

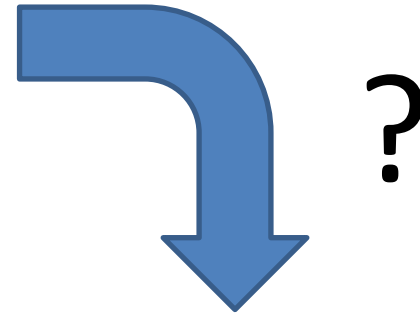
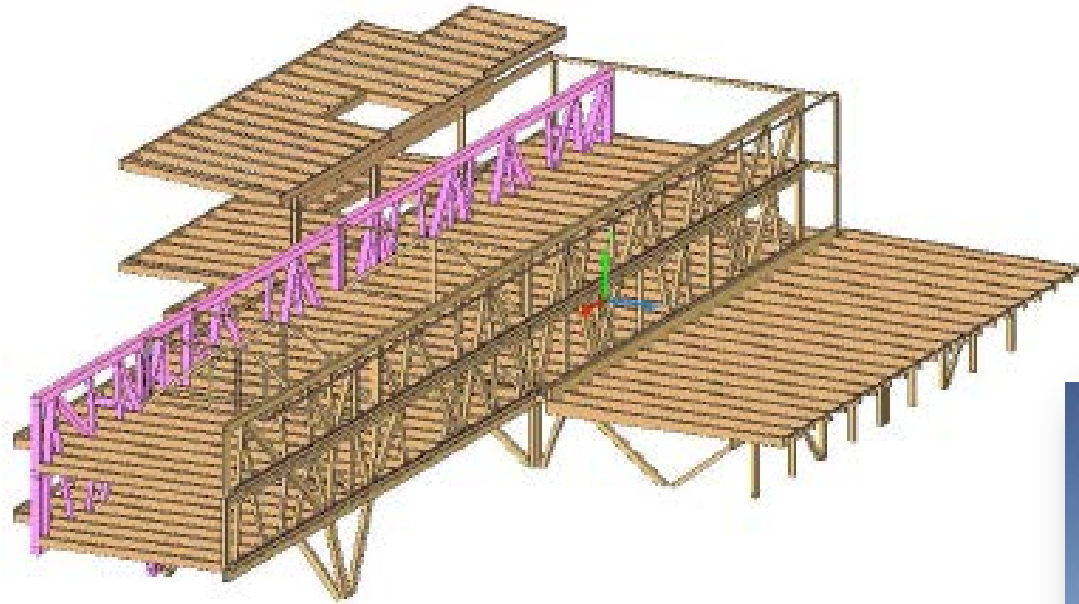


A reflection on the possibility of modelling and predicting decay in structural wooden components by using real building performance data

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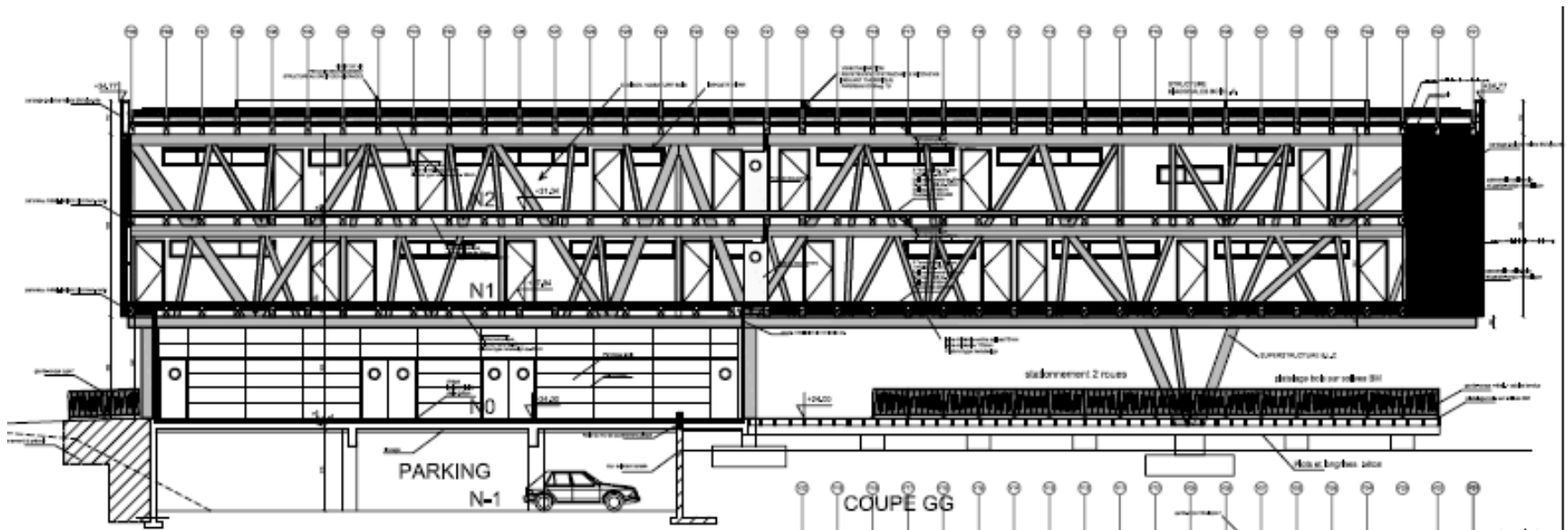


