

Spider webbing the land-atmosphere interface

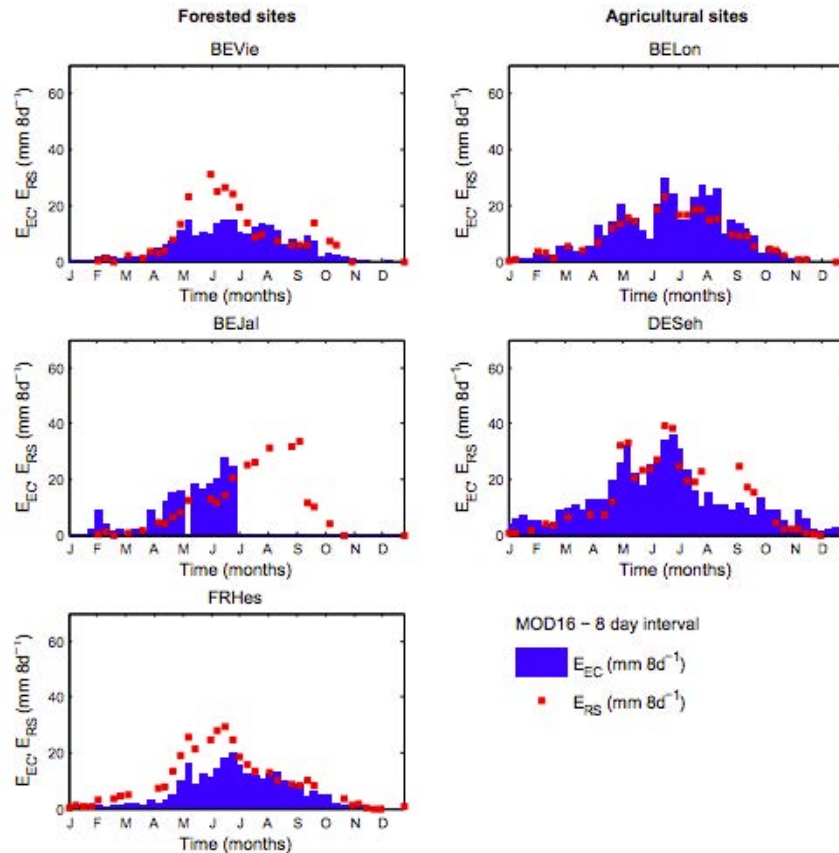
**Connecting
meteorologists and hydrologists**



