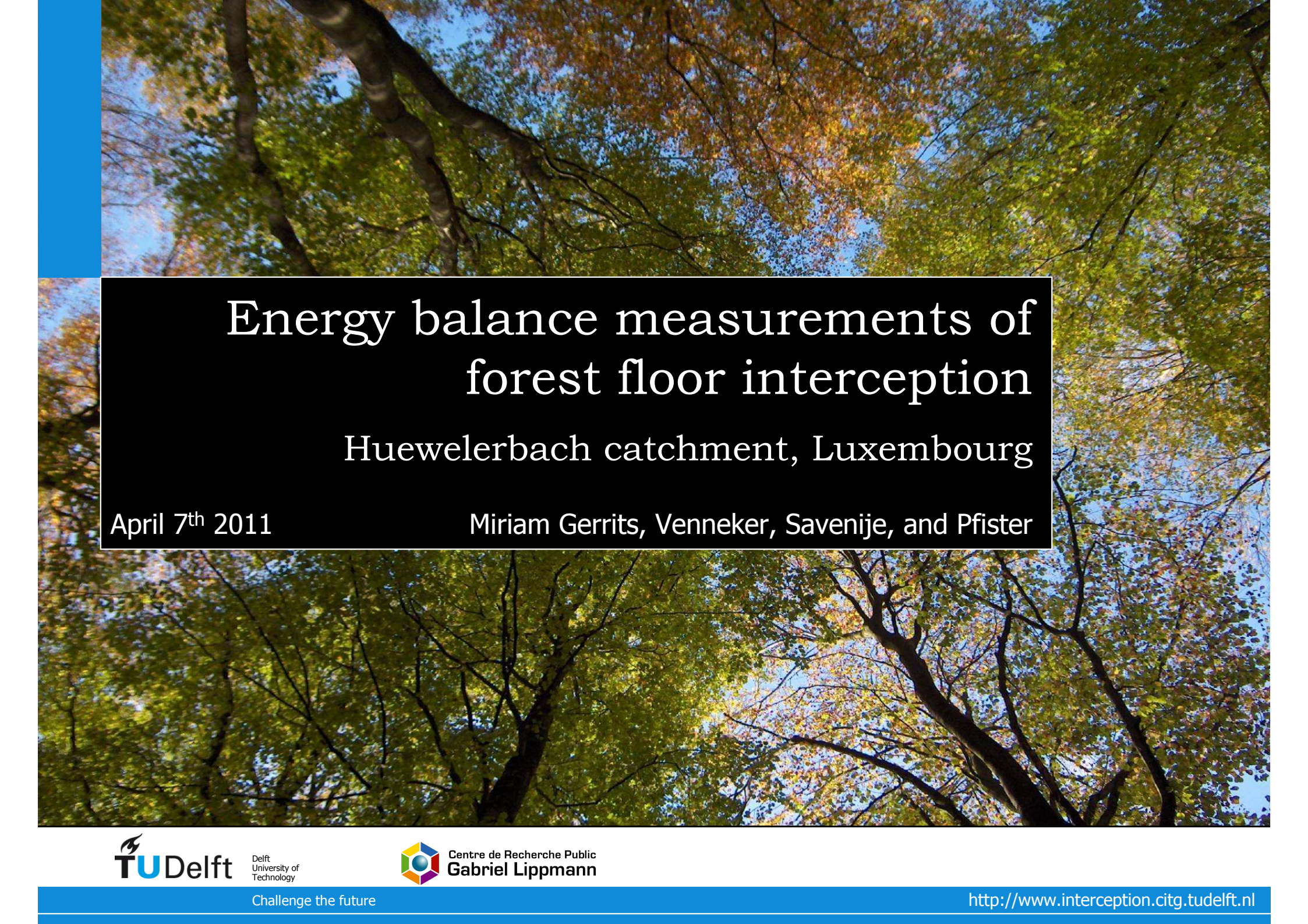




Energy balance measurements of forest floor interception

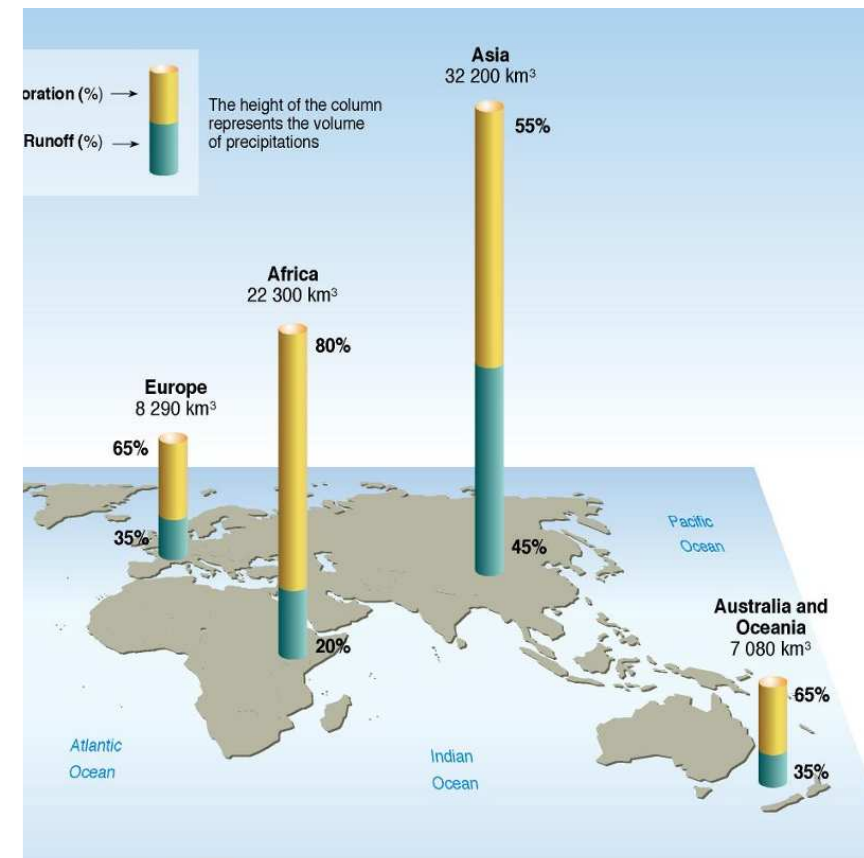
Huewelerbach catchment, Luxembourg

April 7th 2011

Miriam Gerrits, Venneker, Savenije, and Pfister

Motive for this study

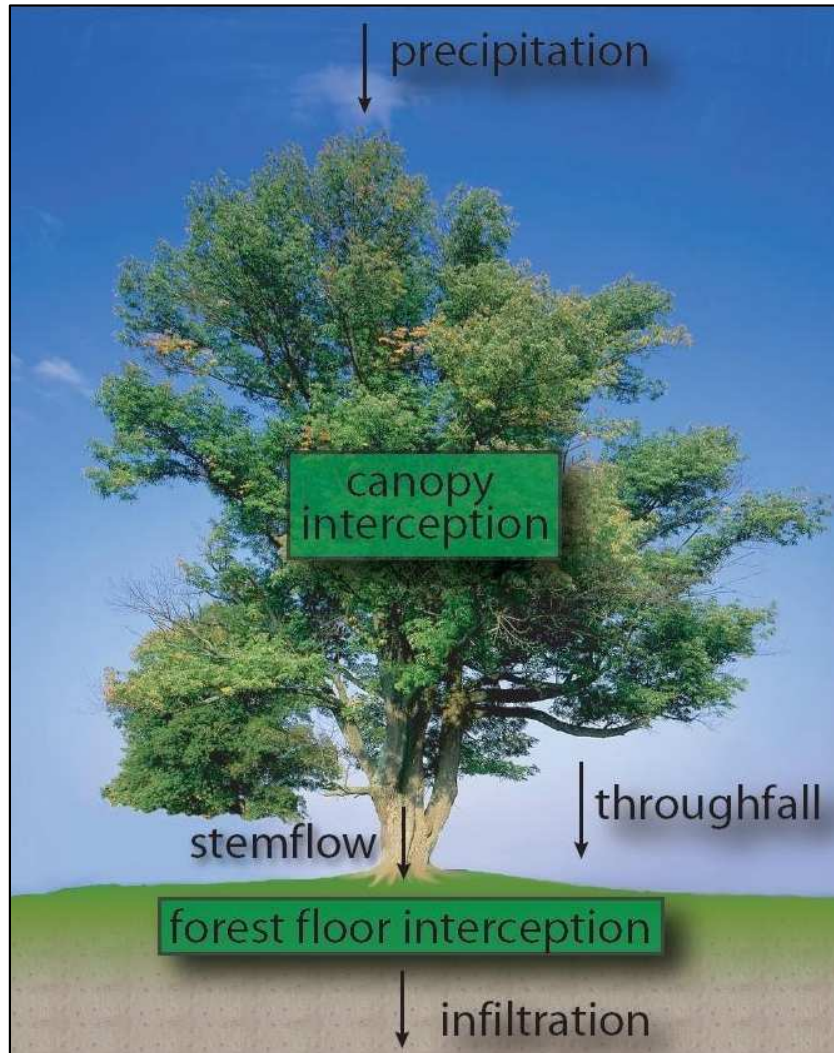
- Evaporation is a major component of the water cycle
- Current focus often on transpiration
- Evaporation:
 - Transpiration
 - Interception
 - Canopy
 - Forest floor
 - Soil evaporation
 - Open water evaporation



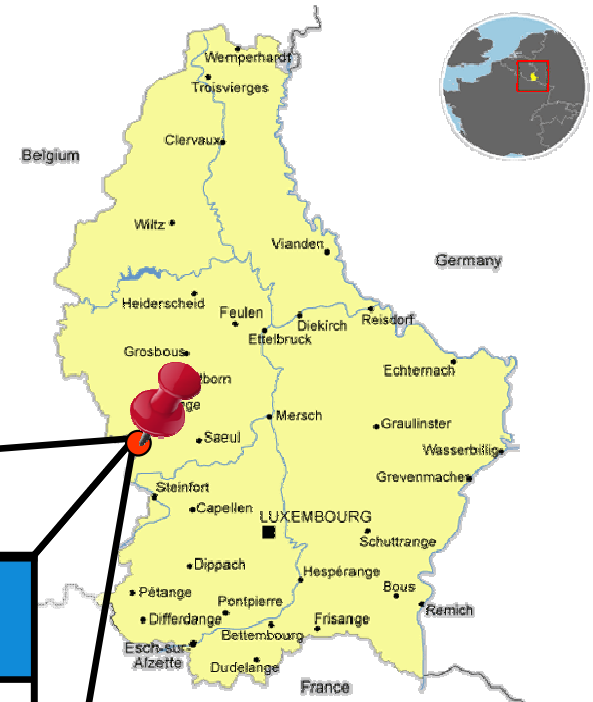
Source: FAO Aquastat, Peter H. Gleick, *Water in Crisis*, New York Oxford University Press, 1993.

PHILIPPE REKACEWICZ - FEBRUARY 2

Interception in forests



Importance of interception: example of a beech forest



2004-2010		Canopy	Forest floor	Total
Beech	Summer	15%	19% (22% of Tf)	34%
	Winter	7%	20% (22% of Tf)	27%

Gerrits, et al. 2010 (Hydrological Processes)

Challenge:

From plot to basin scale

Possible solution direction:

- Developments in Remote Sensing products:
 - Radiation
 - Rainfall
 - Surface Temperature
 - NDVI
 - ...

