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Upscaling of Fluxes Measured at Nam Co Site on Grid Elements

Babel, W.¹, Biermann, T.¹, Huneke, S.², Thiem, E.¹, Chen, X.³,
Ma, W.⁴, Chen, Y.³, Yang, K.³, Ma, Y.³ and Foken, Thomas¹

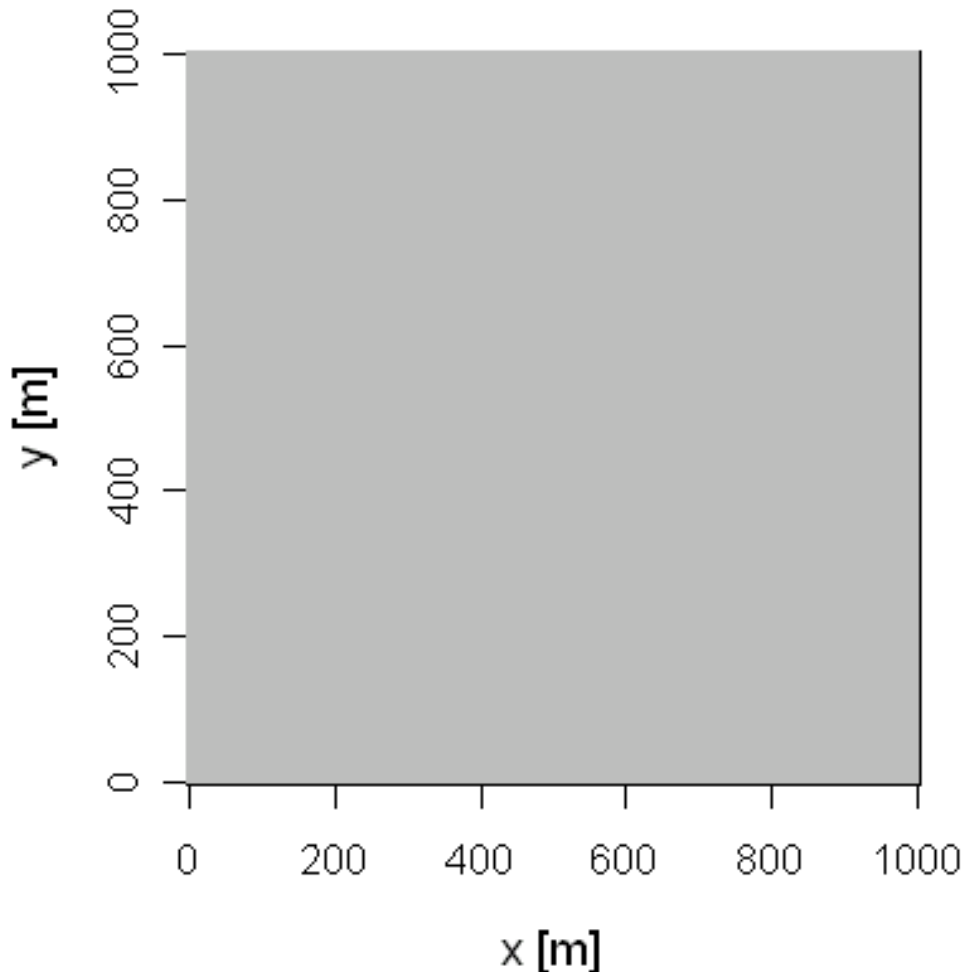
¹ University of Bayreuth, Germany

² Anemos GmbH, Adendorf, Germany

³ Institute of Tibetan Plateau Research, Chinese Academy of Science, China

⁴ Cold and Arid Regions Environmental and Engineering Research Institute, Chinese Academy of Sciences, China

Motivation: Regional flux estimates



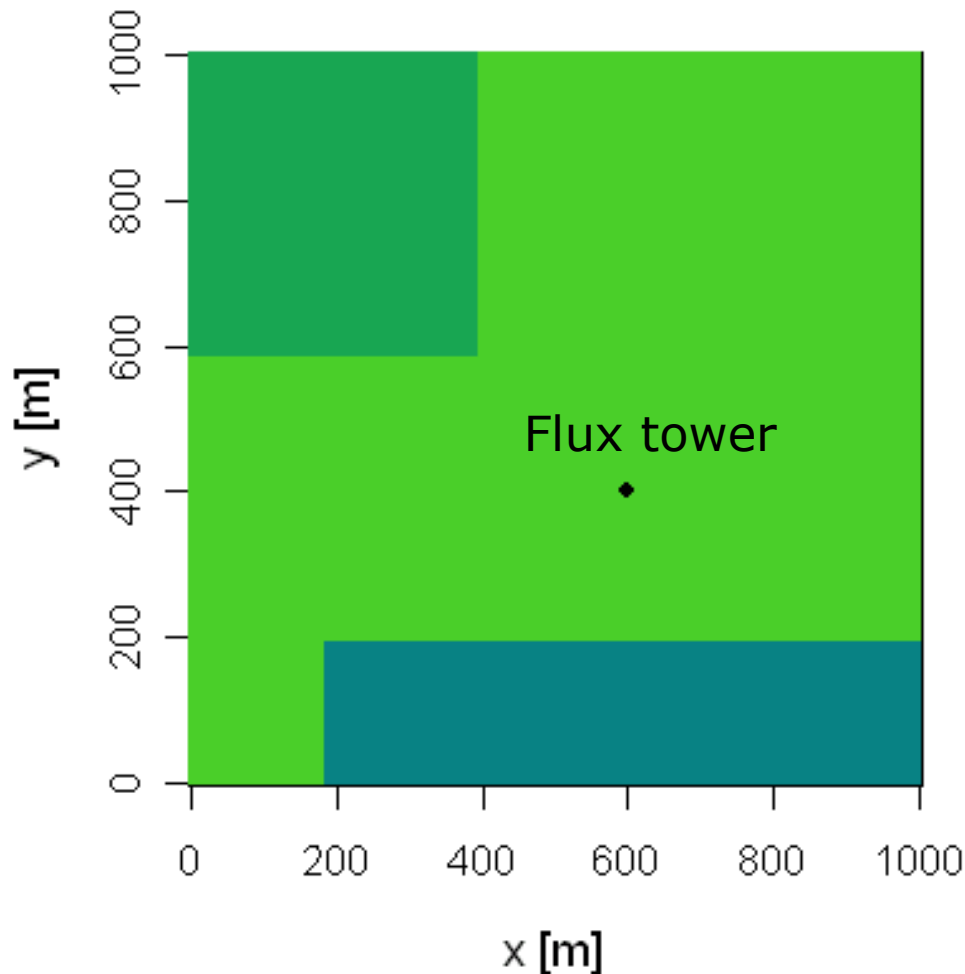
Grid cell of...

