Contribution of the advection terms for NEE in a short-statured ecosystem

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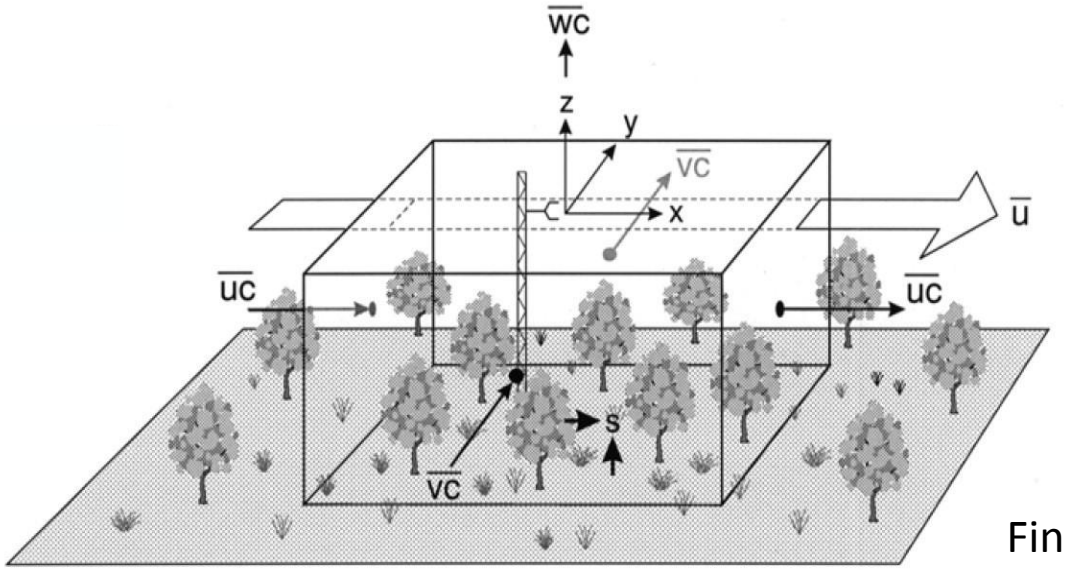
Motivation

- Conservation equation

$$F_{NEE} = F_{EC} + F_s + F_{VA} + F_{HA}$$



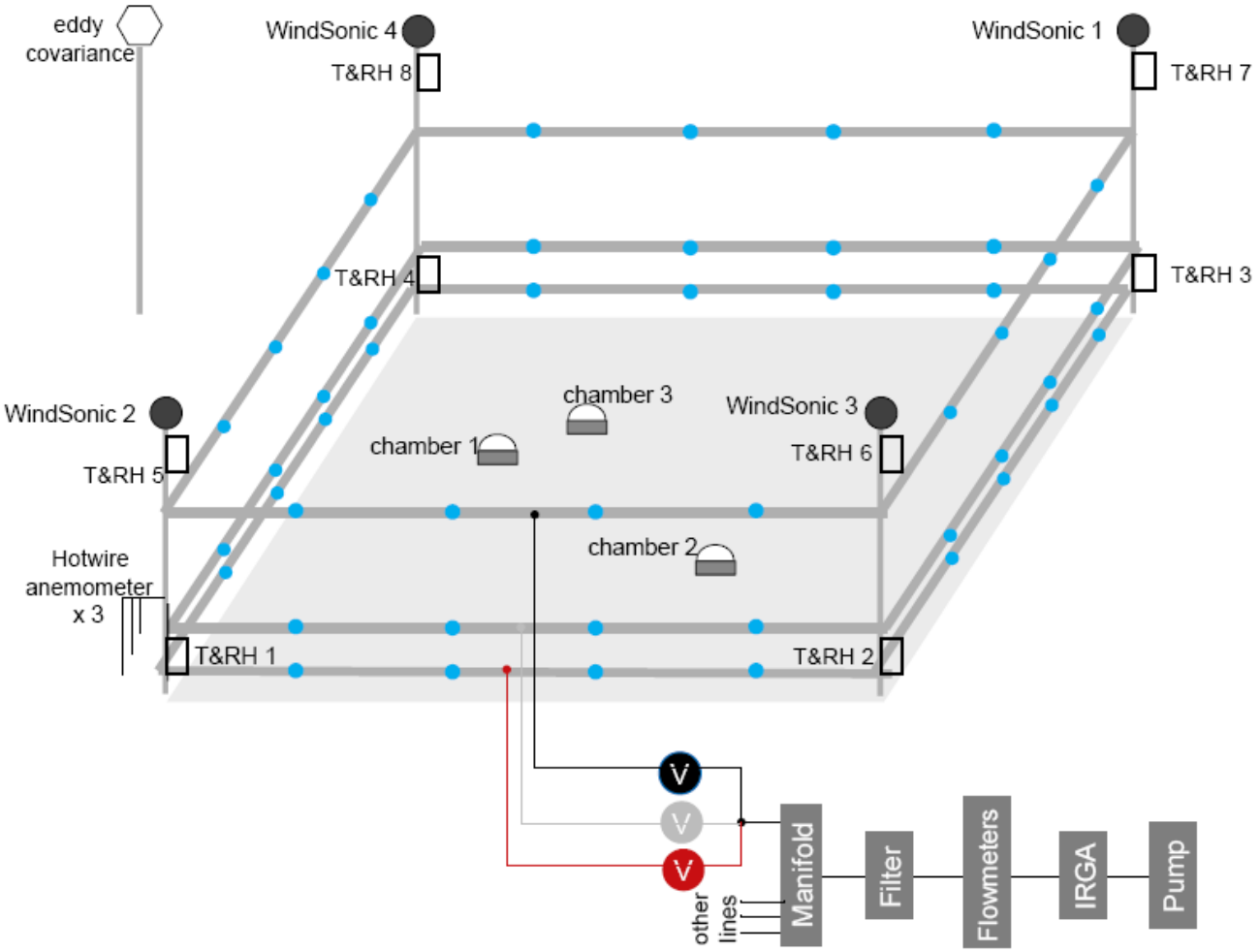
Finnigan *et al.*, 2003

- Contribution of the advection terms in short-statured ecosystems has rarely been reported