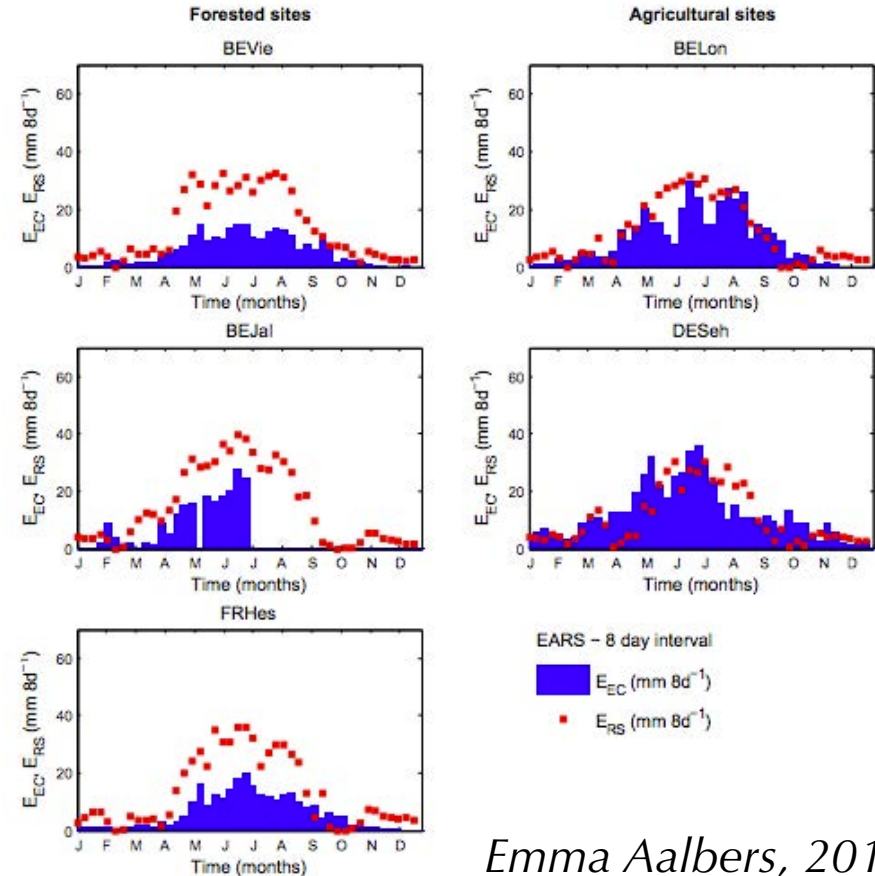
Miriam Coenders

Often mismatch in evaporation as estimated by remote sensing and eddy covariance, especially for tall vegetation (e.g., forests)