Modelling vs real-life performance



The structure

- Three-floor structure: 40 m wooden trusses and composite concrete-wood slabs.
 - Three supports including a cantilever span of about 9 m



The structure

- Construction



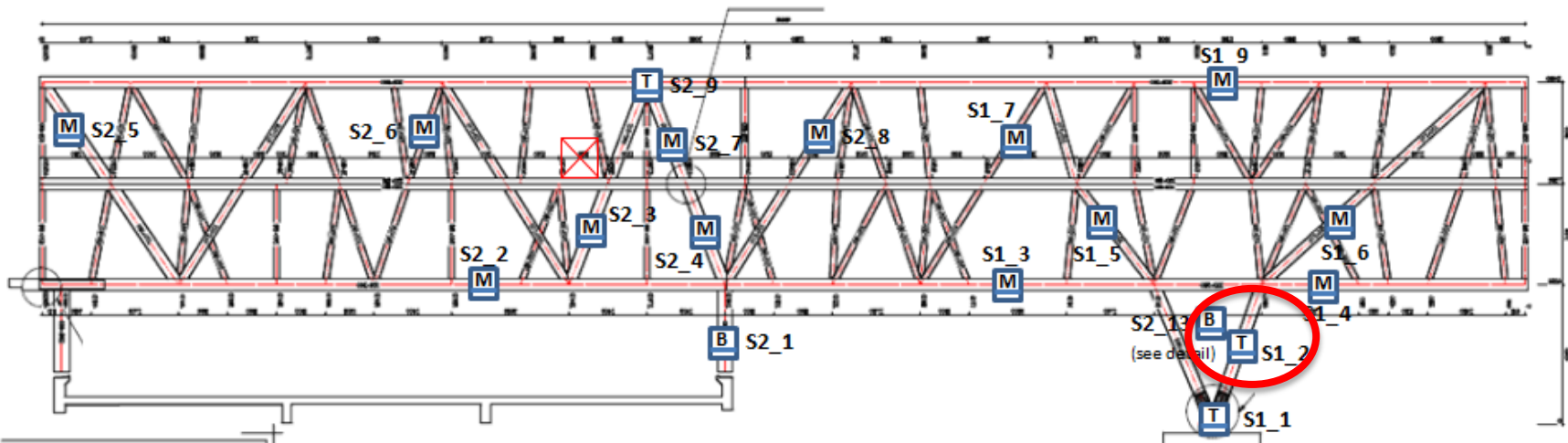