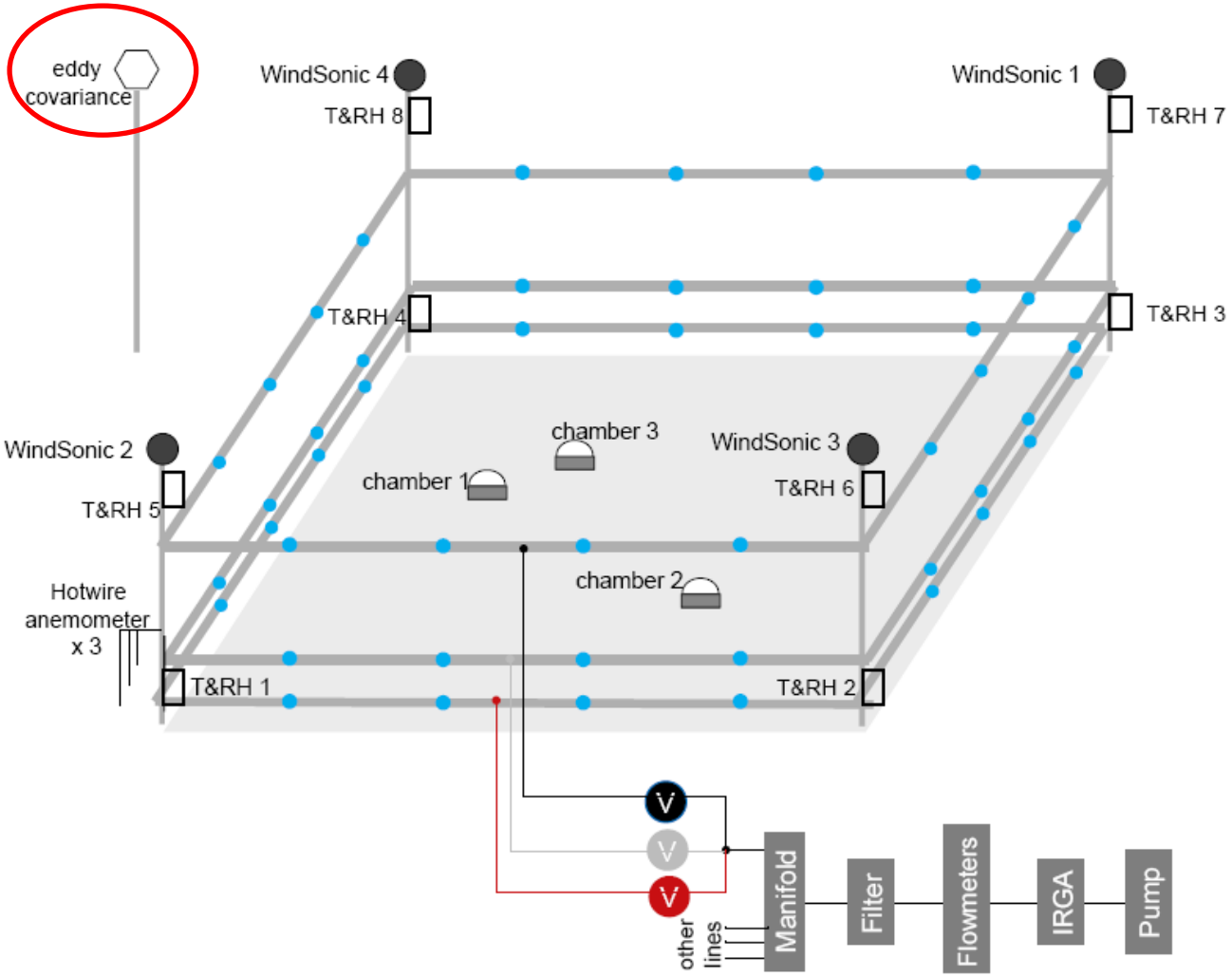
Questions

- How much do advection terms contribute to NEE in short-statured ecosystems?
- Is chamber measurement capable to be used as ‘ground-truth’ for comparison?
- What is the best spatial scale for estimate the advection terms?

Methods


eddy covariance
WindSonic 4
T&RH 8
WindSonic 1
T&RH 7
T&RH 4
T&RH 3
WindSonic 2
T&RH 5
chamber 3
chamber 1
WindSonic 3
T&RH 6
chamber 2
Hotwire anemometer x 3
T&RH 1
T&RH 2
other lines
Manifold
Filter
Flowmeters
IRGA
Pump

