM4** |
| Microphysics scheme | WRF Single-Moment 3-class (Hong et al., 2004) |
| Long-wave radiation scheme | Rapid radiative transfer model (RRTM, Mlawer et al. (1997)) |
| Short-wave radiation scheme | Dudhia (Dudhia, 1989) |
| Number of vertical levels | 40 |
| Time step | 90/30/10/3.3 s |
| Model initial date | 18 June 2011 at 12:00 UTC |
| Period analysed | 19 June 2011 (09:00 - 15:00 UTC) |
| Leading time (spin-up) | 21 h |

**Román-Cascón et al. (2021)**
***Geosci. Model Dev. 14, 3939–3967***

# Land cover impacts on SEB






## Surface Energy Balance (SEB)

$R_{net}$ = LW↓ + SW↓ - LW↑ - SW↑

Sum of fluxes = SH + Le + G