The structure

- Construction

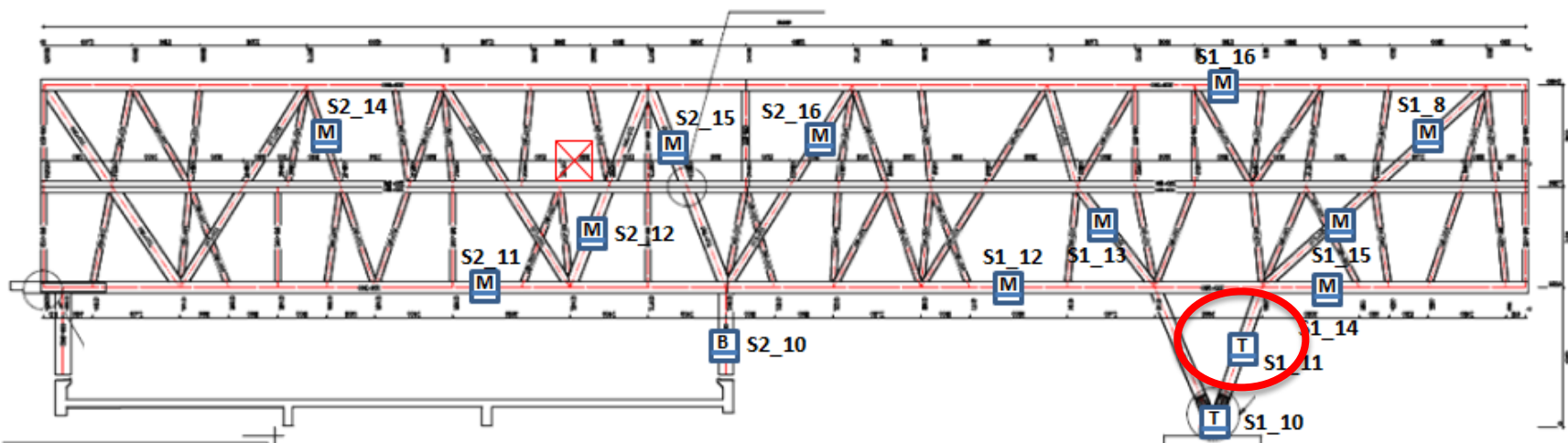


Sensor positions

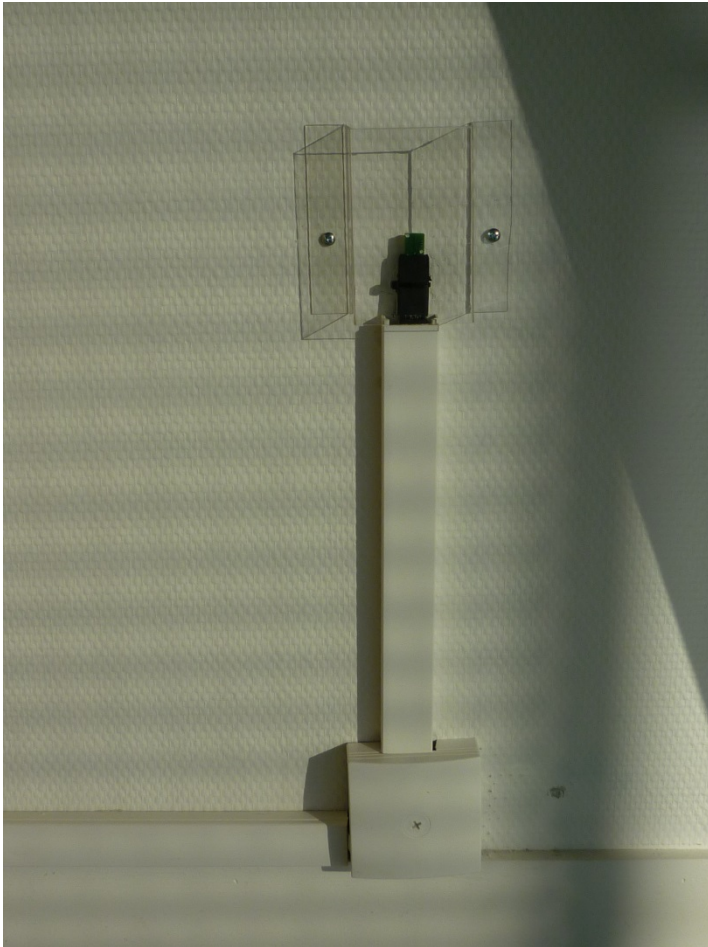
SOUTH TRUSS



NORTH TRUSS

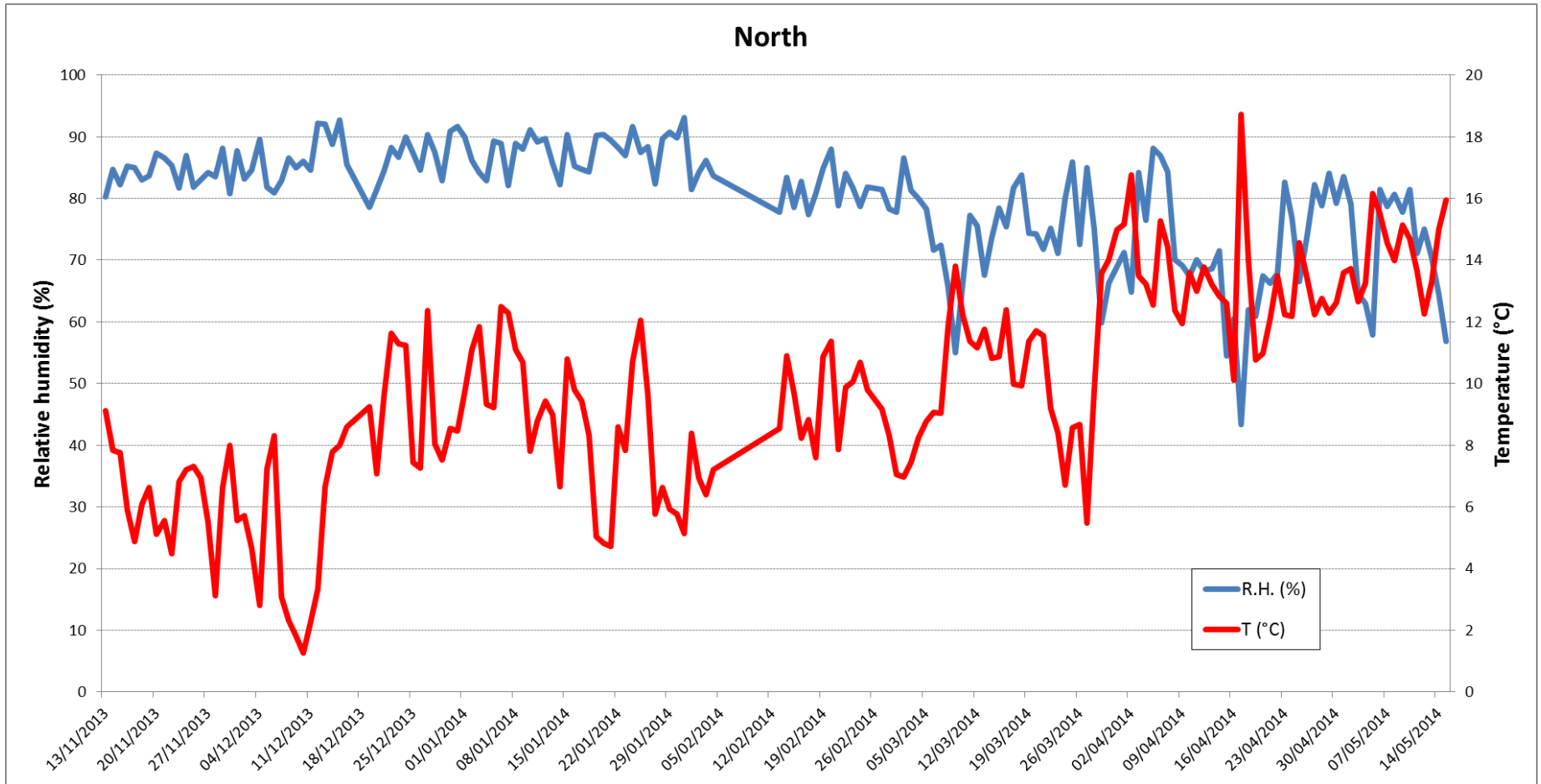


Wall sensors



- Relative humidity
- Temperature
- Recorded every 30 s
- Data presented today was collected from 13/11/2013 to 14/05/2014

Example - North side



Estimation of MC

$$\text{EMC}(\%) = \frac{1,800}{W} \left[\frac{Kh}{1 - Kh} + \frac{K_1Kh + 2K_1K_2K^2h^2}{1 + K_1Kh + K_1K_2K^2h^2} \right]$$