Methods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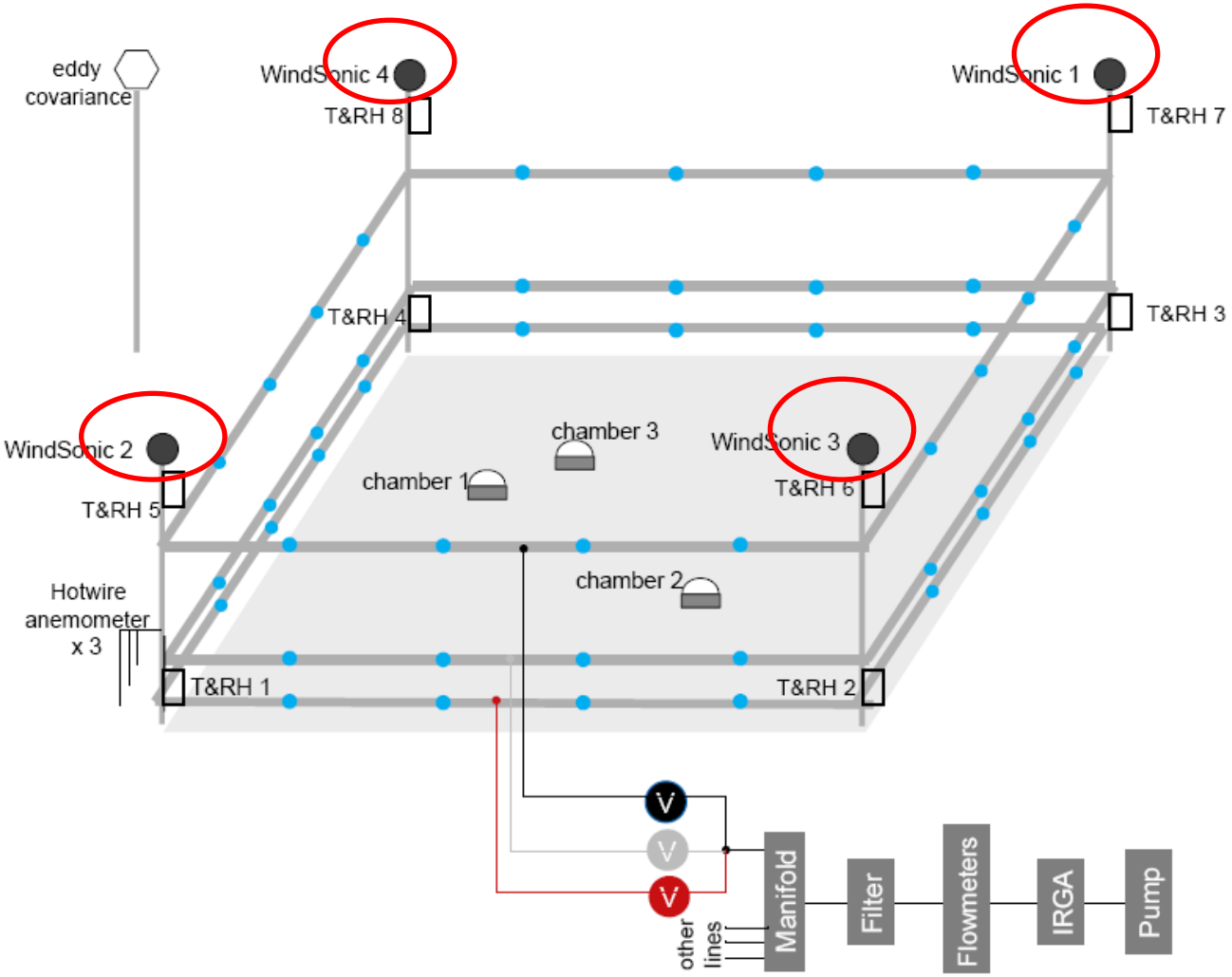
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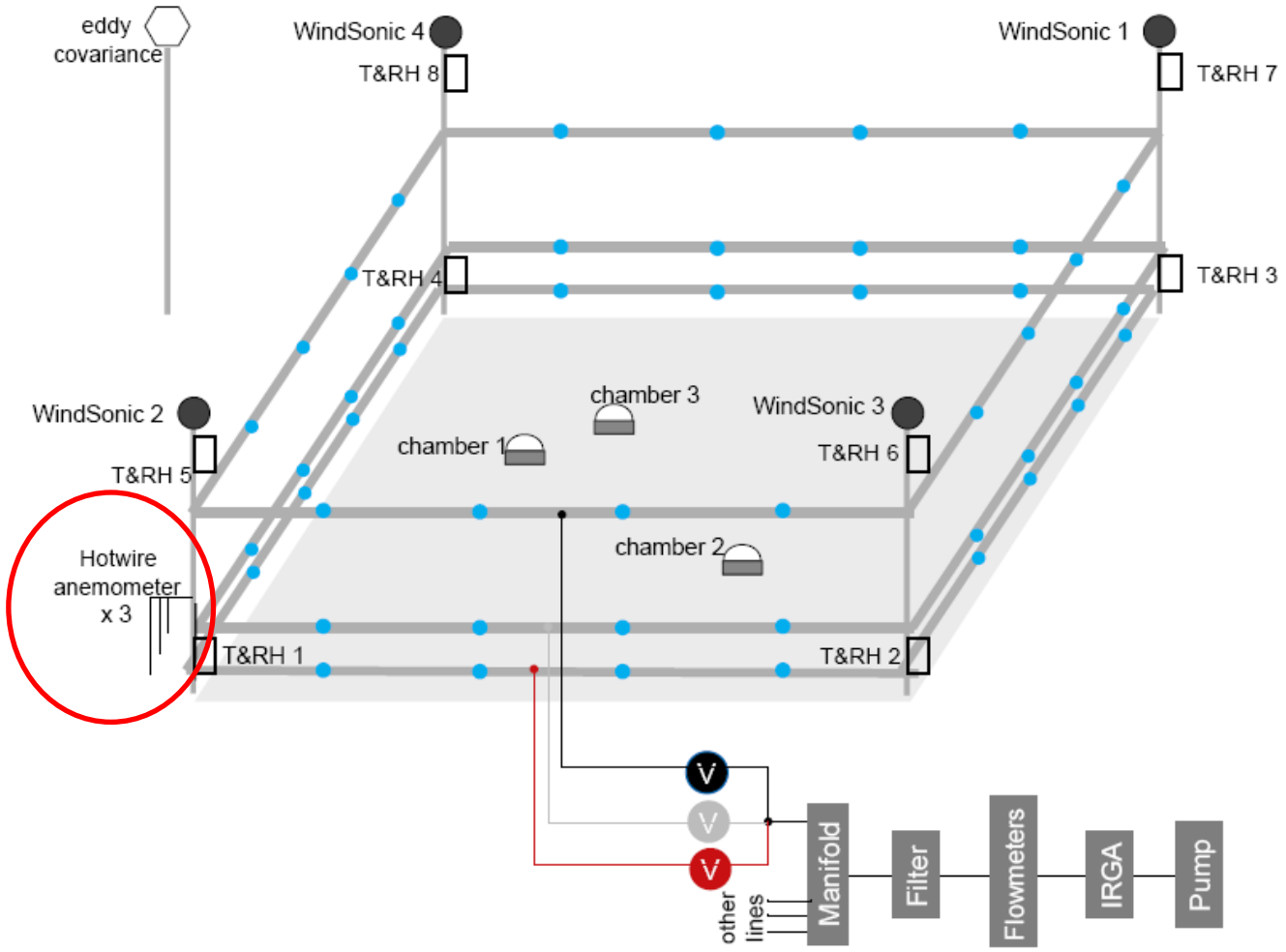
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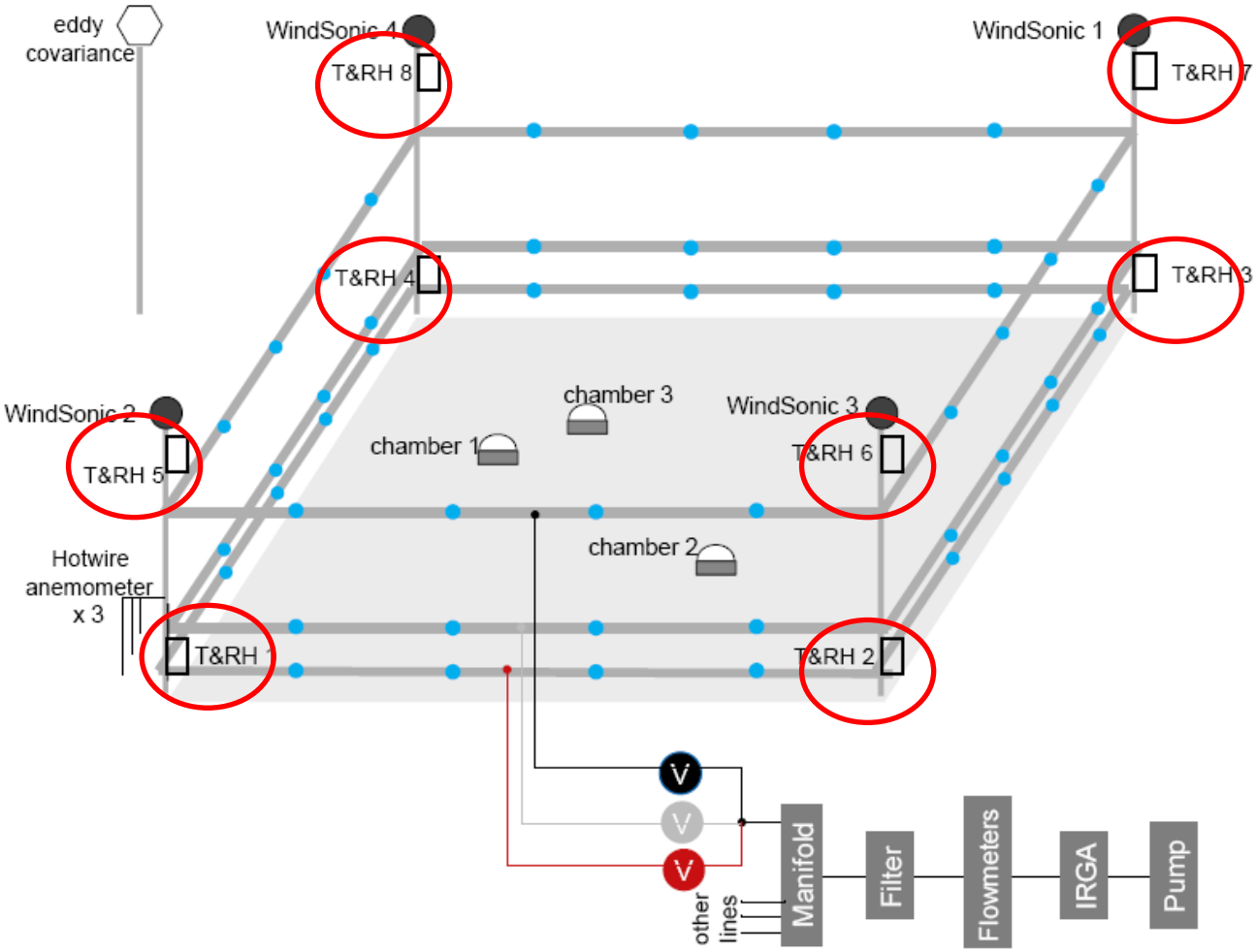
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T&RH 8