➡ ENERGY BALANCE

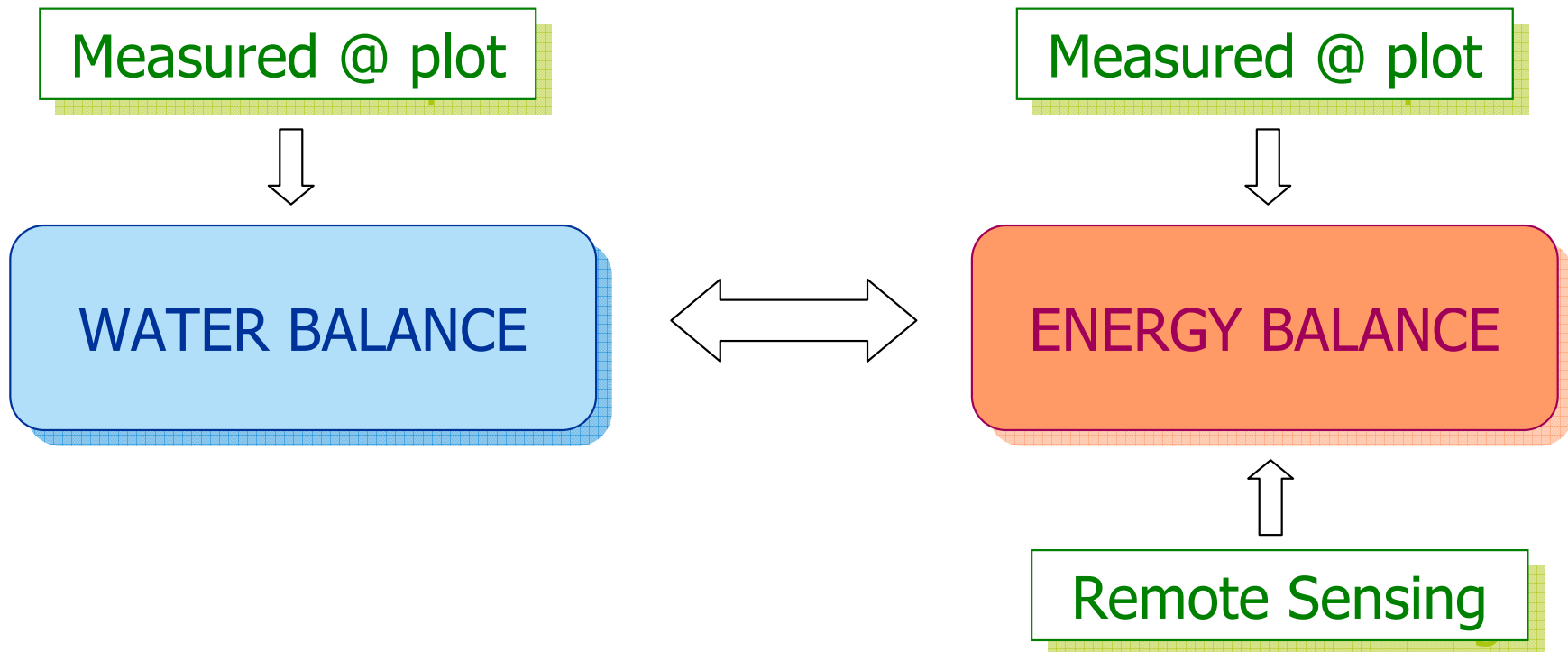


Challenge:

From plot to basin scale

On the plot scale:

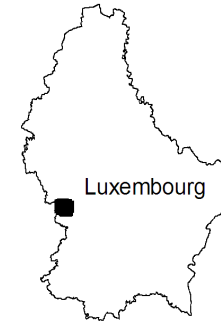
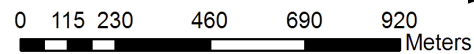
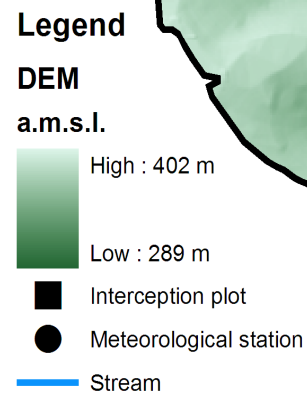
Find relation between the water and the energy balance