For temperature T in °C,

$$W = 349 + 1.29T + 0.0135T^2$$

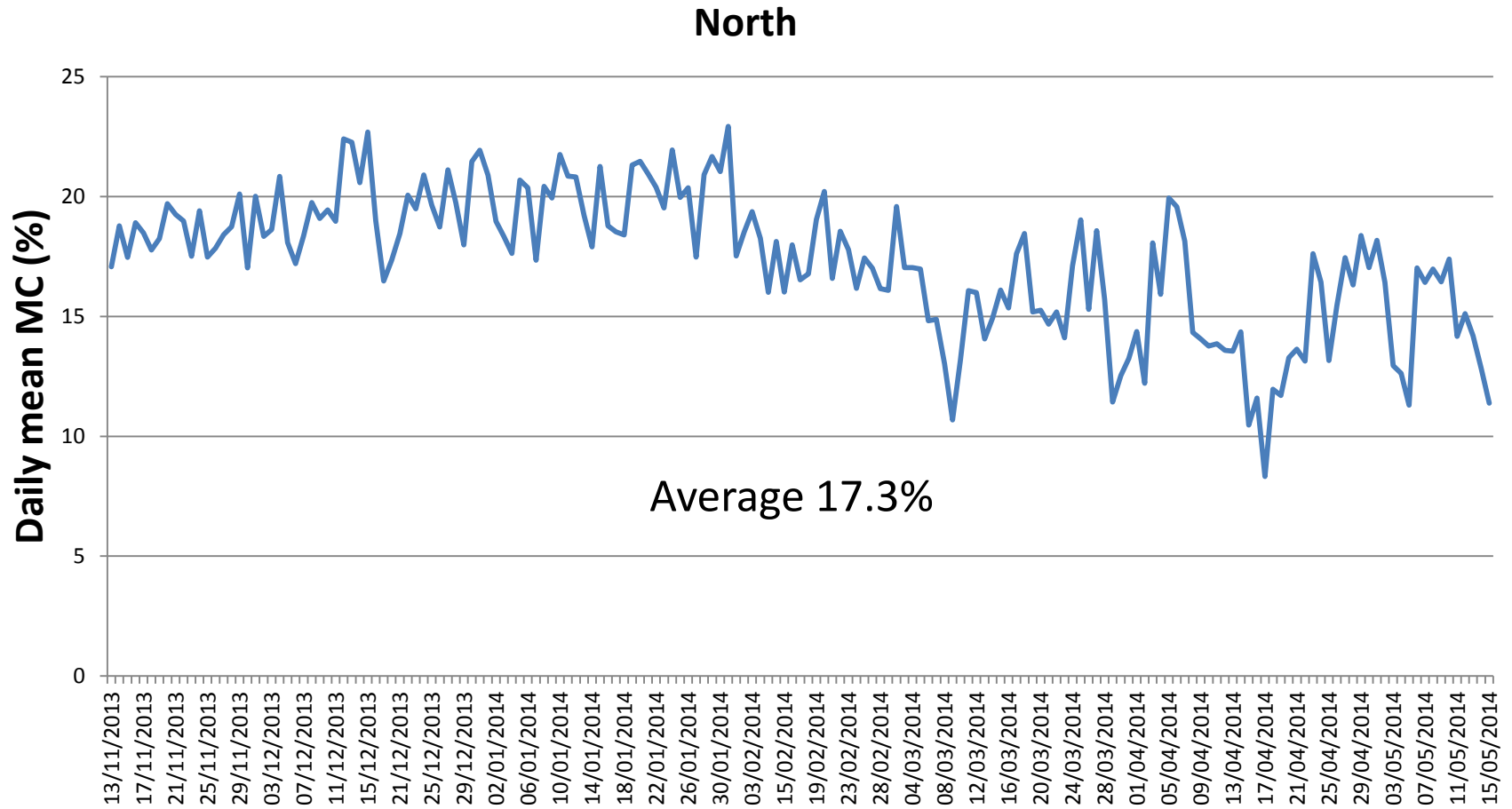
$$K = 0.805 + 0.000736T - 0.00000273T^2$$