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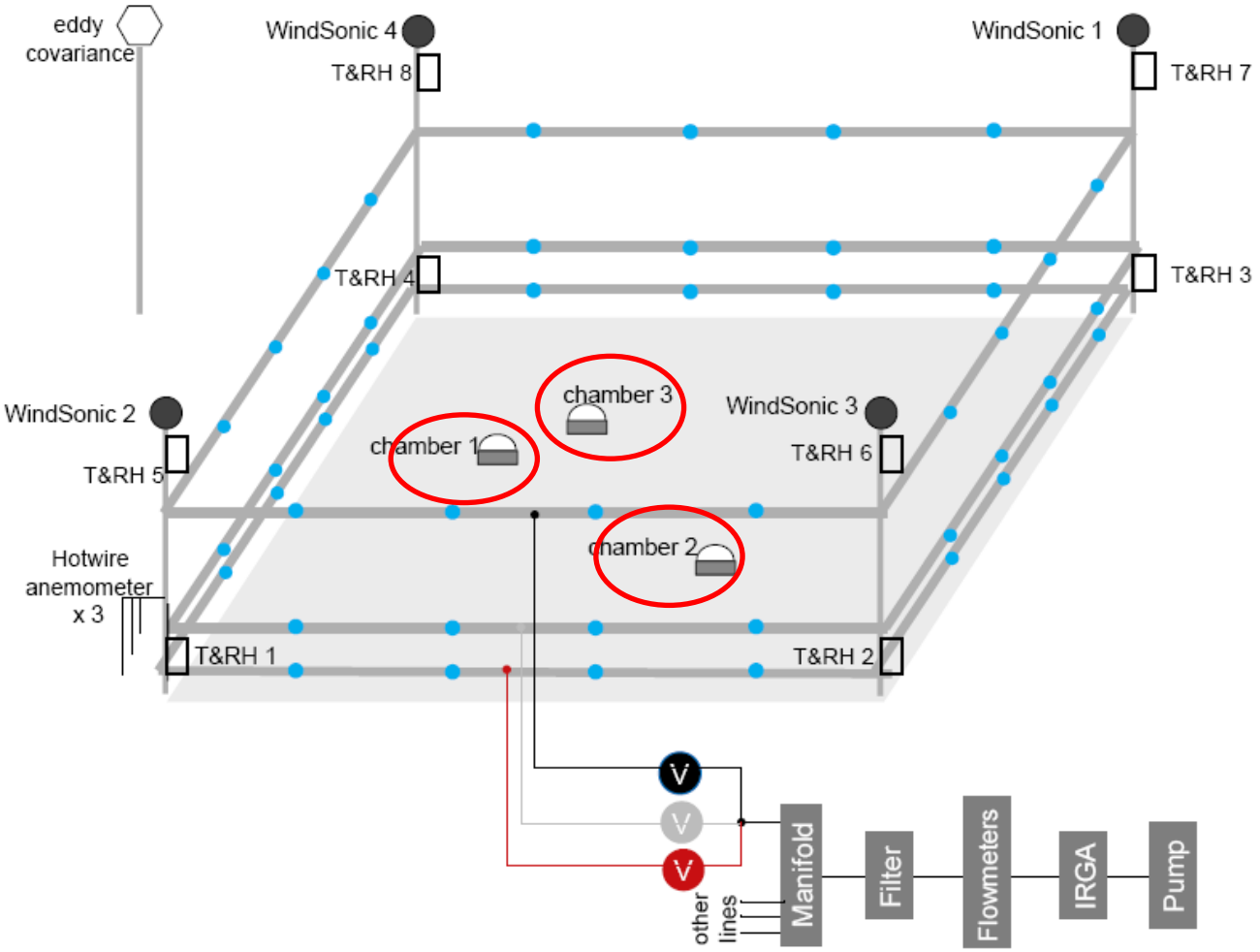
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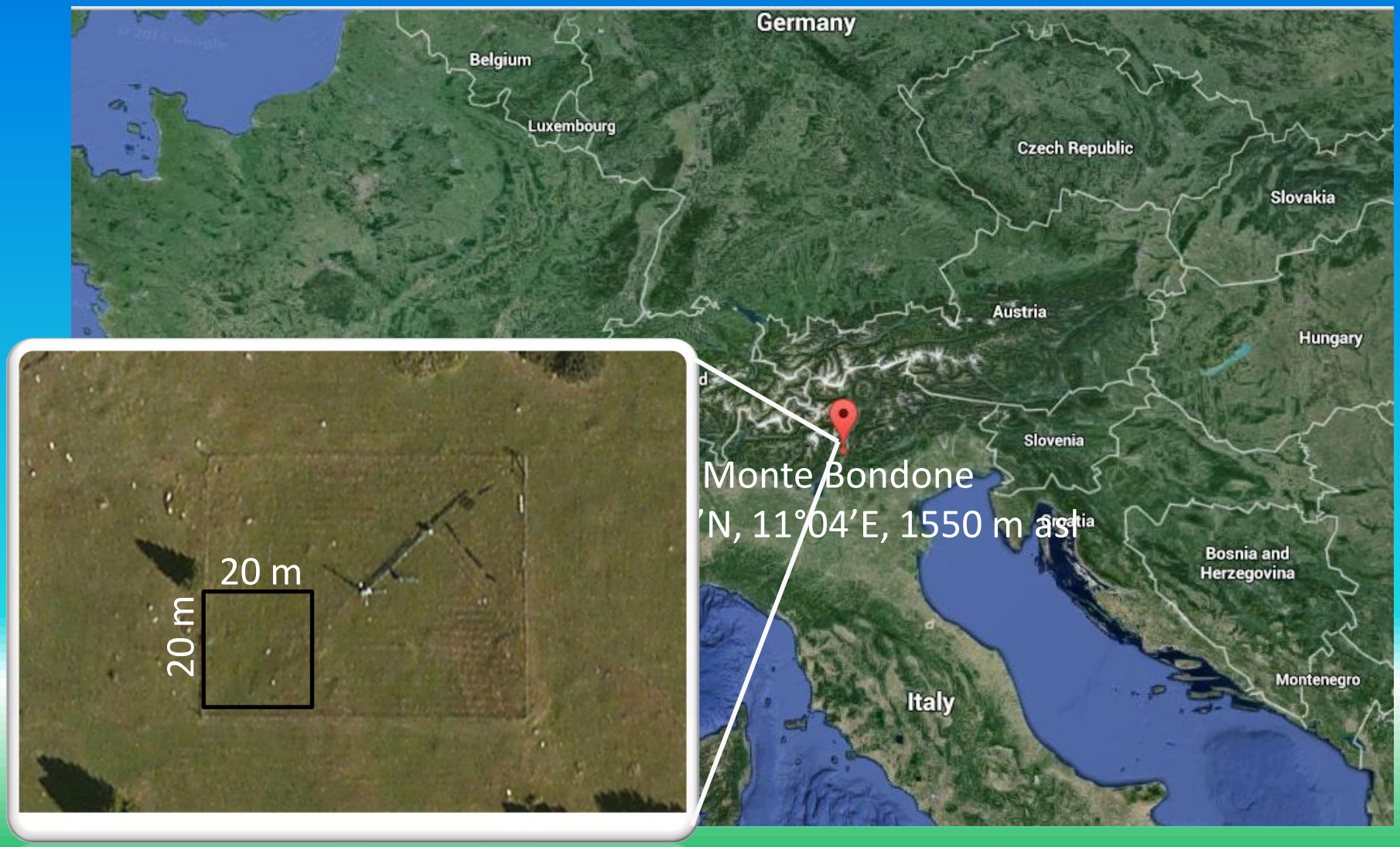
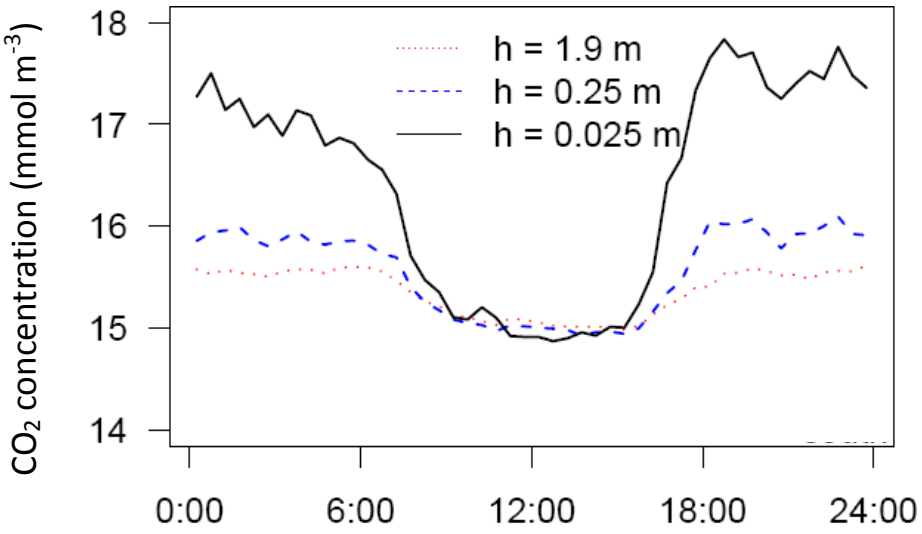
WindSonic 3
T&RH 6
chamber 2
Hotwire anemometer x 3
T&RH 1
T&RH 2
other lines
Manifold
Filter
Flowmeters
IRGA
Pump