The interception plot



Huewelerbach catchment

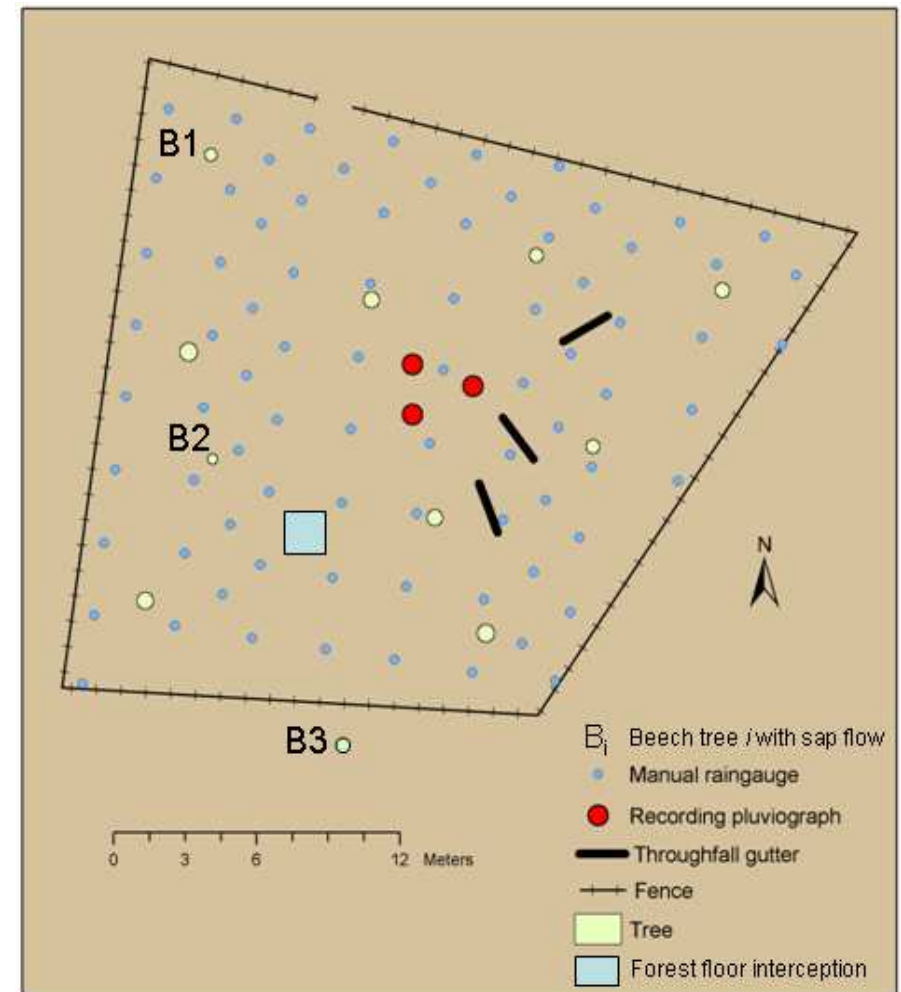


Water balance:

Canopy interception equipment

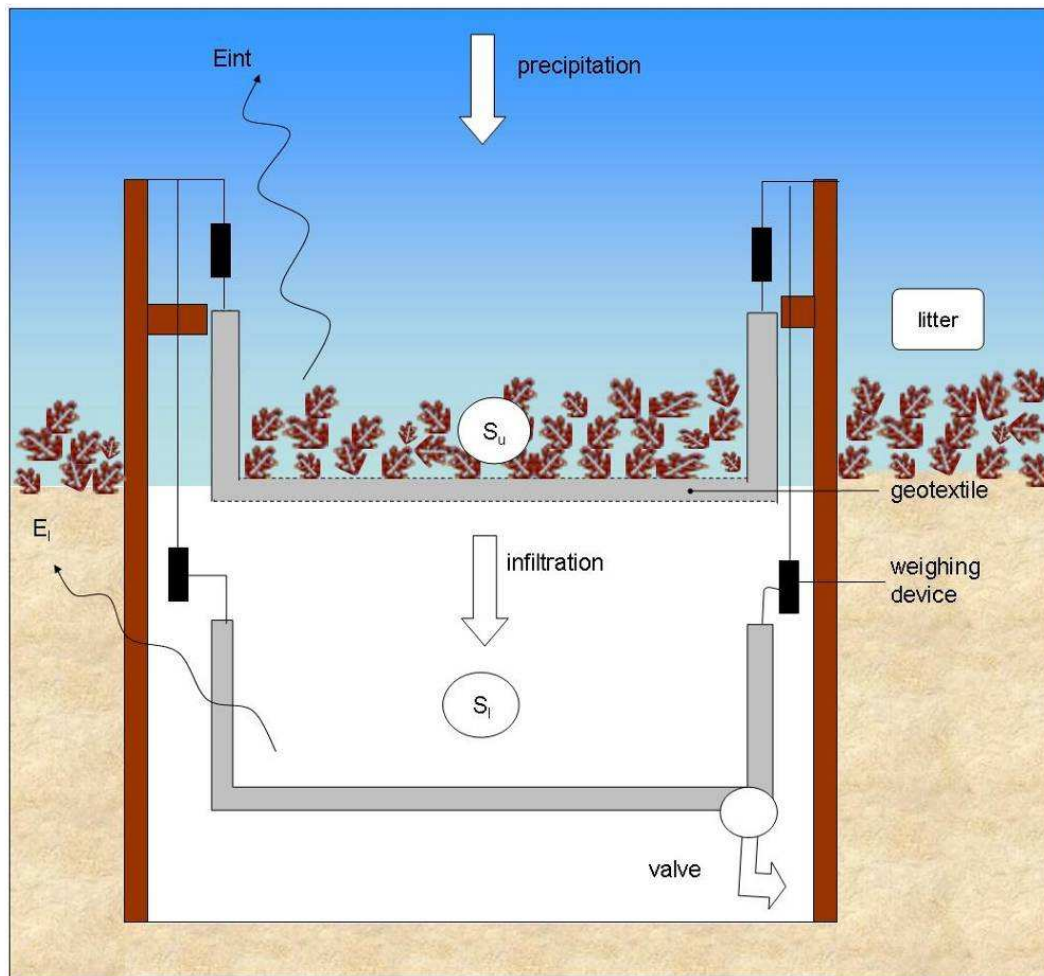


3 gutters (2 m) $\Rightarrow$ tipping bucket
81 pluviometers $\Rightarrow$ manual (2-4 weeks)



Water balance:

