Monitoring forest carbon exchange in complex terrain

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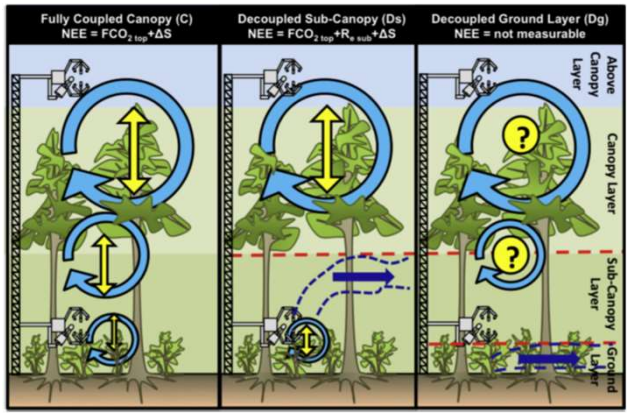
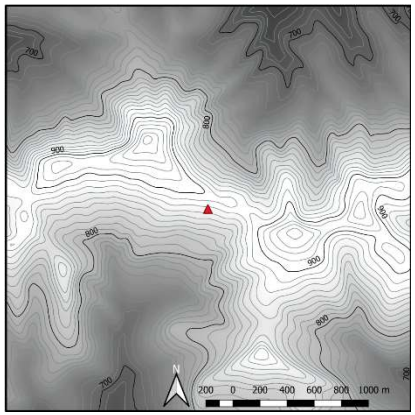
Decoupling: challenge at forest sites



Thomas et al., 2013, AFM

Measurement site Bílý Kříž



Jocher et al., 2020, AFM

- Beskidy mountains, Czech Republic
- ~ 40 years old Norway Spruce stand
- EC since more than 10 years
- Tower close to a ridge
- Since 2017: additional EC below canopy
- LAI ~ 9 m^2 m^{-2}, stand height ~ 18 m

Two-level filtering approaches

- σ_w-filtering

Newly proposed:

- Telegraphic approximation agreement (TA_a) on raw w: the direction of w above and below canopy indicates coupling/decoupling
- Cross correlation maximum w (CCF_{max}): the magnitude of CCF_{max} within a given averaging interval indicates coupling/decoupling

Results and conclusions

- Decoupling, as detected via TA_a and CCF_{max} cannot be sufficiently described by any other single-level environmental parameter.
- Each two-level filtering approach yielded a better capture of ecosystem respiration in the annual carbon budgets, hence, more accurate assessments of forest carbon exchange.
- **Consequently, specific two (or multi)-level analysis appears to be mandatory to evaluate decoupling.**