- Remote sensing data
- Mesoscale model

EC – derived flux
measurements serve as
ground truth

Problem: spatial
representativeness

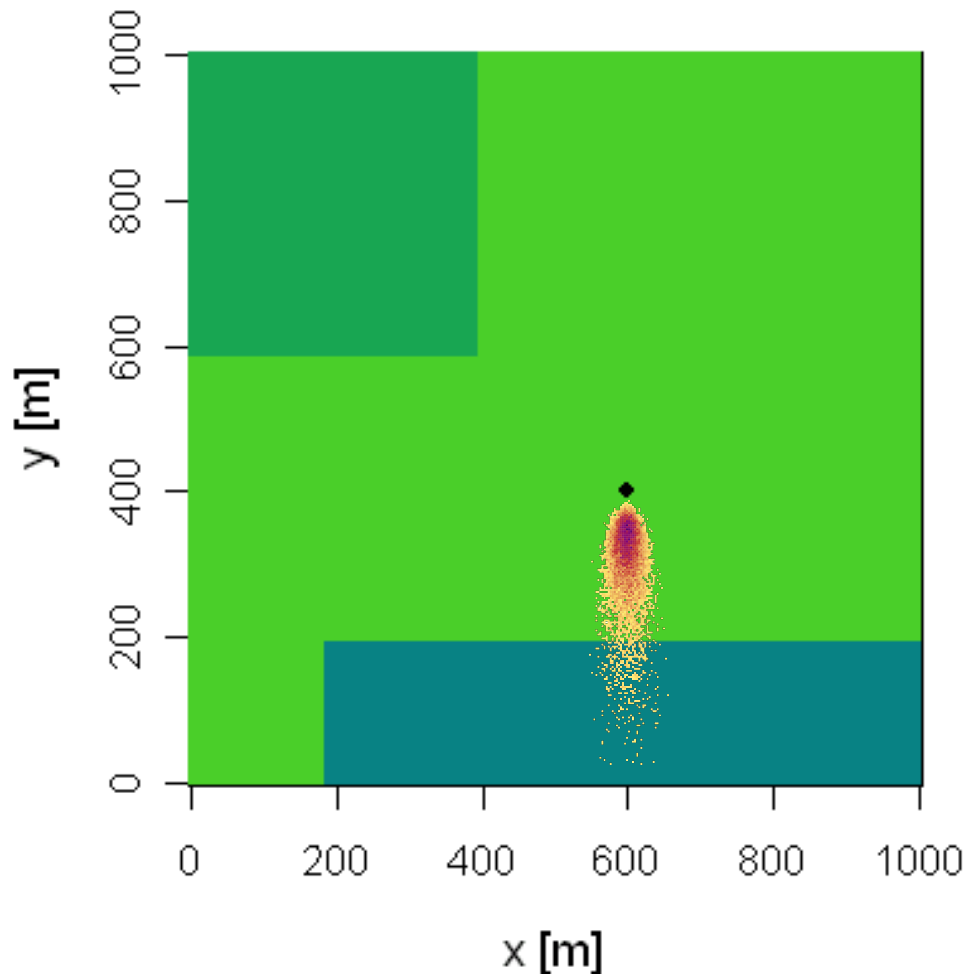
Representativeness of flux observations



Flux measurements are designed to represent the target land use

- Landuse
- Target
 - adjacent 1
 - adjacent 2

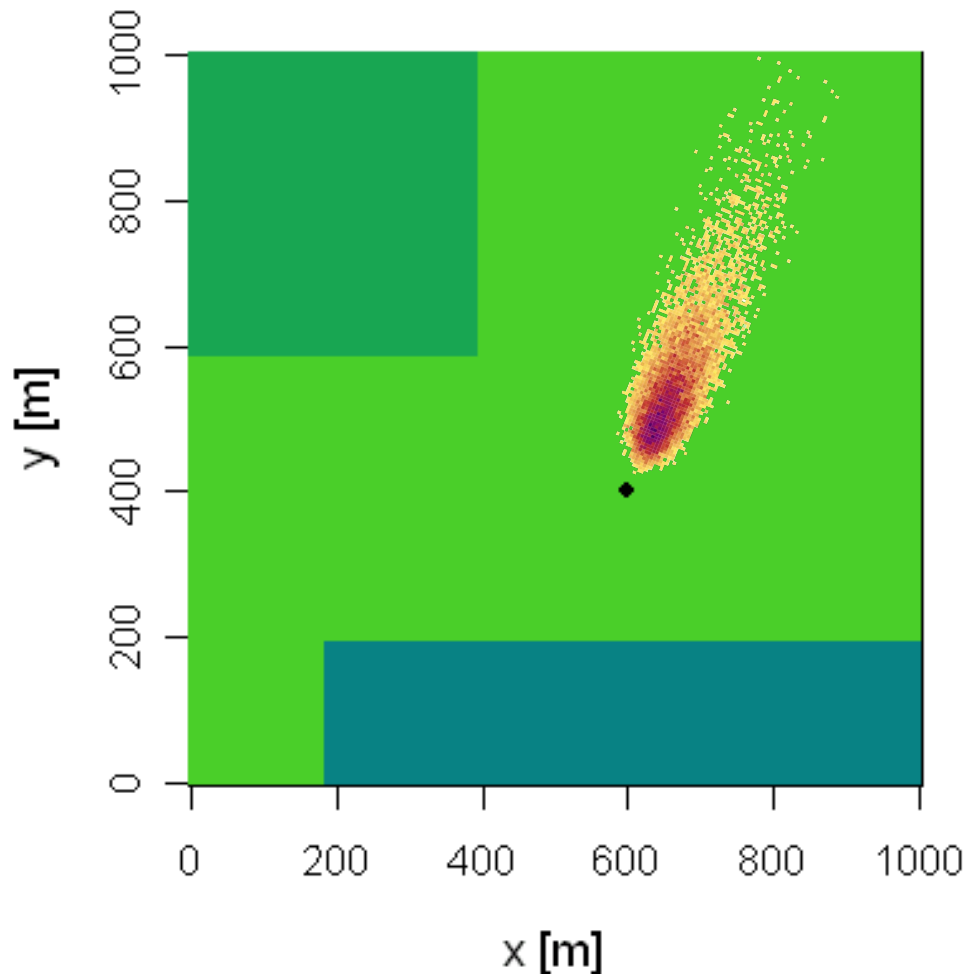
Measurement footprint



Observations represent
its footprint

Problem:
Footprint not
stationary

Measurement footprint

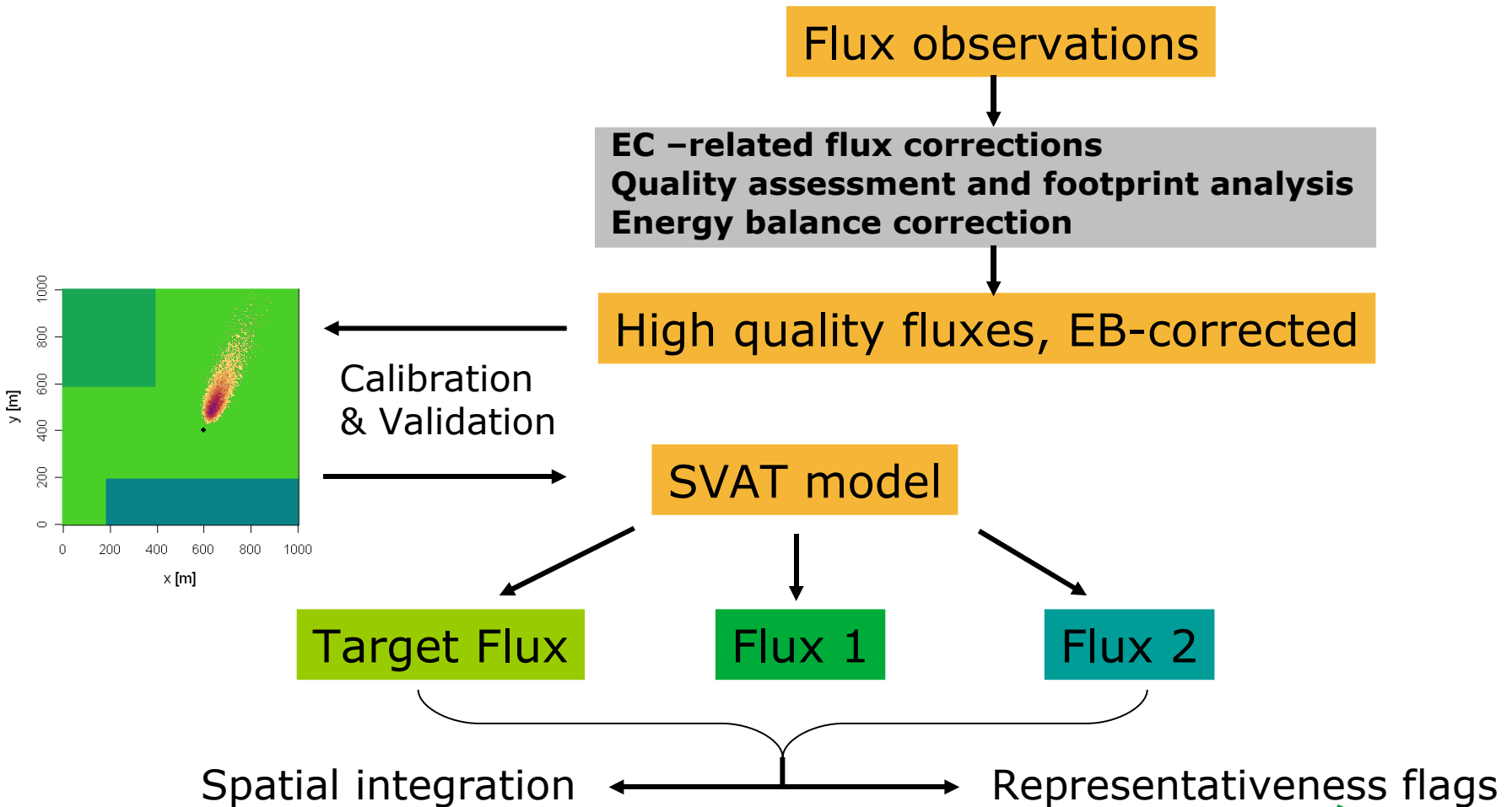


Variable size and location
according to wind direction
and atmospheric stratifi-
cation