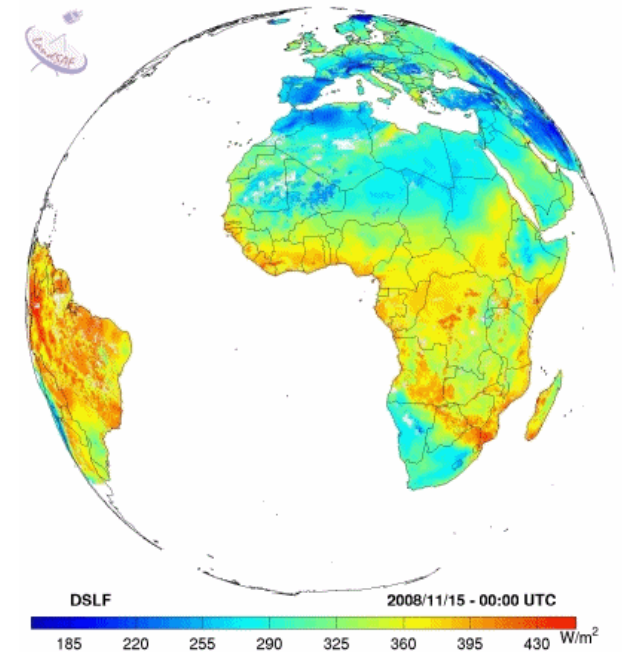
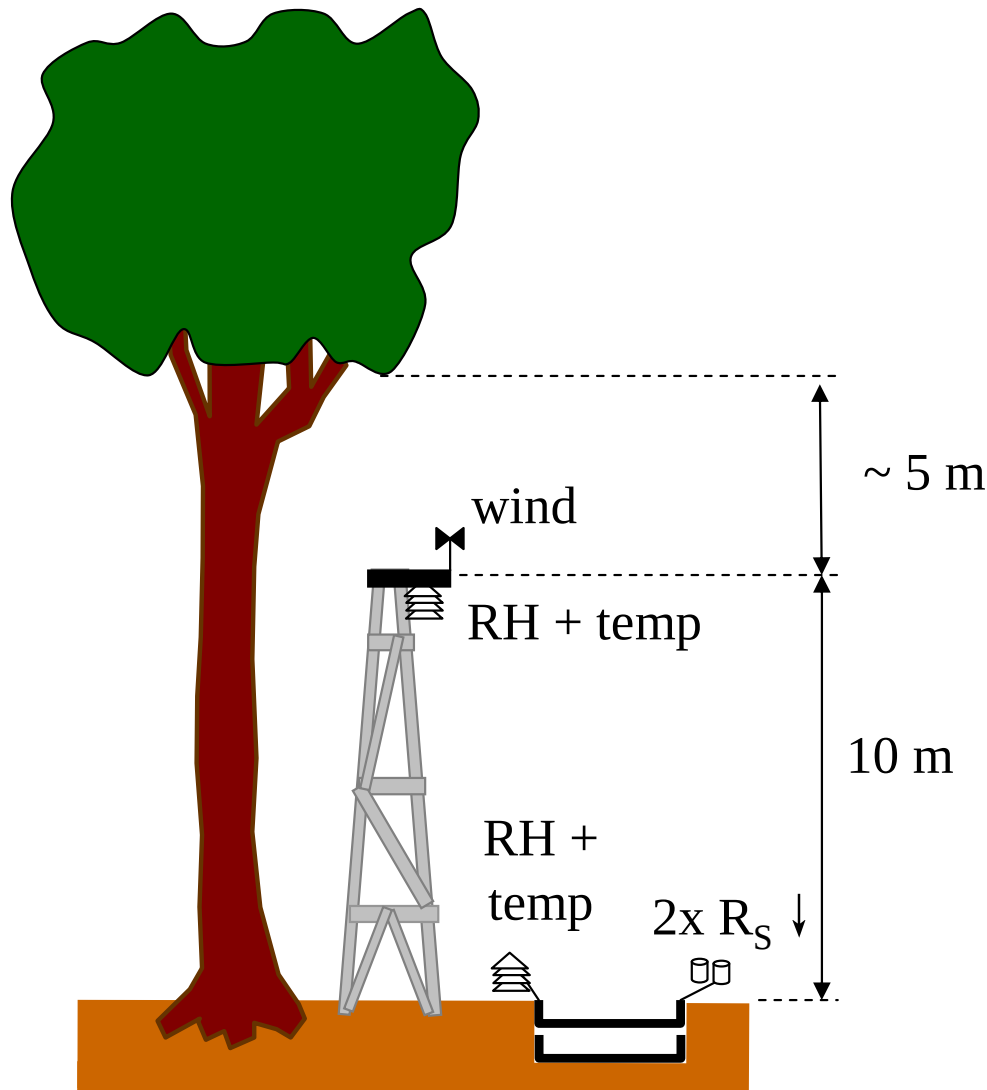
Forest floor interception equipment



$$E_{i,f} = P_{net} - \left(\frac{dS_u}{dt} + \frac{dS_l}{dt} \right)$$

Gerrits, et al. 2007 (HESS)

Energy balance: the parameters



$R_L \downarrow$ (<http://landsaf.meteo.pt>)