MOD16

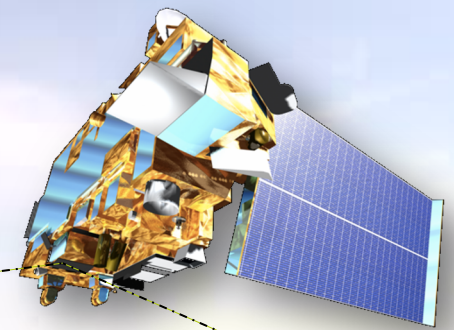


EARS



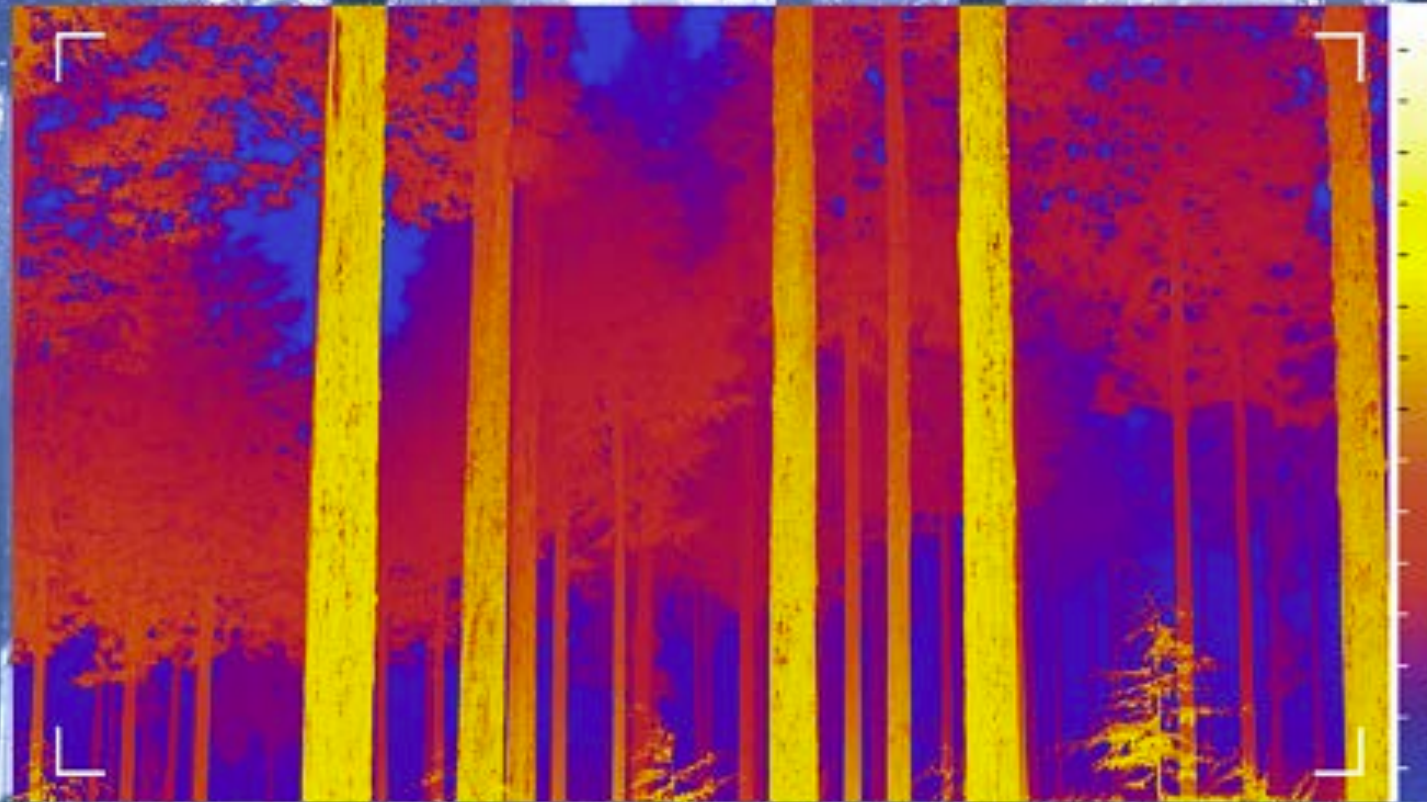
Emma Aalbers, 2015

One of the problems is the difficulty to sense
inside the vegetation