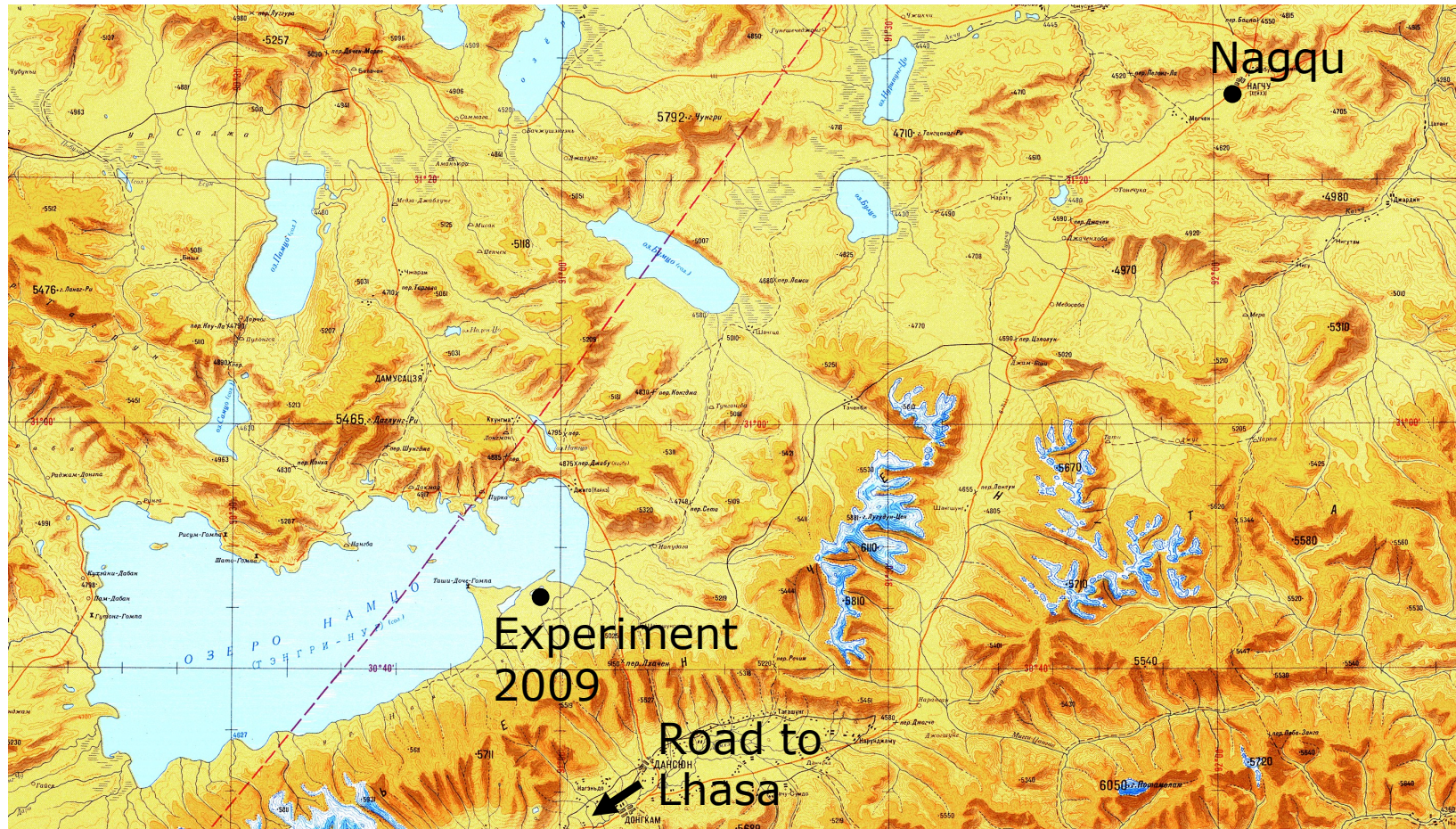
Landuse

- Target
- adjacent 1
- adjacent 2

Concept: Upscaling in heterogeneous landscapes

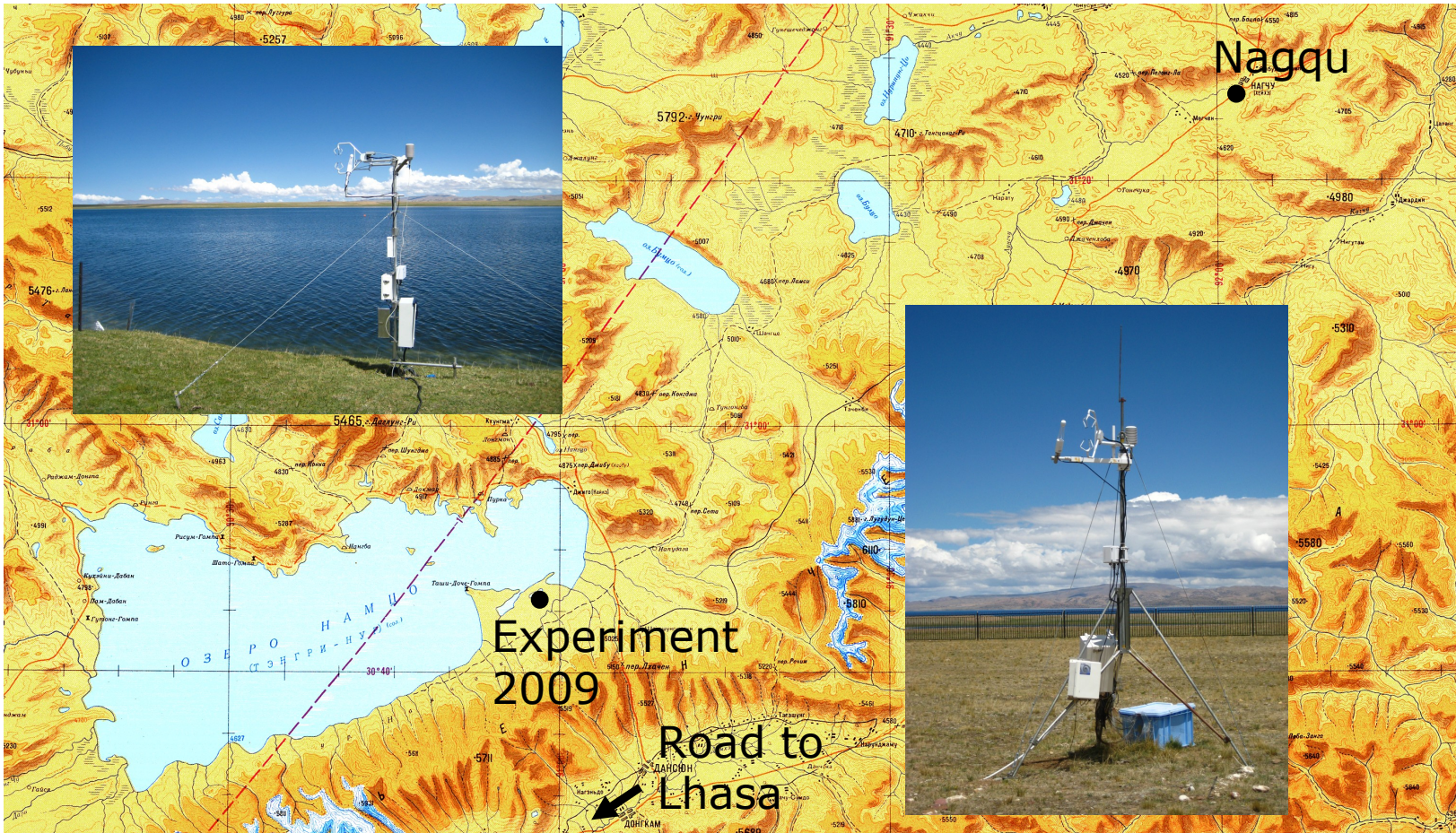