Site

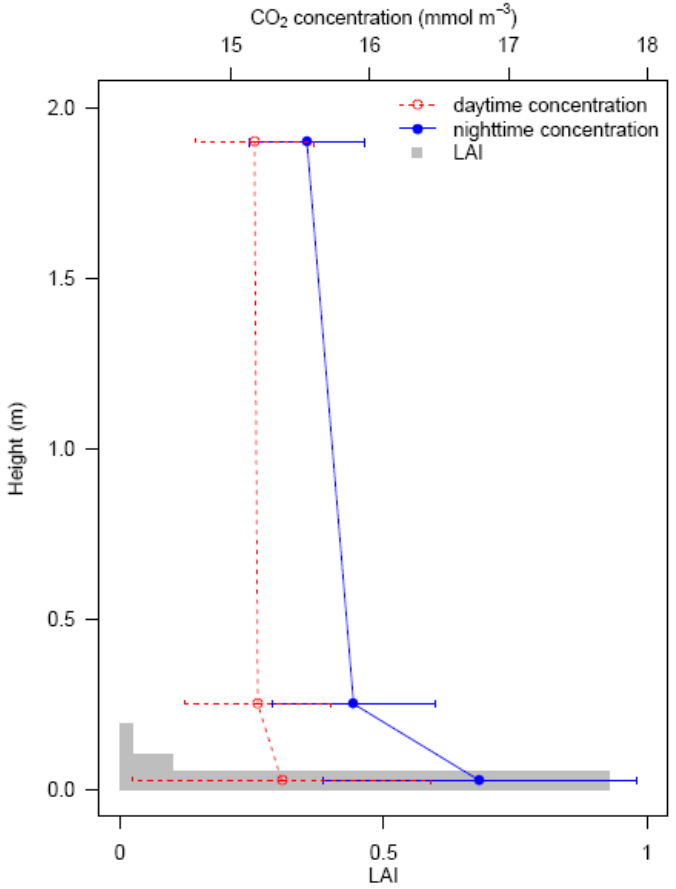

Germany
Belgium
Luxembourg
Czech Republic
Slovakia
Austria
Hungary
Slovenia
Bosnia and Herzegovina
Montenegro
Italy
Monte Bondone
'N, 11°04'E, 1550 m asl
20 m
20 m