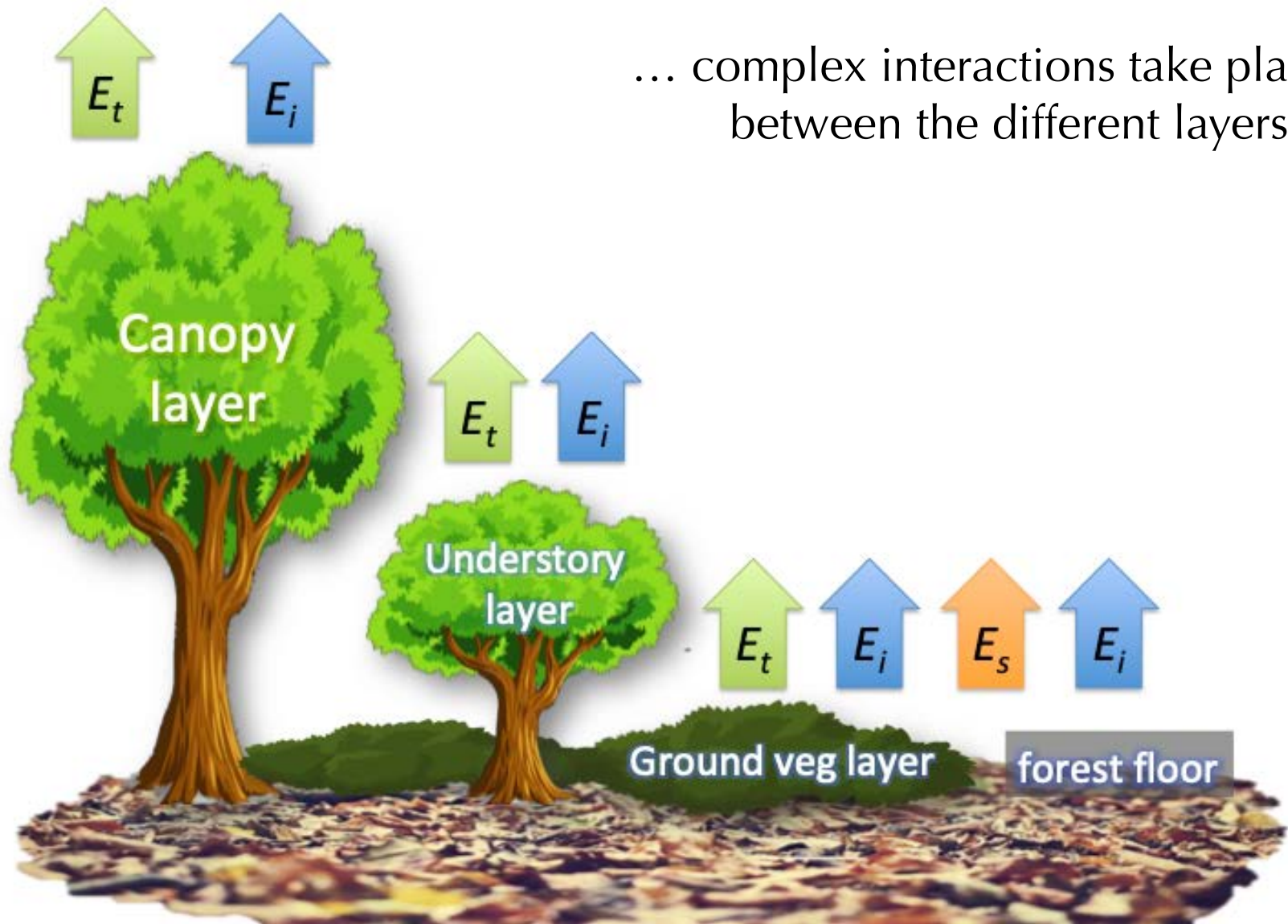


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But within the vegetation the energy distribution isn't straightforward...