Location of the measurements

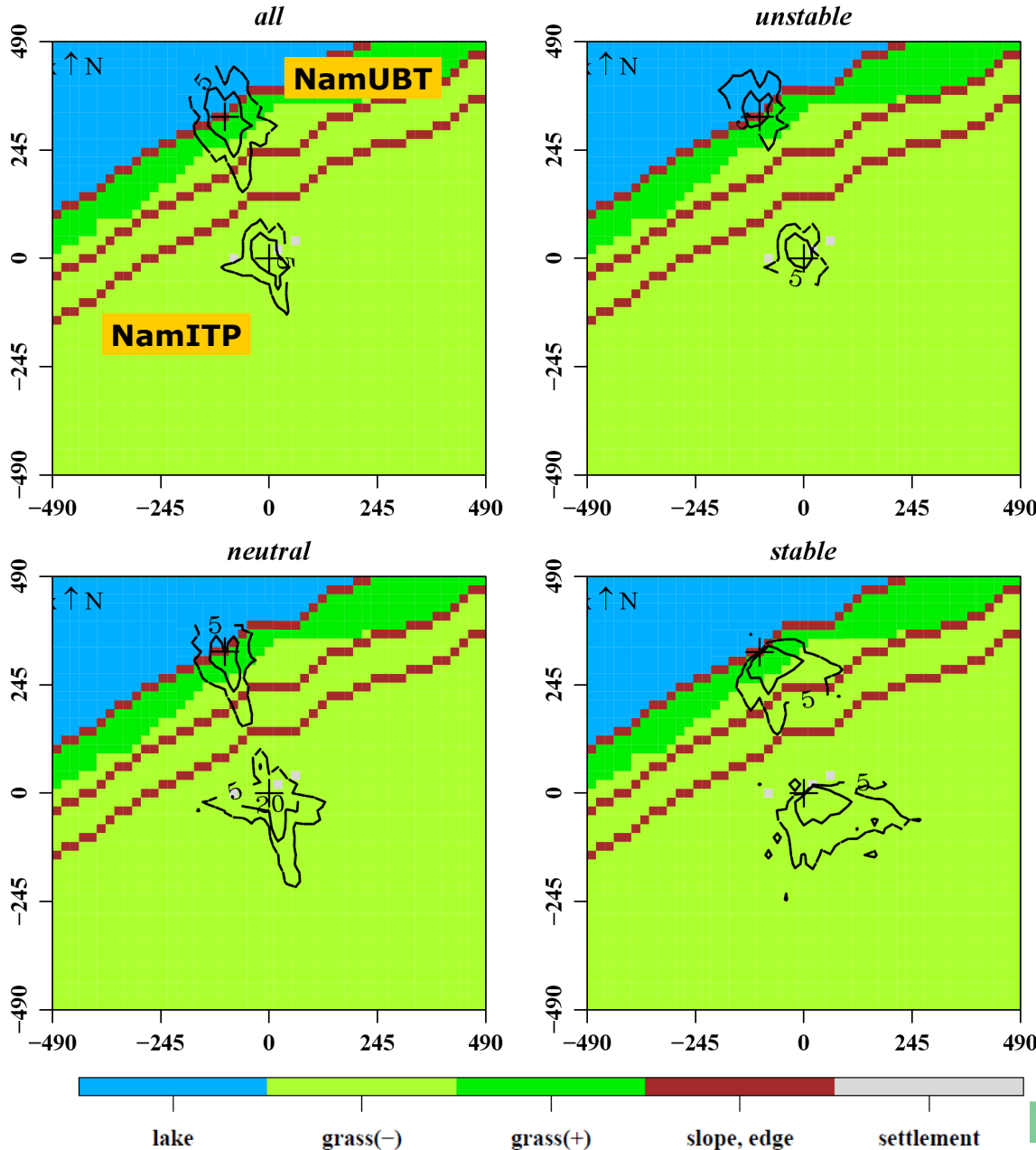


<http://en.poehali.org/maps>

Location of the measurements



<http://en.poehali.org/maps>



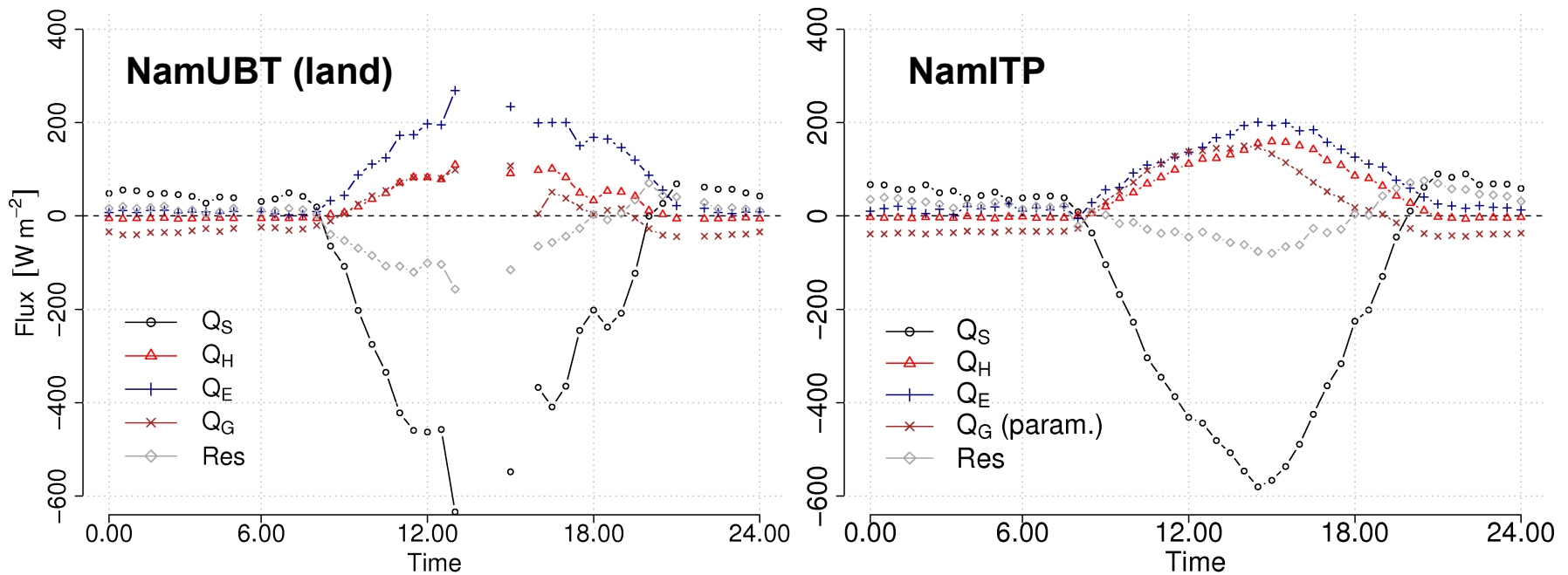