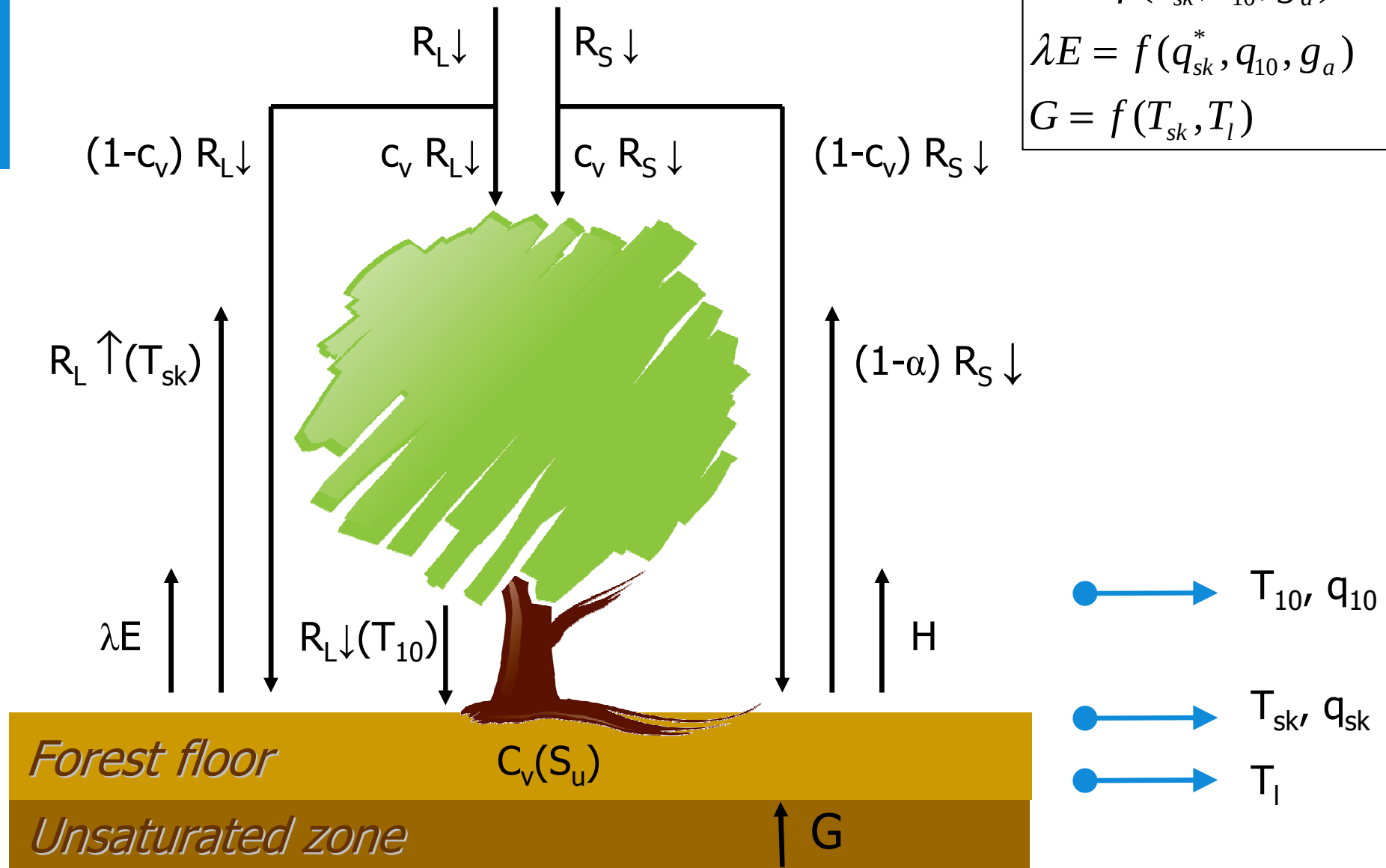
Energy balance: the model

$$C_v \frac{dT_{sk}}{dt} = R_N - H - \lambda E - G$$

$$H = f(T_{sk}, T_{10}, g_a)$$

$$\lambda E = f(q_{sk}^*, q_{10}, g_a)$$

$$G = f(T_{sk}, T_l)$$