... complex interactions take place
between the different layers...



... and vapour is not homogenously released to the atmosphere.





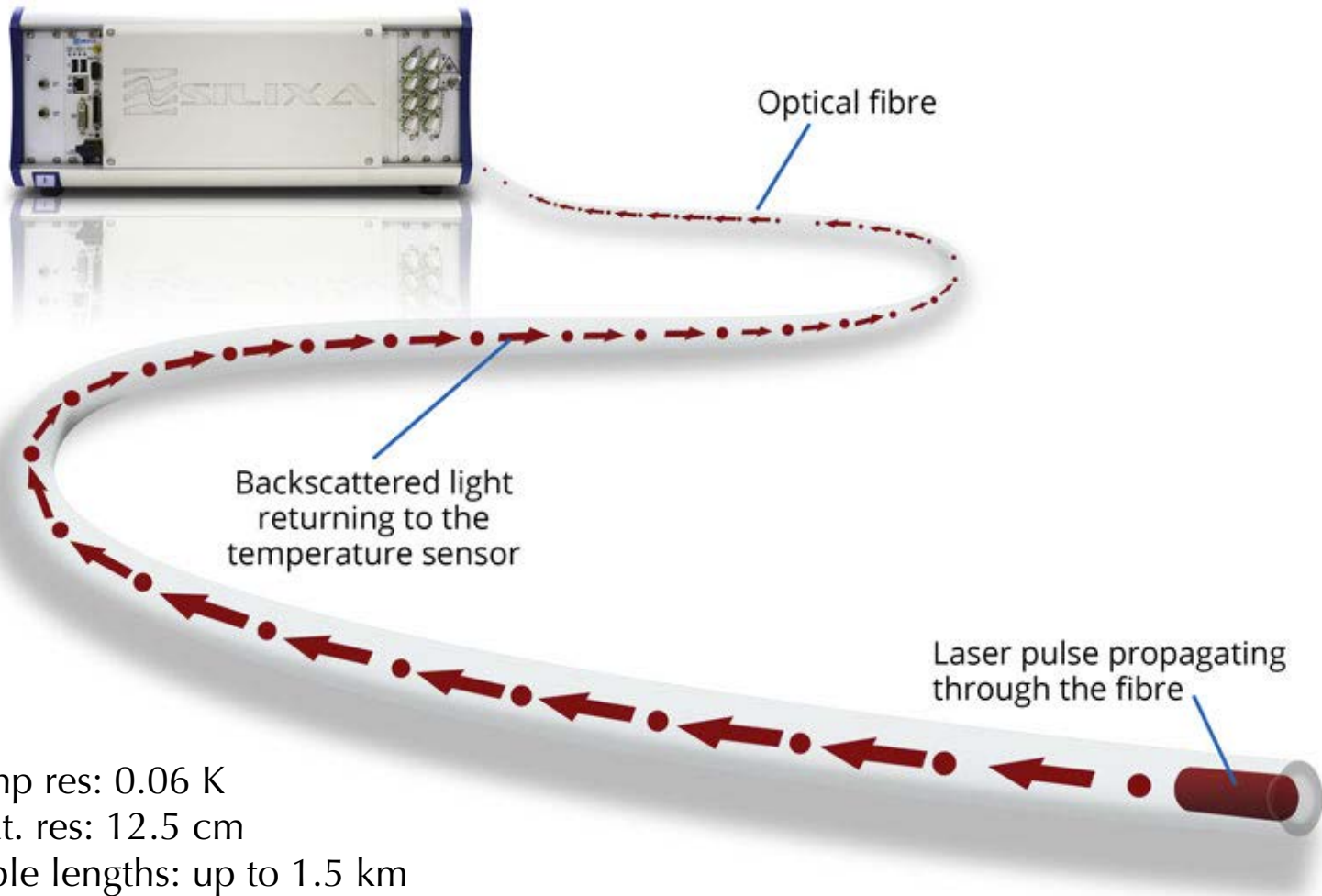
So if we want to know what's happening inside
the vegetation layers, we also need to
measure there

...continuously in the vertical and horizontal.