Footprint climatology

Experiment 2009

Measurement period
June 26th – Aug 8th

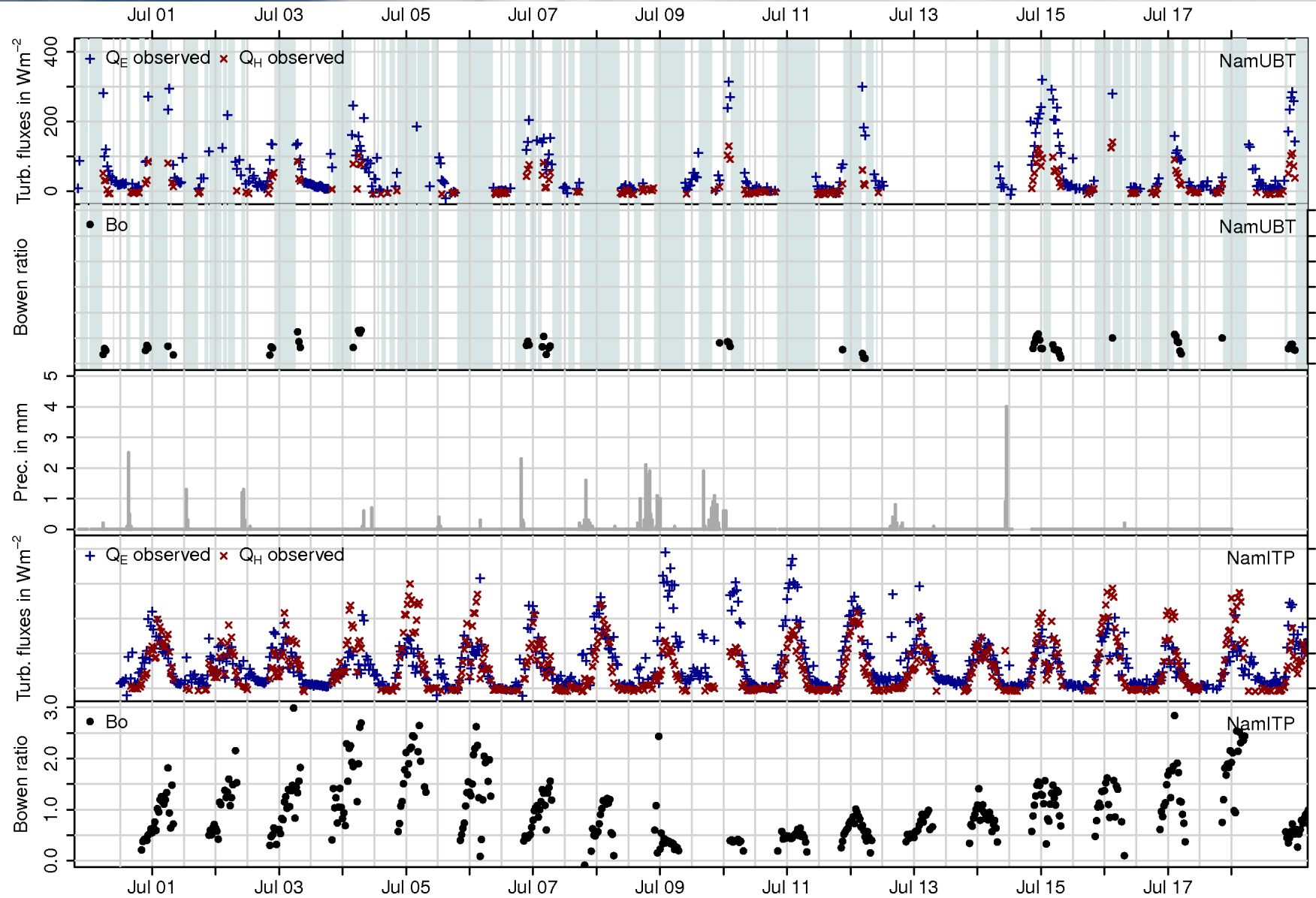
Focus here:
Land surface fluxes
Lake fluxes see P1.2

