EMS Annual Meeting Abstracts
Vol. 20, EMS2023-74, 2023, updated on 27 Jul 2024
https://doi.org/10.5194/ems2023-74
EMS Annual Meeting 2023

Evaluation of the representativity of reference long-term surface flux measurements in an heterogeneous landscape : the Météopole campaign (MOSAI project)

Mathilde Jomé[1], Fabienne Lohou[1], Marie Lothon[1], Guylaine Canut[2], Fleur Couvreux[2], Aurore Brut[3], Solène Derrien[1], William Maurel[2], Jean-Claude Etienne[2], Antoine Vial[1], and Olivier Garrouste[2]

[1]Laboratoire d'Aérologie, CNRS, Université de Toulouse, Toulouse, France
[2]Centre National de Recherches Météorologiques - UMR 3589, CNRS, Météo-France, Toulouse, France
[3]Centre d'Études Spatiales de la Biosphère, CNRS, Université de Toulouse, CNES, Toulouse, France

The meterological phenomena draw their energy from the Earth's surface and dissipate most of their energy close to the surface. The land surface, through its topography, soil moisture, temperature or vegetation activity, impacts the atmosphere from daily to seasonal time scale. The Working Group on Numerical Experimentation survey on systematic errors established that the outstanding errors in the modelling of surface fluxes of momentum and sensible and latent heat is the second most important issue. Therefore to reduce these biases, an accurate assessment of the Land-Atmosphere (L-A) exchanges, and their correct representation, are essential for weather and climate forecasts.

The evaluation of L-A exchanges in numerical weather and climate prediction models in the context of heterogeneous surfaces is the main objective of the Models and Observations for Surface-Atmosphere Interactions (MOSAI) project. The main objective of our study corresponds to the first scientific objective of MOSAI : to investigate and determine the uncertainty and representativeness of L-A exchanges measured over heterogeneous landscapes by reference towers. To achieve these objectives, dedicated field experiments are needed to document the variability of the L-A exchanges within a grid mesh around the ACTRIS sites. A set of a one year-field campaign per site are currently performed at Météopole (Toulouse, 2021), at SIRTA (Palaiseau, 2022) and at P2OA (Lannemezan, 2023).

Two long-term objectives are defined with the aim of completing the measured surface flux at the ACTRIS sites. The first objective concerns the horizontal representativeness of the local measured surface flux in the heterogeneous landscape at the scale of the ESM or NWP grid. The second one is here to quantify the surface flux uncertainties (random and systematic errors) and provide information on the SEB non-closure at each site.

Results concerning the second objective will be presented using the Météopole campaign during which six sites with different surface types were implemented to estimate the Surface Energy

Balance (SEB). The arrangements of the different surface patchesis studied to quantify the heterogeneity of our landscape (patches size distribution,...). With that, several indicators that aim to quantify the surface flux heterogeneities are investigated and applied to several domain sizes (from footprint to larger domains). These indicators are cross-analysed with the SEB non-closure to investigate a possible impact of surface heterogeneity and secondary circulations on SEB non-closure.