But HOW?

ookaroto

Tool that (might) be able to do the job: Distributed Temperature Sensing (DTS)

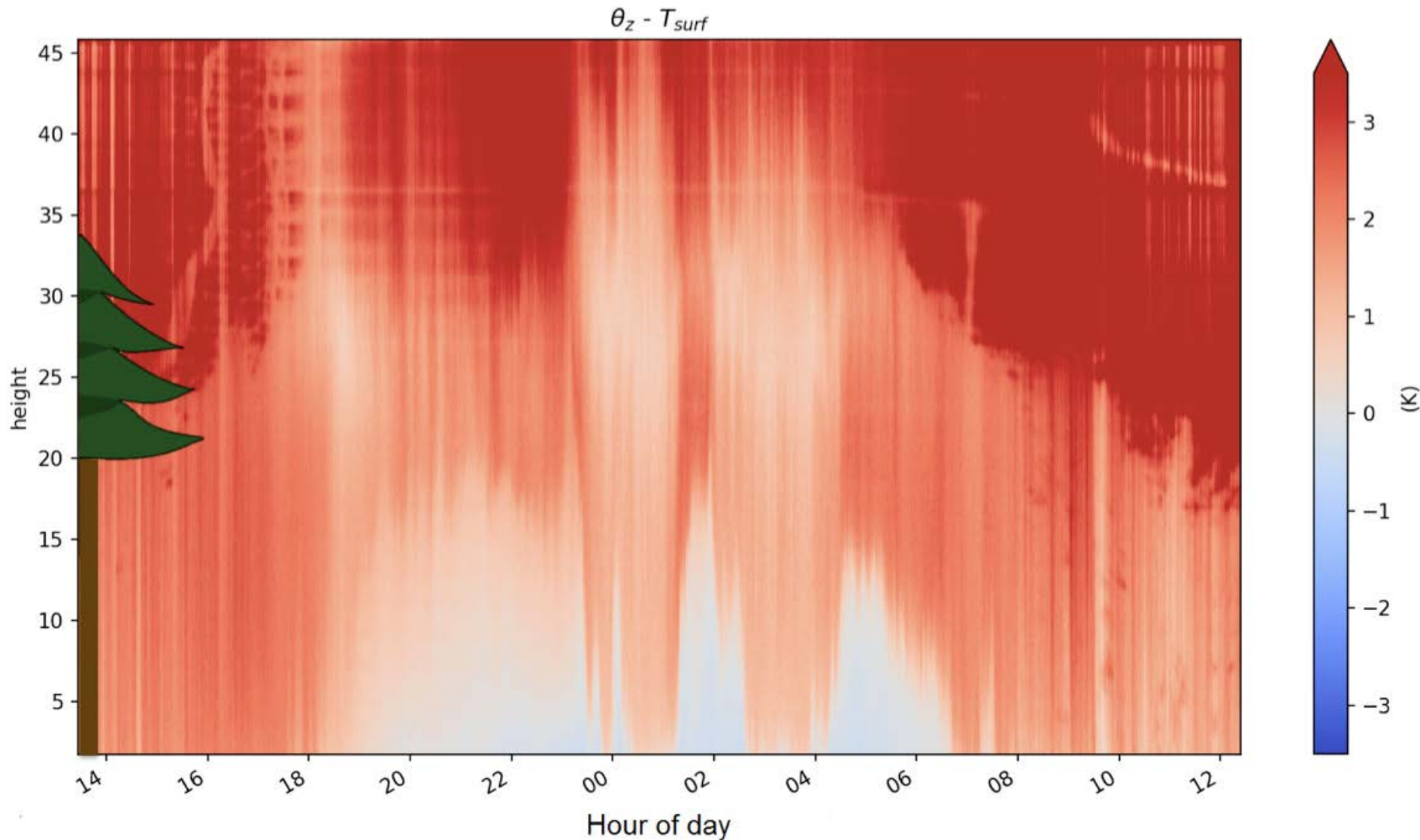


- Temp res: 0.06 K
- Spat. res: 12.5 cm
- Cable lengths: up to 1.5 km

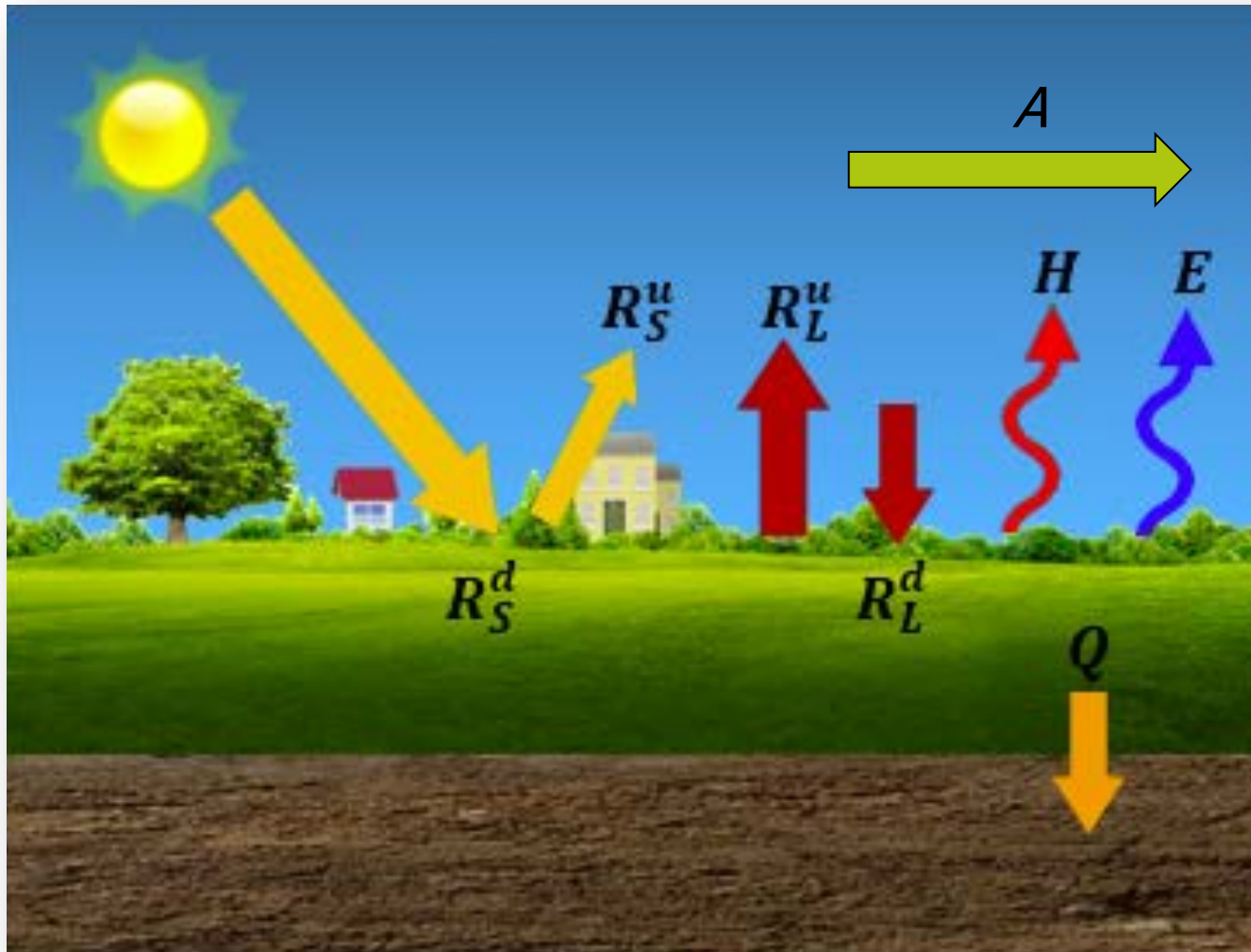
Spider webbing the DTS fibre optic cables through the land-atmosphere interface