Measurements at Nam Co 2009

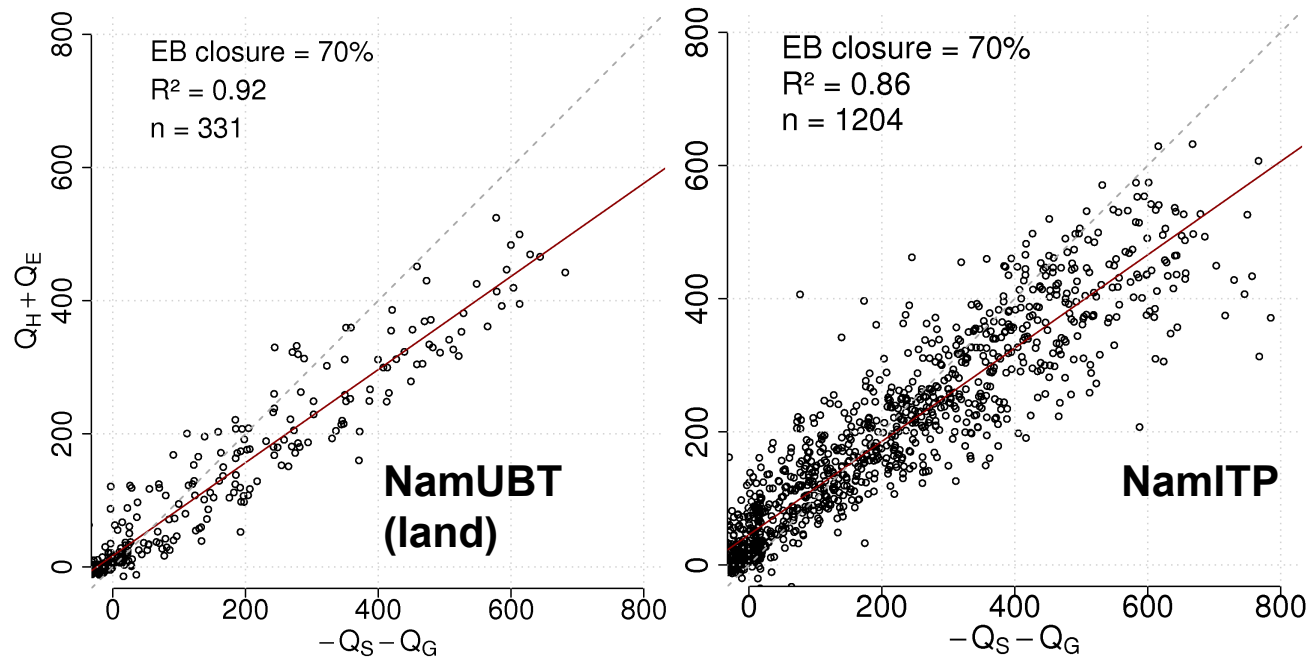


Mean daily cycles of energy balance components

Q_G from NamITP parameterised (Santanello and Friedl, J Appl Meteor, 2004)

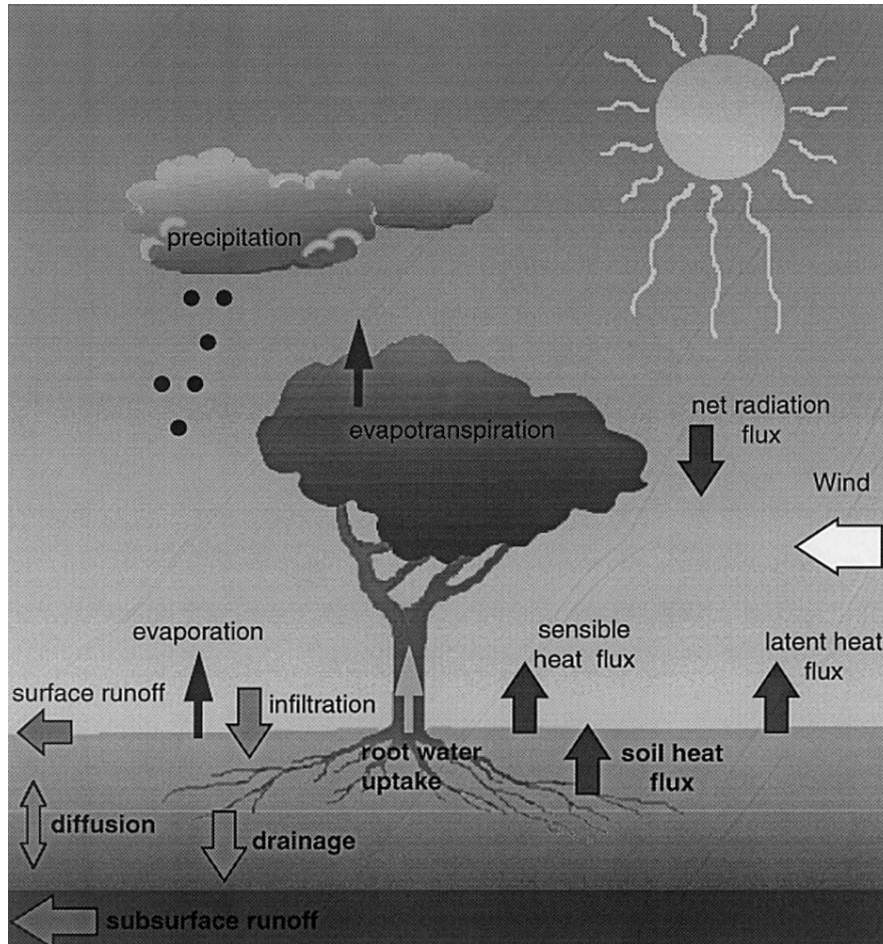


EB correction of turbulent fluxes



- Residuum is calculated and distributed to Q_E and Q_H according to the Bowen ratio Bo
- Absolute values have to exceed 10 Wm^{-2} to calculate Bo ;
Otherwise the turbulent fluxes are used unchanged