Field campaign

CO_2 concentration

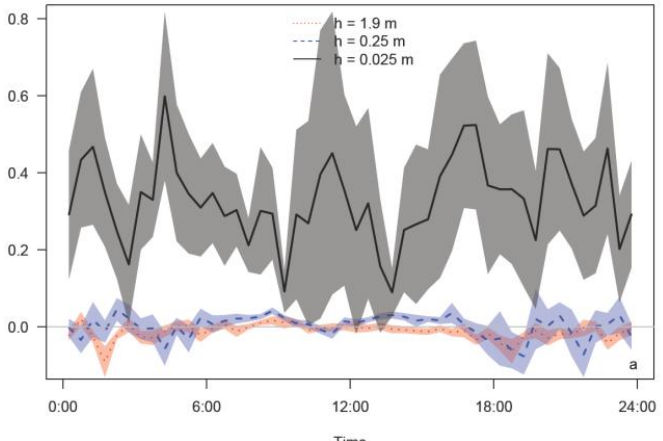


Diurnal variation

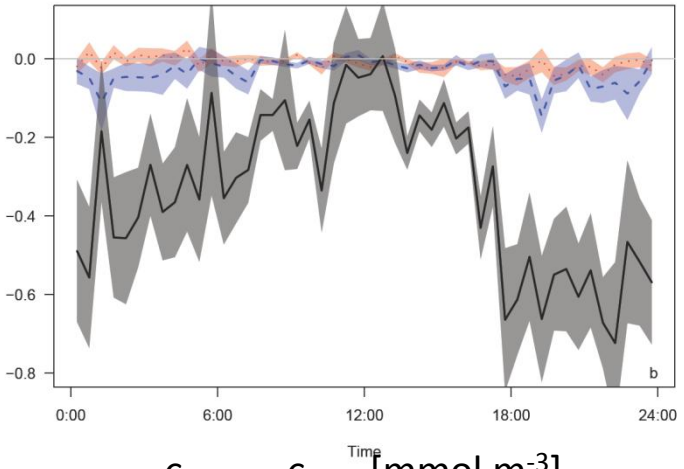


Vertical profile

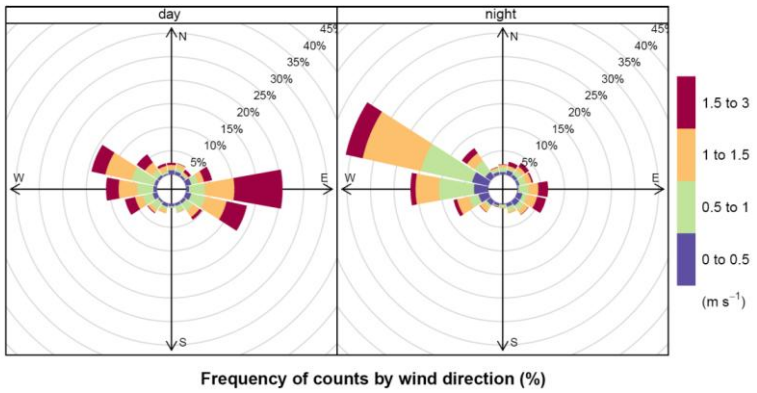
Horizontal advection (F_{HA})

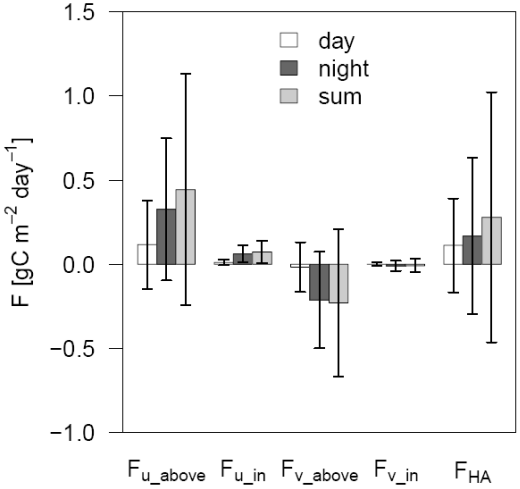


$c_{east} - c_{west}$ [mmol m^{-3}]

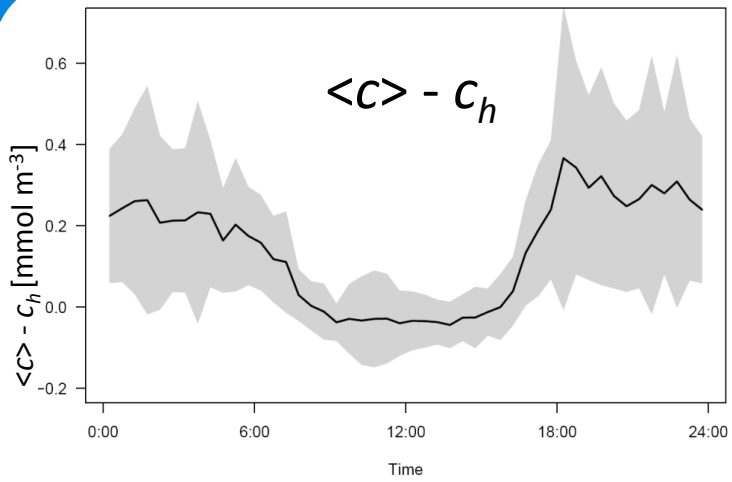


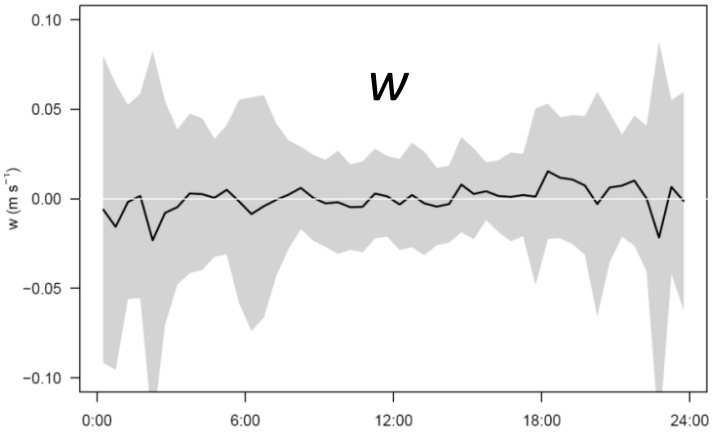
$c_{north} - c_{south}$[mmol m^{-3}]