DTS provides detailed information on temperature gradients within a forest

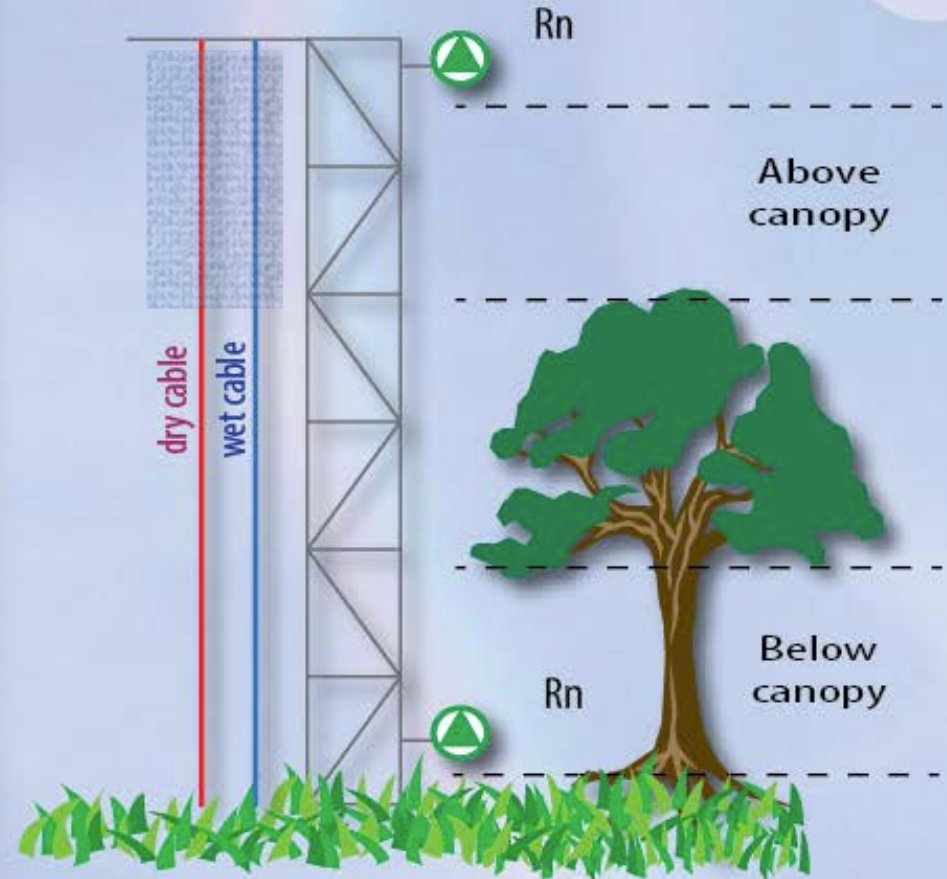


Can we derive the surface energy balance fluxes from these temperature profiles?