SVAT modelling: SEWAB



Atmosphere: Bulk transfer eq., Resistance approach for the latent heat flux

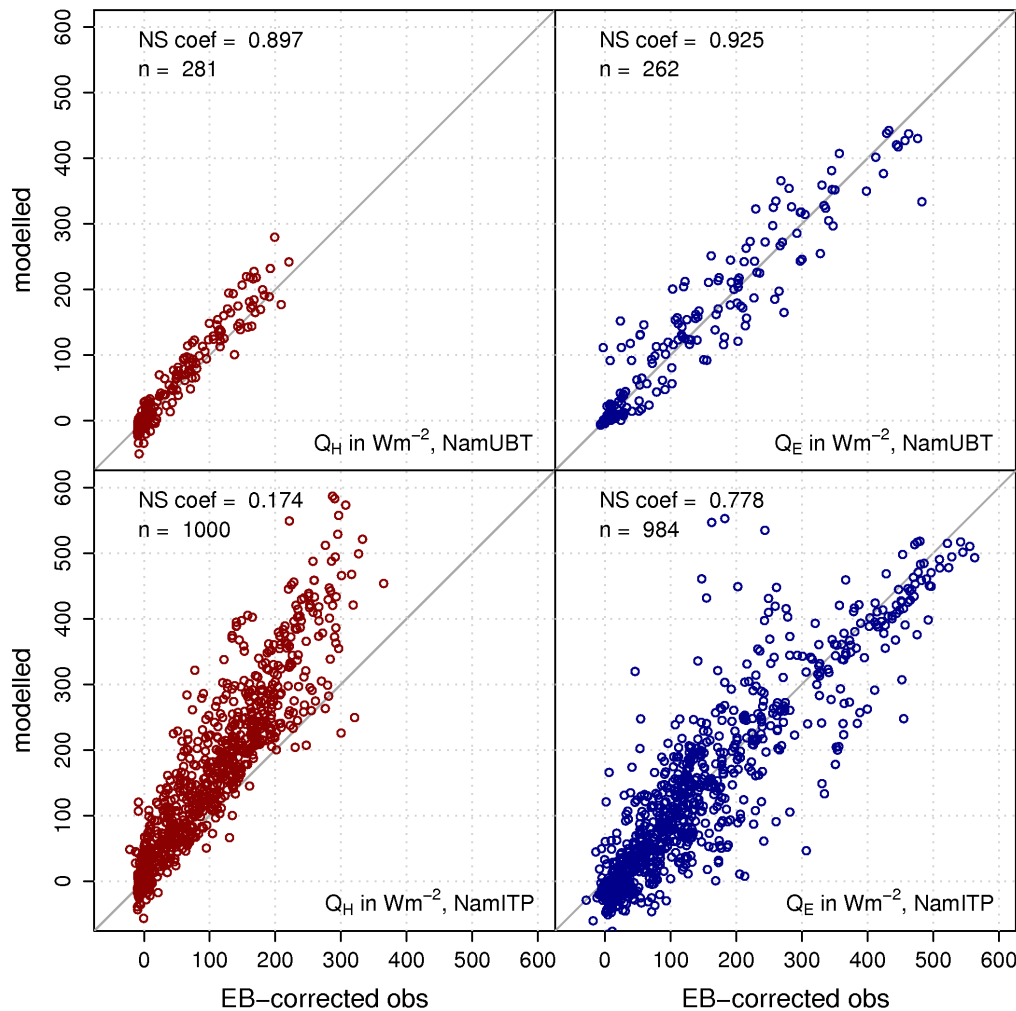
Vegetation: Stomatal resistance (Pinty et al.)

Soil: thermal diffusion eq., Richardson eq., soil moisture characteristics by Clapp and Hornberger

Special Feature: Energy balance closure by iteration of the surface temperature

Mengelkamp et al., Adv. Water Resour., 1999

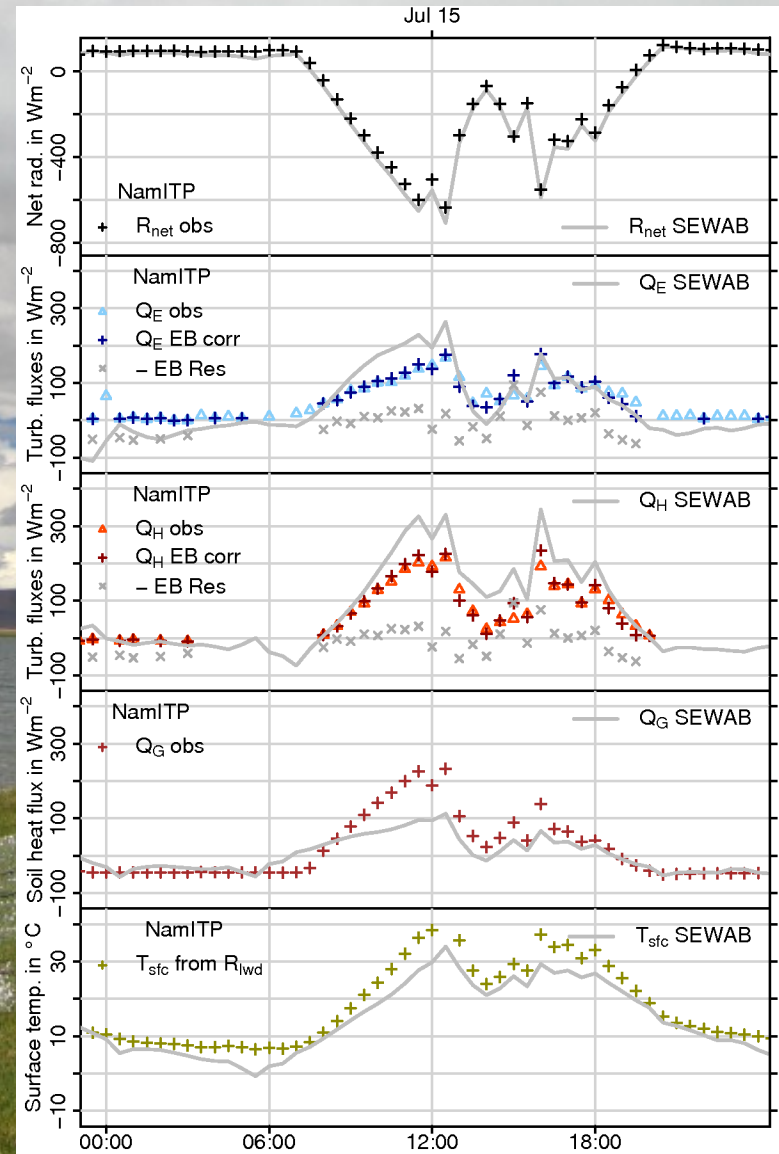
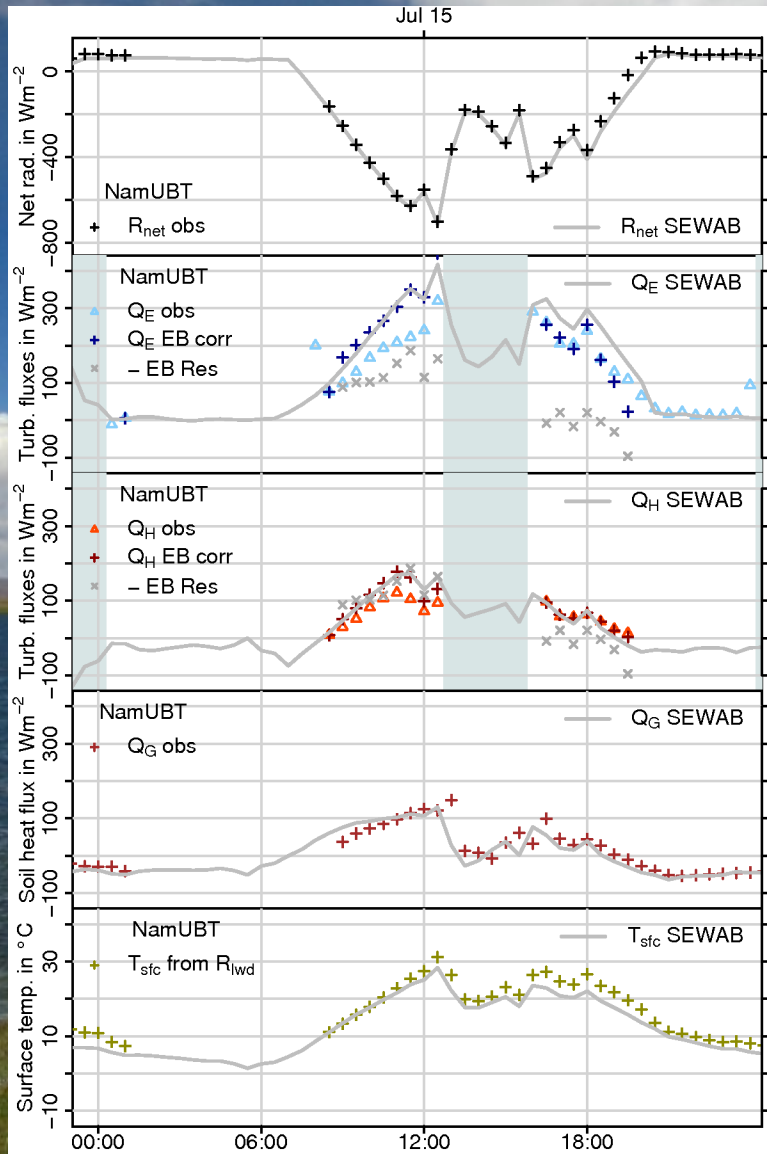
Model performance