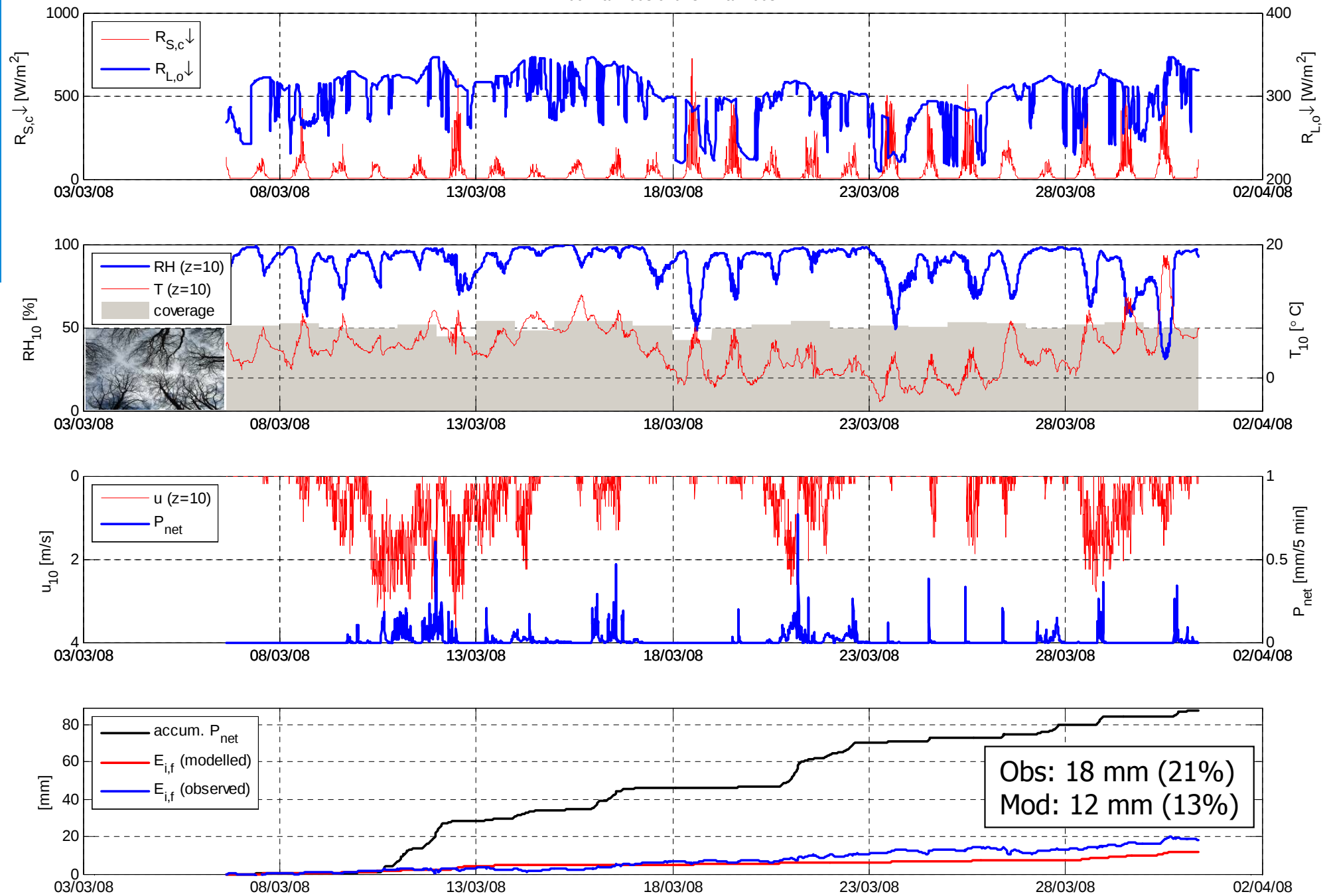


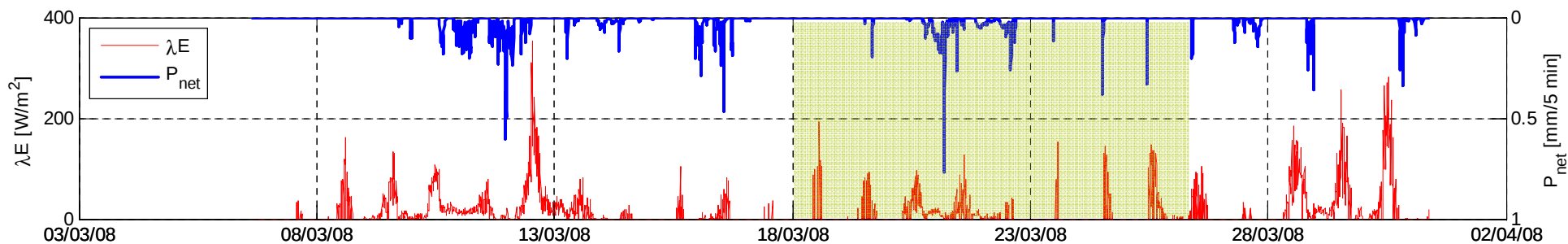
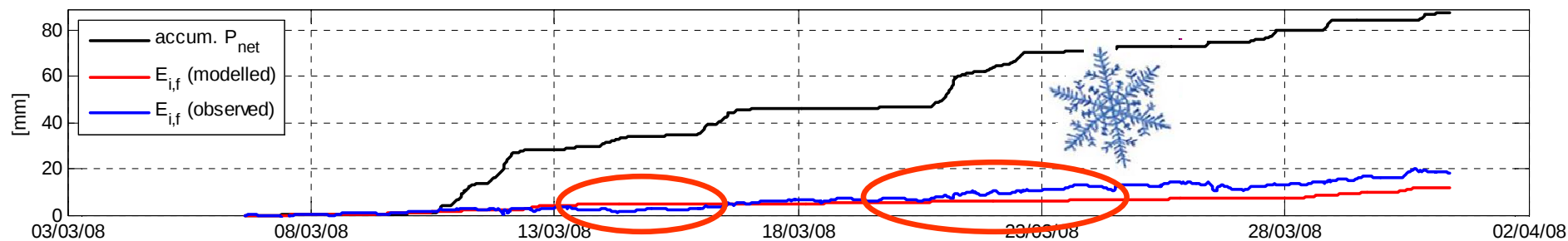
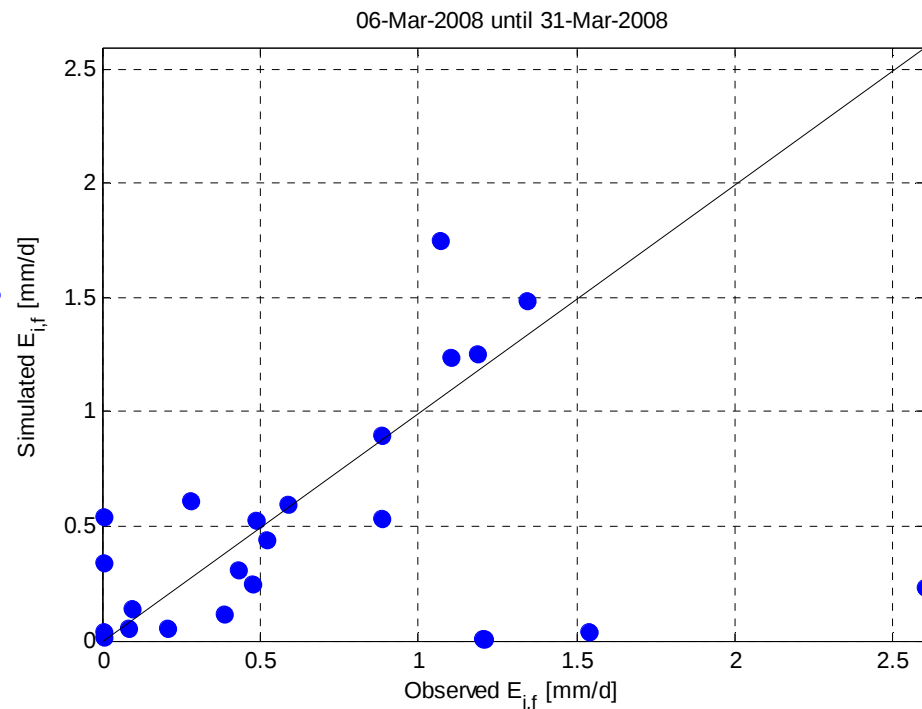
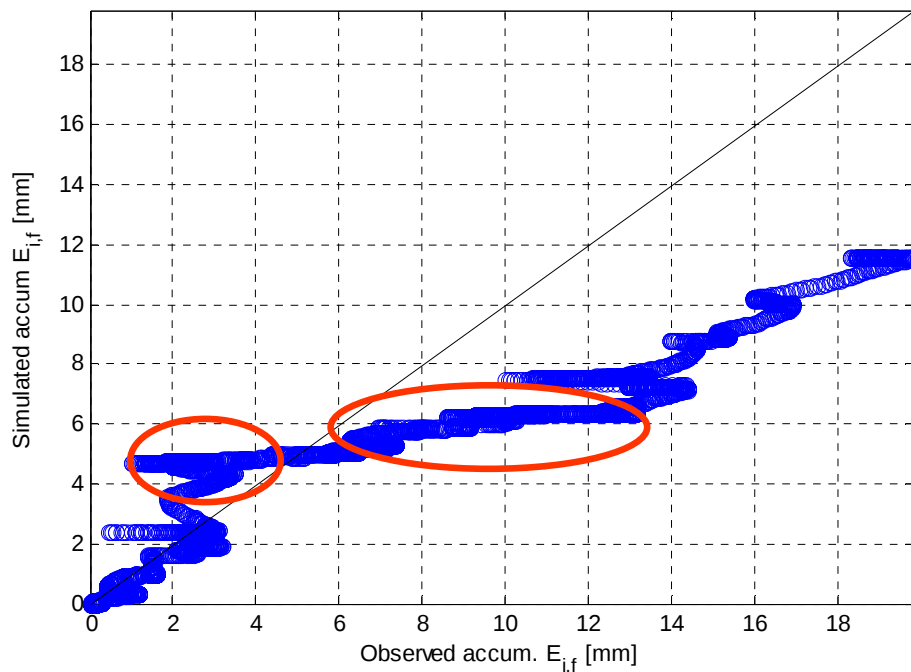