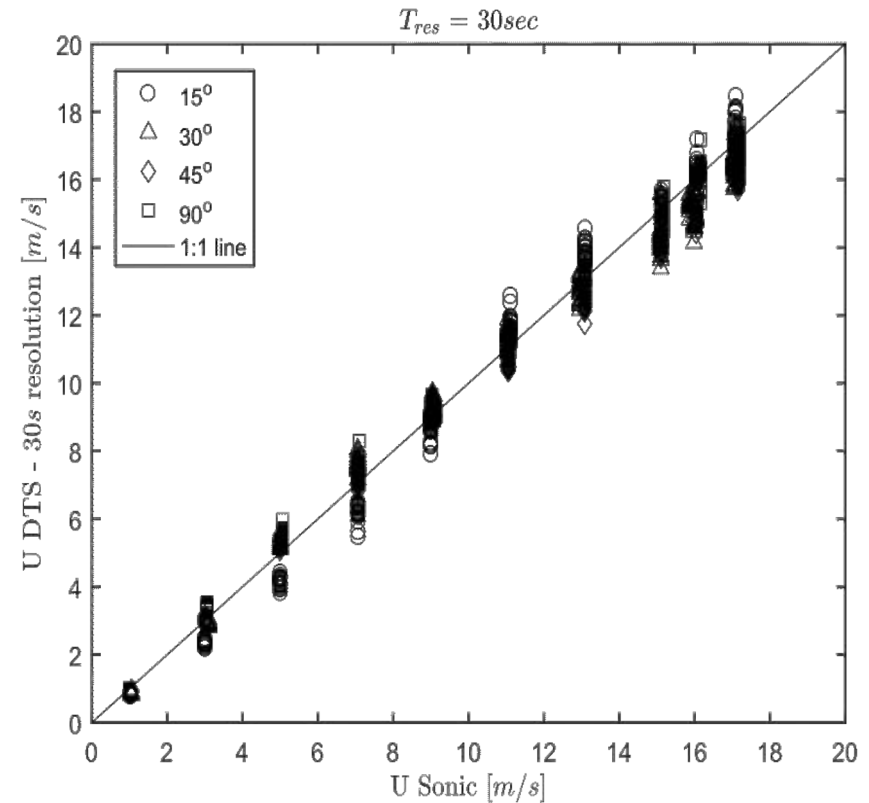
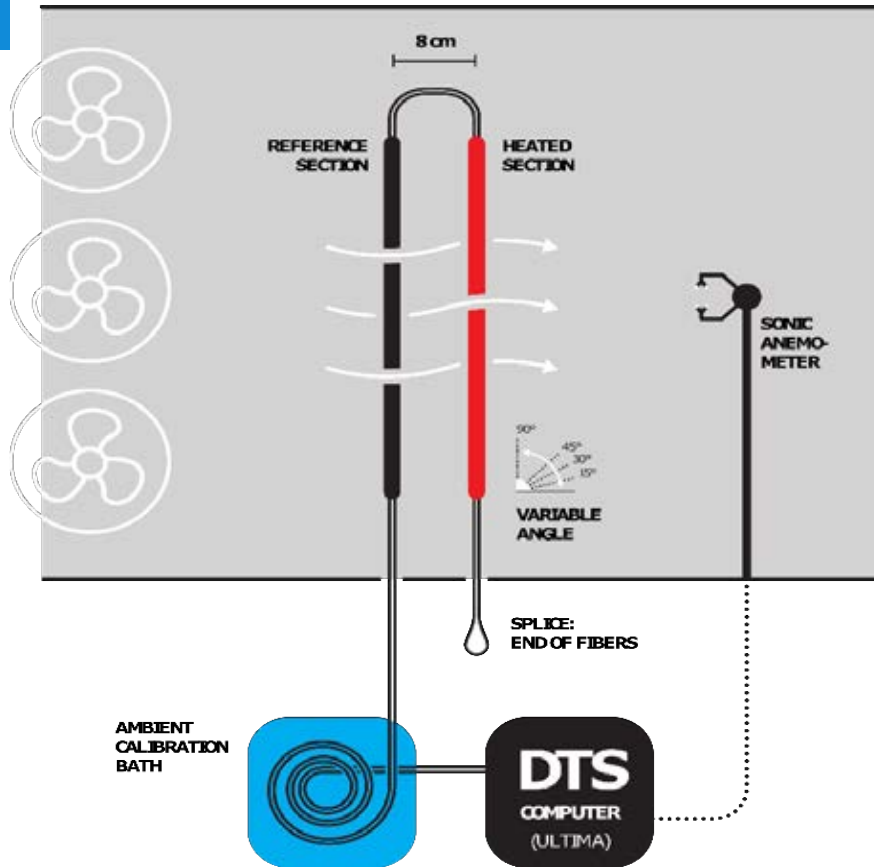


Latent Heat Flux: Bowen Ratio

$$\left. \begin{aligned} \beta &= \frac{H}{\rho\lambda E} = \gamma \frac{\Delta T_a}{\Delta e_a} \\ R_n &= H + \rho\lambda E + Q \end{aligned} \right\} \rho\lambda E = \frac{R_n - Q}{1 + \beta}$$



Sensible Heat Flux: Wind profile



Van Ramshorst et al., AMT-d 2019

And maybe the others as well... to be continued

Further readings:

Miriam Coenders-Gerrits, Bart Schilperoort, César Jiménez-Rodríguez “[Evaporative processes on vegetation: an inside look](#)” (2020). pp 35-48. Book chapter in “[Precipitation Partitioning by Vegetation: A Global Synthesis](#)”, editors John T. Van Stan, II; Ethan D. Gutmann; Jan Friesen; Springer.

Jiménez-Rodríguez, C. D., Coenders-Gerrits, M., Schilperoort, B., González-Angarita, A., and Savenije, H.: Vapor plumes in a tropical wet forest: spotting the invisible evaporation, Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2020-14>, in review, 2020

Van Ramshorst, J. G. V., Coenders-Gerrits, M., Schilperoort, B., van de Wiel, B. J. H., Izett, J. G., Selker, J. S., Higgins, C. W., Savenije, H. H. G., and van de Giesen, N. C.: Wind speed measurements using distributed fiber optics: a windtunnel study, Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2019-63>, 2019

Schilperoort, B., Coenders-Gerrits, A.M.J., Luxemburg, W.M.J., Jiménez Rodríguez, C.D., Cisneros Vaca, C., and Savenije, H.H.G. (2018): [Technical note: using Distributed Temperature Sensing for Bowen ratio evaporation measurements](#). Hydrology and Earth System Sciences, 22, 819-830