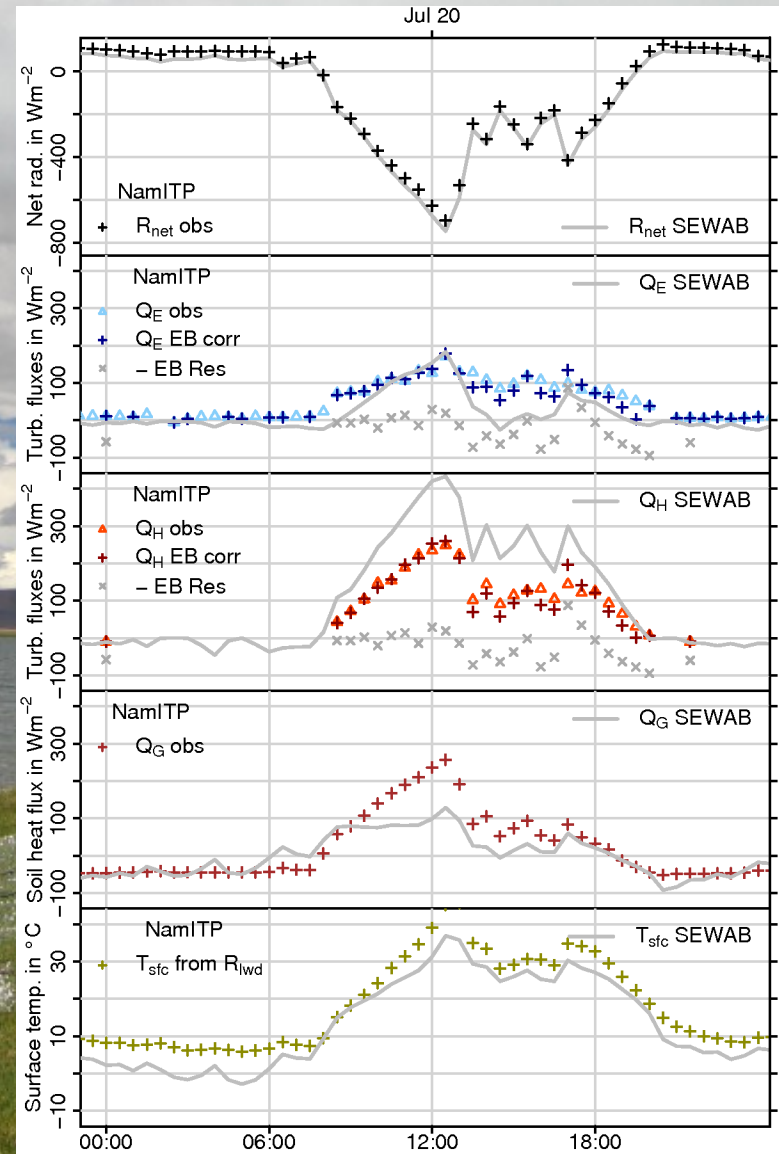
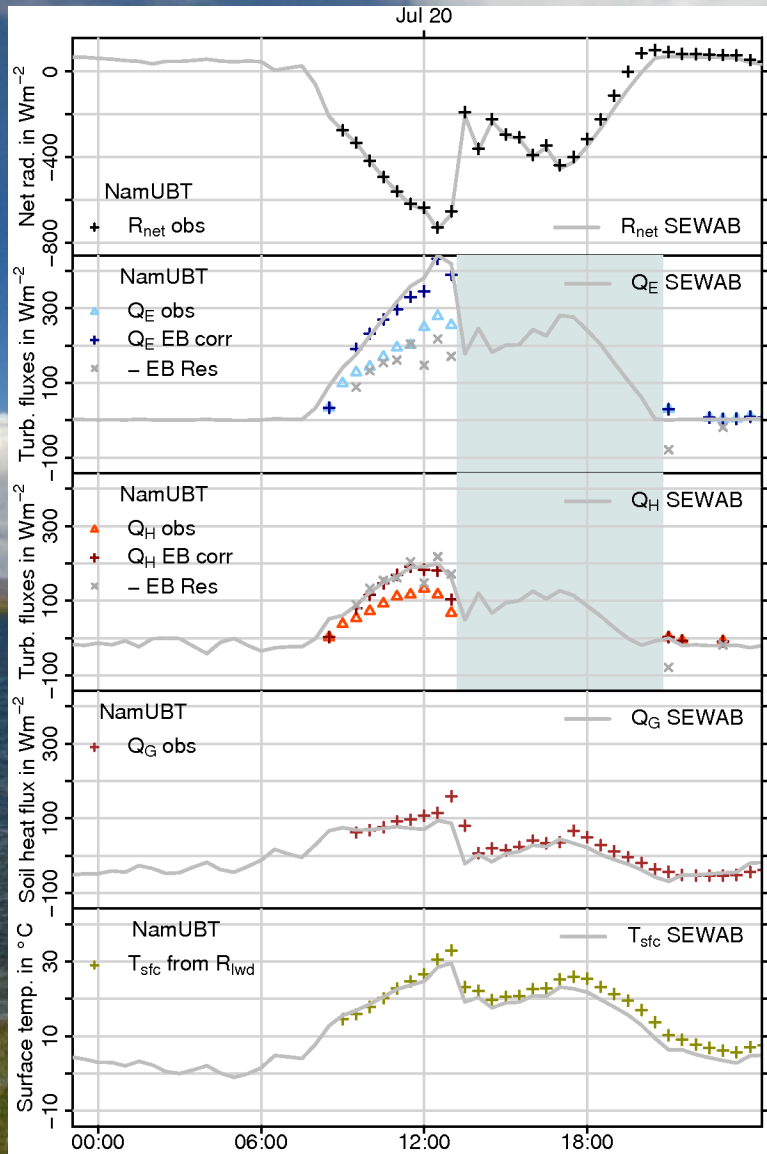


Used quality flags: 1-3
(from 1 to 9)

NamUBT
Only few data points,
but well represented

NamITP
During dry conditions
not well represented by
the model





Conclusions

Upscaling via modelling unknown land use types in principle possible, but the following problems have to be solved:

- unadequate representation of the ITP data by the model fluxes during dry conditions at the moment → model structure problem

EB closure of the turbulent fluxes significantly enhances representation of the data by the model, but:

- More accurate soil heat flux must be determined
- EB closure correction with the Bowen ratio only valid for humid conditions in this case study
- Fraction of residual attributed to the sensible heat flux is function of B_o and soil moisture conditions (and also of larger scale boundary conditions, advection, but not easy to determine)

Acknowledgements

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Thank you !