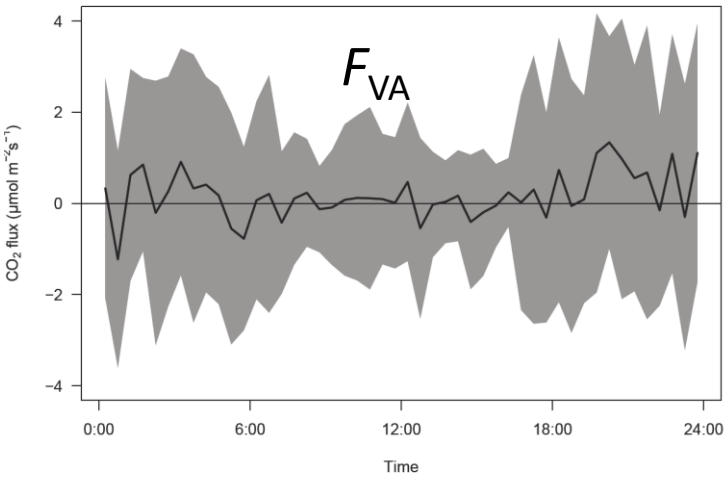


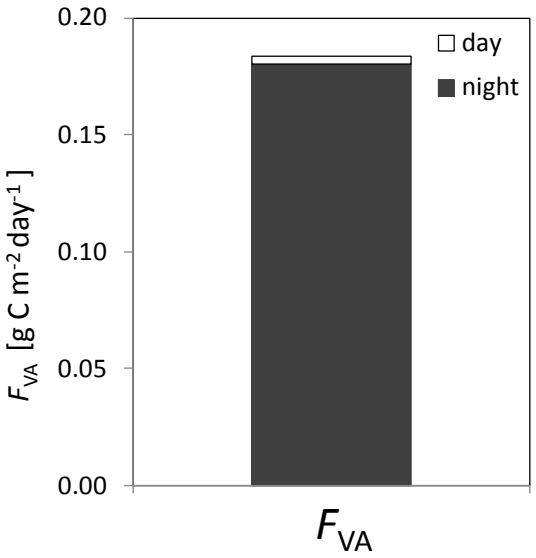


Vertical advection (F_{VA})

