

Notes from Group E discussion on “Land-Atmosphere Exchange”, 2019-08-28

Attendees: Georg Wohlfahrt (Chair), Manuela Lehner, Ivana Stiperski, Karmen Babic, Norbert Kalthoff, Pier Luigi Vidale; Marco Falocchi, Leonardo Montagnani, Marta Galvagno, Isabelle Gouttevin, Rebecca Mott-Grünewald, Holly Oldroyd, Helen Ward, Jean-Martial Cohard, Werner Eugster, Sean Burns, Joan Cuxart (co-chair and rapporteur).

*This subject is poorly developed currently in the WP, the very diverse group initiated a bottom-up discussion on how to expand that part.

*We agree that we are dealing with surface layer and lower ABL issues coupled with surface processes, including snow/ice, vegetation, urban areas and water bodies.

*A discussion on how to measure very close to the surface, when structures (such as downslope flows) are so close to the ground, implying a lot happening below the standard 2m height. The talks are mostly about instrumentation, small, fast and low-cost if possible.

*Canopies and slopes: measuring measuring within, above, downwind

*Fluxes of matter: biologically relevant gases (namely CO₂) and water vapour, near-surface fog.

*The advection issue, very often related to surface heterogeneities, occupied a substantial time. In connection to that the following issues may be connected:

- scales: which are relevant, how to determine and treat them.
- surface energy balance closure issues: imbalances larger than 30% are common and this affects not only missing processes (such as advection) but also instrumental uncertainties, and mismatch of instrument footprints.
- similarity theory: MO not adapted to heterogeneous terrain, how to expand/replace it?

*In such variable landscape what is the representativeness of a point measurement? Also, how can we be more or less certain that the findings from the experiments are "repeatable" or "generalizable"?

*Also we reflect on "true data", to what point the data that we provide can be used e.g. in initialization or validation of models or parameterizations, especially the terms of the surface energy budget. We conclude that at least uncertainty of the data should be provided to let the users be aware of the issue.

*On modelling: How should these small scale motions be represented as subgrid scale processes in numerical models. Vertical and horizontal resolution issues. How to compare point observations to grid model data?

*There is a generalized concern on the urban occupation of significant parts of valleys and the related air quality issues. Currently experimental displays tend to avoid urban areas but this should change in the near future. A connection with people working in air quality is recommended.

*The surface characteristics must be well known in heterogeneous terrain and scarce point measurements may not be enough. Improvements can come from dense sampling of soil characteristics (soil moisture, soil structure...) and also using available high resolution data bases and remote sensing information.

*How to translate all these issues to the field experiment? We envision to measure at progressively finer resolution (embedded grids), but this issue was interrupted by the end of the session (later the subject was addressed in a dedicated subsession during the discussion on Observations).

The group considers that it can be constituted as a working group on Land-Atmosphere Exchange within the TEAMx initiative, without further formal subdivisions.