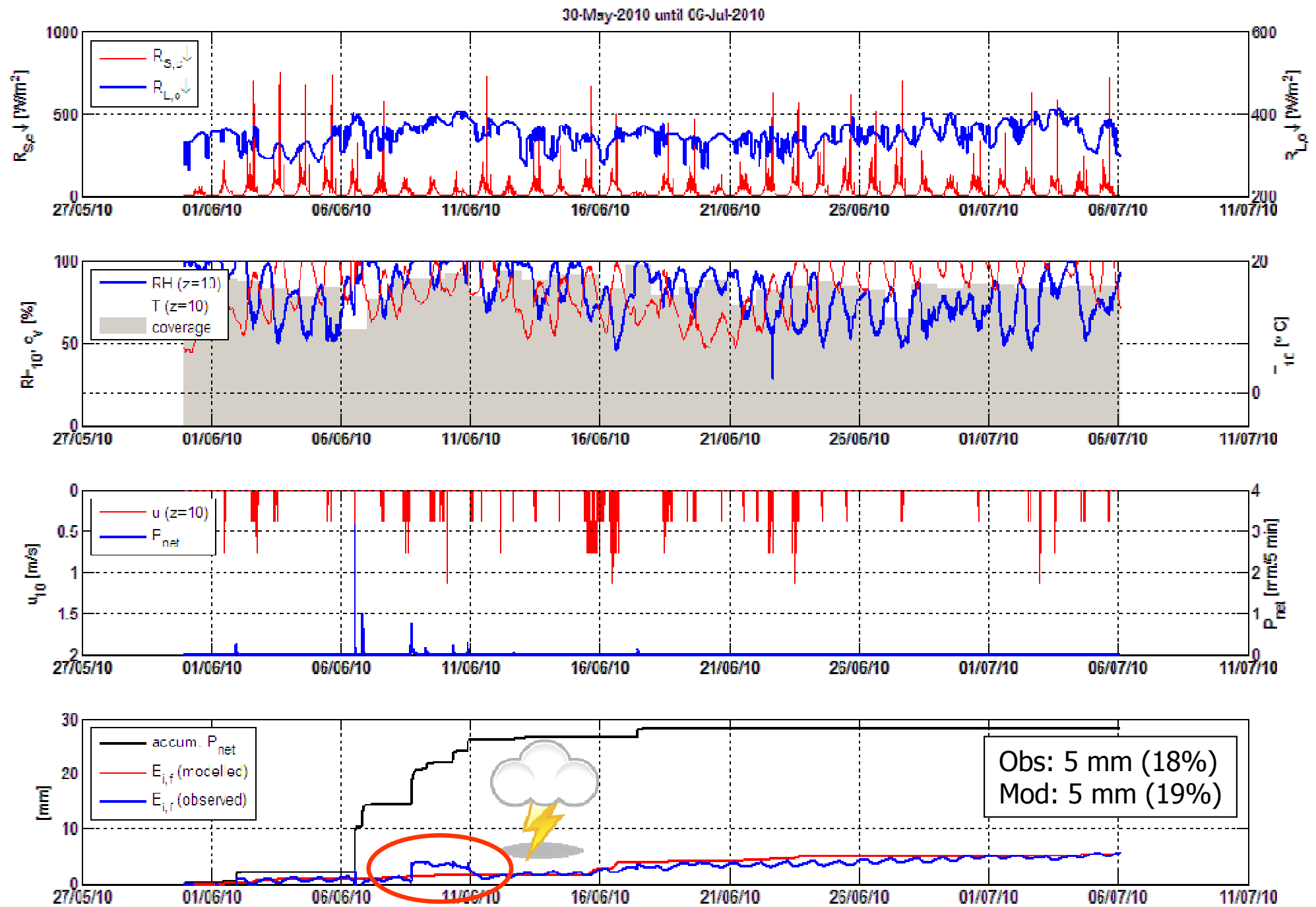
Results... Winter... Summer



06-Mar-2008 until 31-Mar-2008







Conclusions

- Energy balance model shows reasonable results, however:
 - Extreme weather conditions (snow, thunder)
 - Temperature sensitivity of observations
- Future:
 - Including canopy and coupling
 - Using more RS products
 - Upscaling

The authors would like to thank:

- Jean Francois Iffly, Cyrille Tailliez, Wim Luxemburg, and Hessel Winsemius;
- Fonds National de la Recherche Luxembourg, and Delft Cluster (the Netherlands)