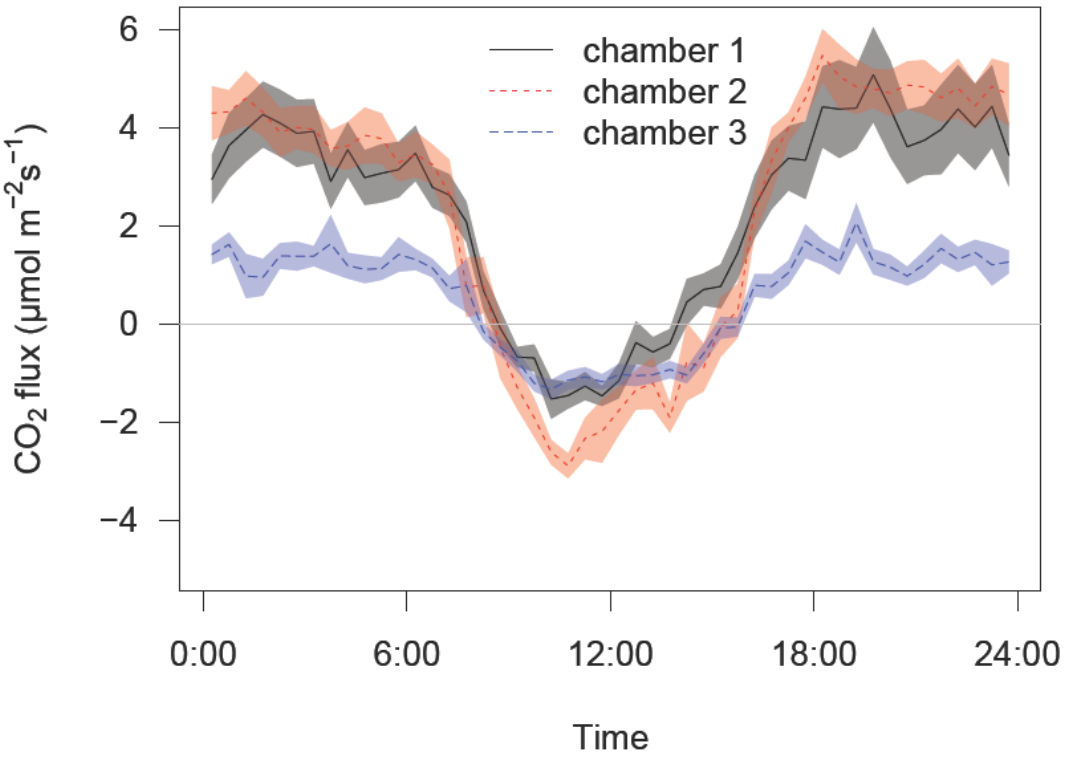






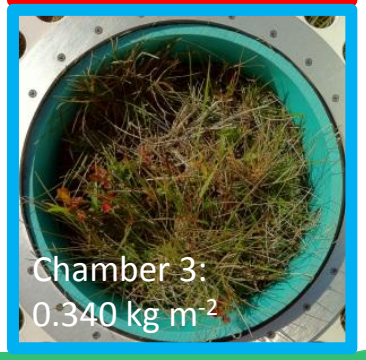


$F_{chamber}$

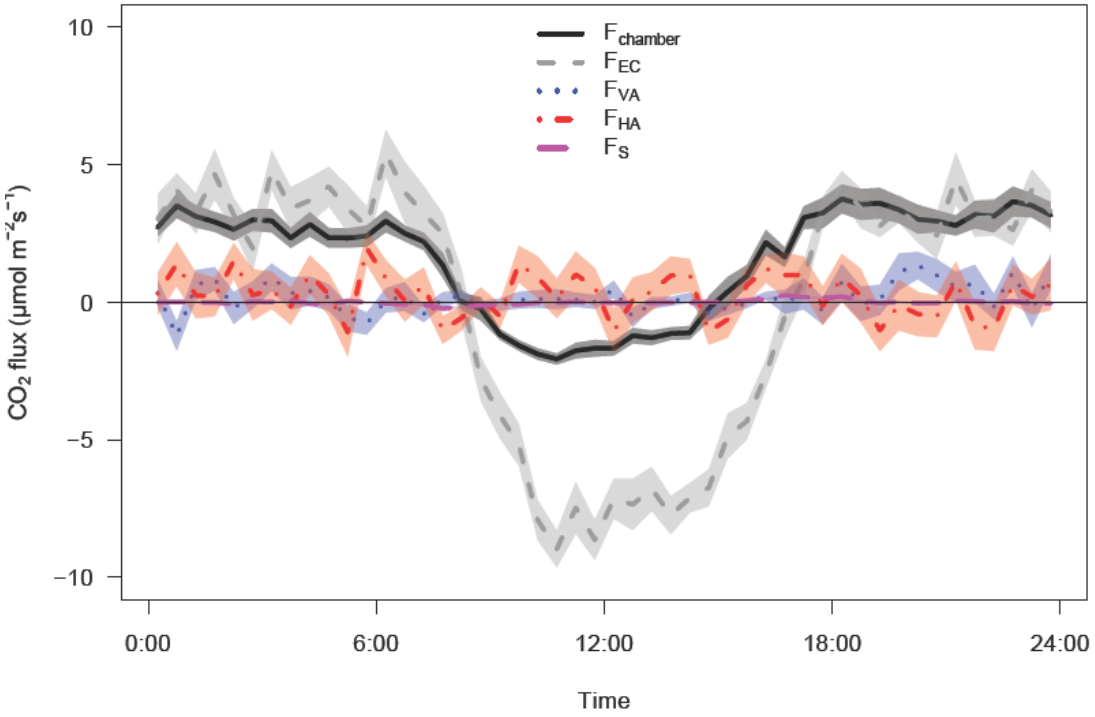


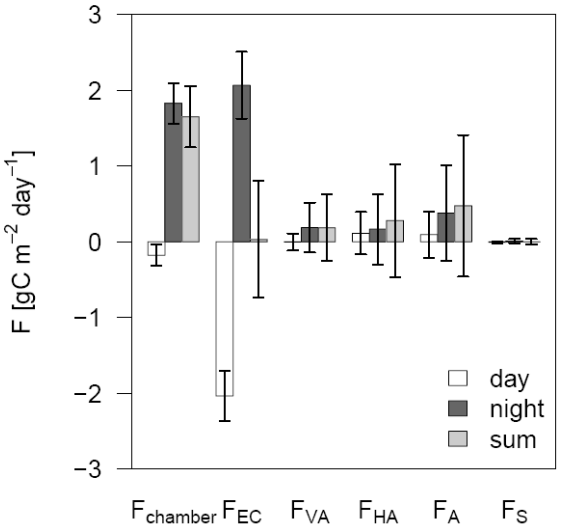
Dominant vegetation types:

- *Festuca rubra* (L.) 25%
- *Nardus stricta* (L.) 13%
- *Trifolium sp.* (L.) 14%



Flux terms


10
5
0
−5
−10
$F_{chamber}$
F_{EC}
F_{VA}
F_{HA}
F_S
CO_2 flux (µmol $m^{-2}s^{-1}$)
0:00
6:00
12:00
18:00
24:00
Time


3
2
1
0
−1
−2
−3
F [gC m^{-2} day^{-1}]
day
night
sum
$F_{chamber}$
F_{EC}
F_{VA}
F_{HA}
F_A
F_S

Conclusions

Q: How much do advection terms contribute to NEE in short-statured ecosystems?

A: Advection terms have remarkable contribution to NEE estimation in the alpine meadow site.

Q: Is chamber measurement capable to be used as 'ground-truth' for comparison?

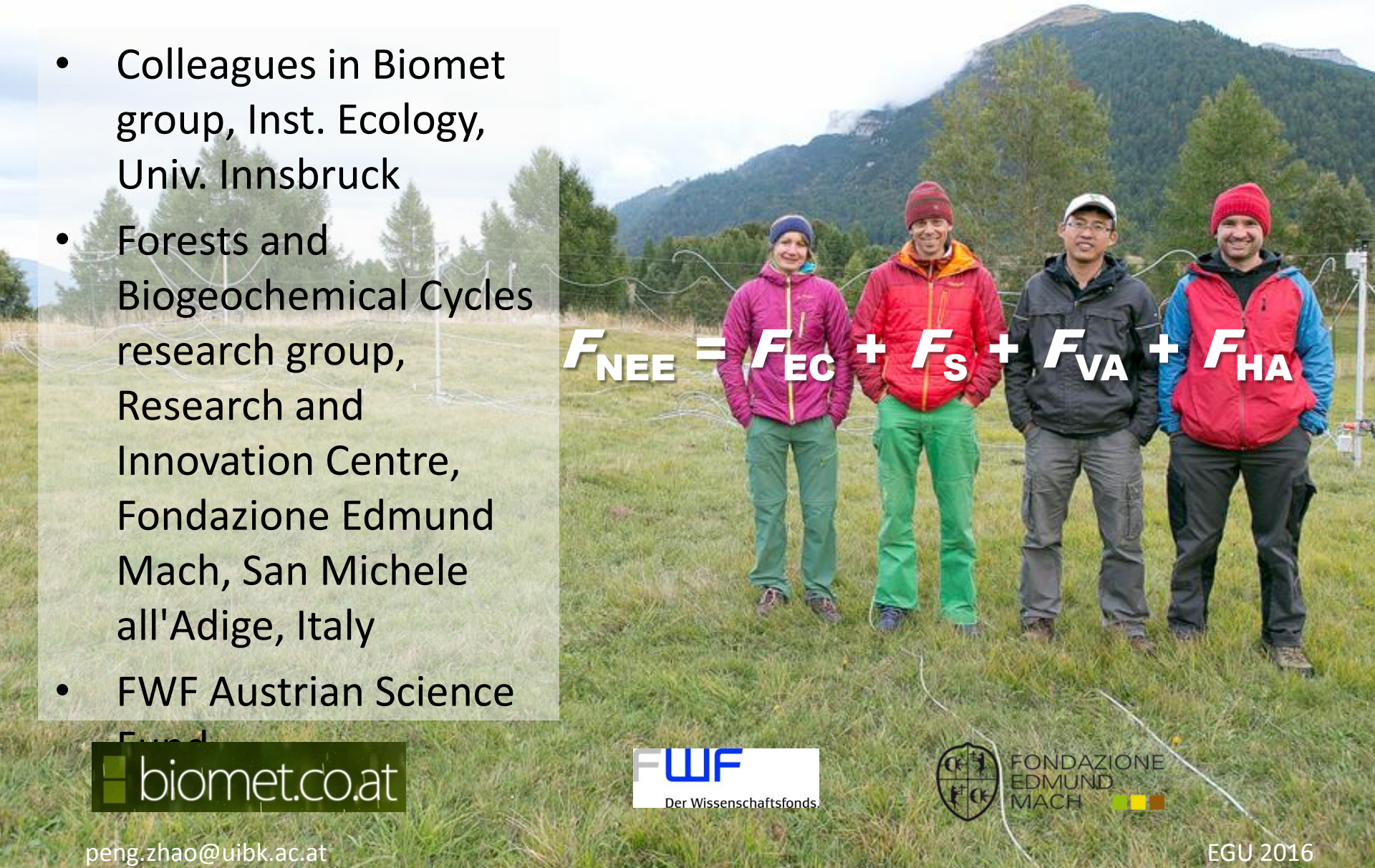
A: It is challenging as a reference probably due to the vegetation heterogeneity.

Q: What is the best spatial scale for estimate the advection terms?

A: 20 m by 20 m is well acceptable in this study. Further experiments are expected.

Acknowledgements

- Colleagues in Biomet group, Inst. Ecology, Univ. Innsbruck
- Forests and Biogeochemical Cycles research group, Research and Innovation Centre, Fondazione Edmund Mach, San Michele all'Adige, Italy
- FWF Austrian Science Fund



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FWF Der Wissenschaftsfonds.

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Thank you for your attention