$$K_1 = 6.27 - 0.00938T - 0.000303T^2$$

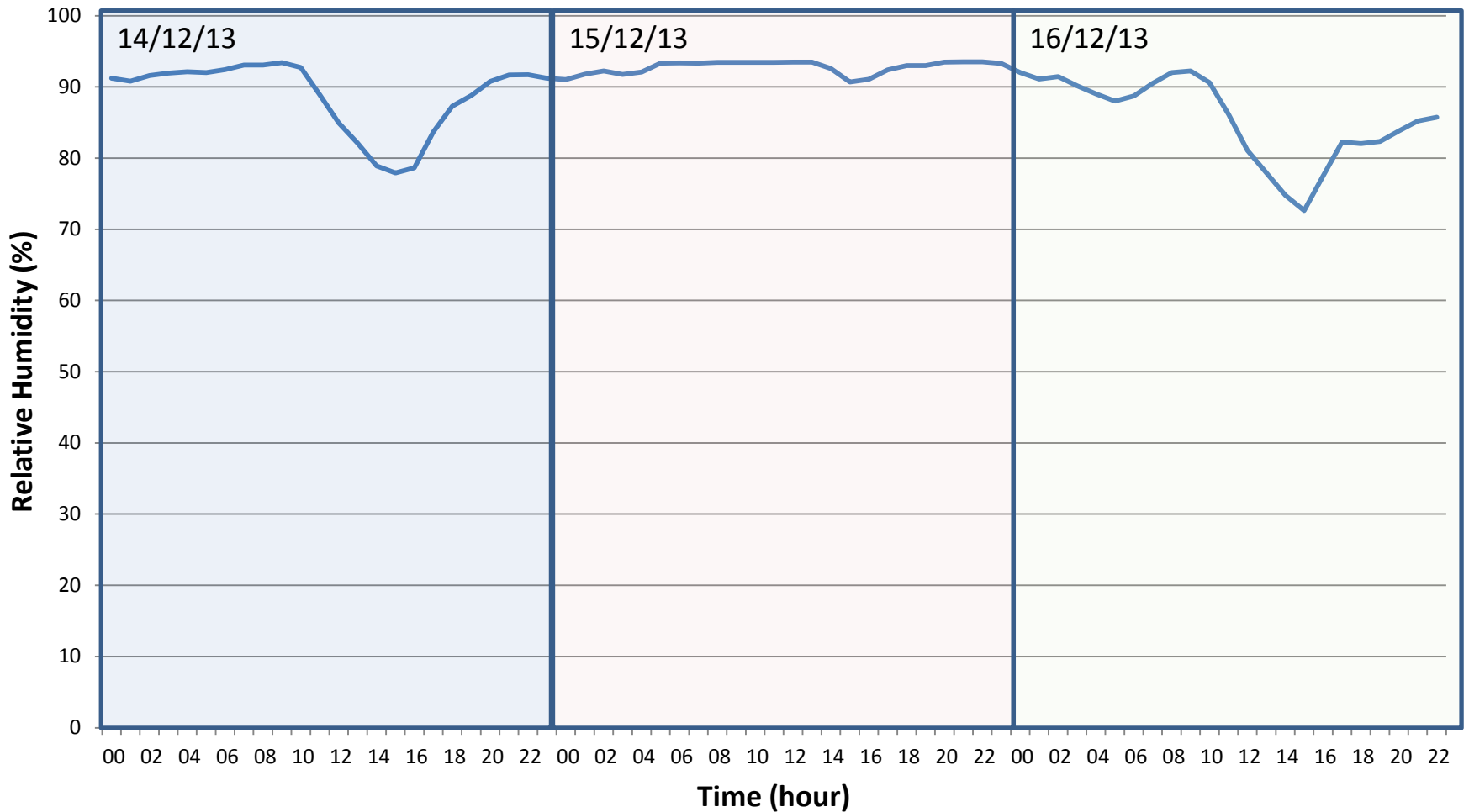
$$K_2 = 1.91 + 0.0407T - 0.000293T^2$$

Simpson, W.T. 1973. Predicting equilibrium moisture content of wood by mathematical models. *Wood and Fiber* 5(1): 41–49.

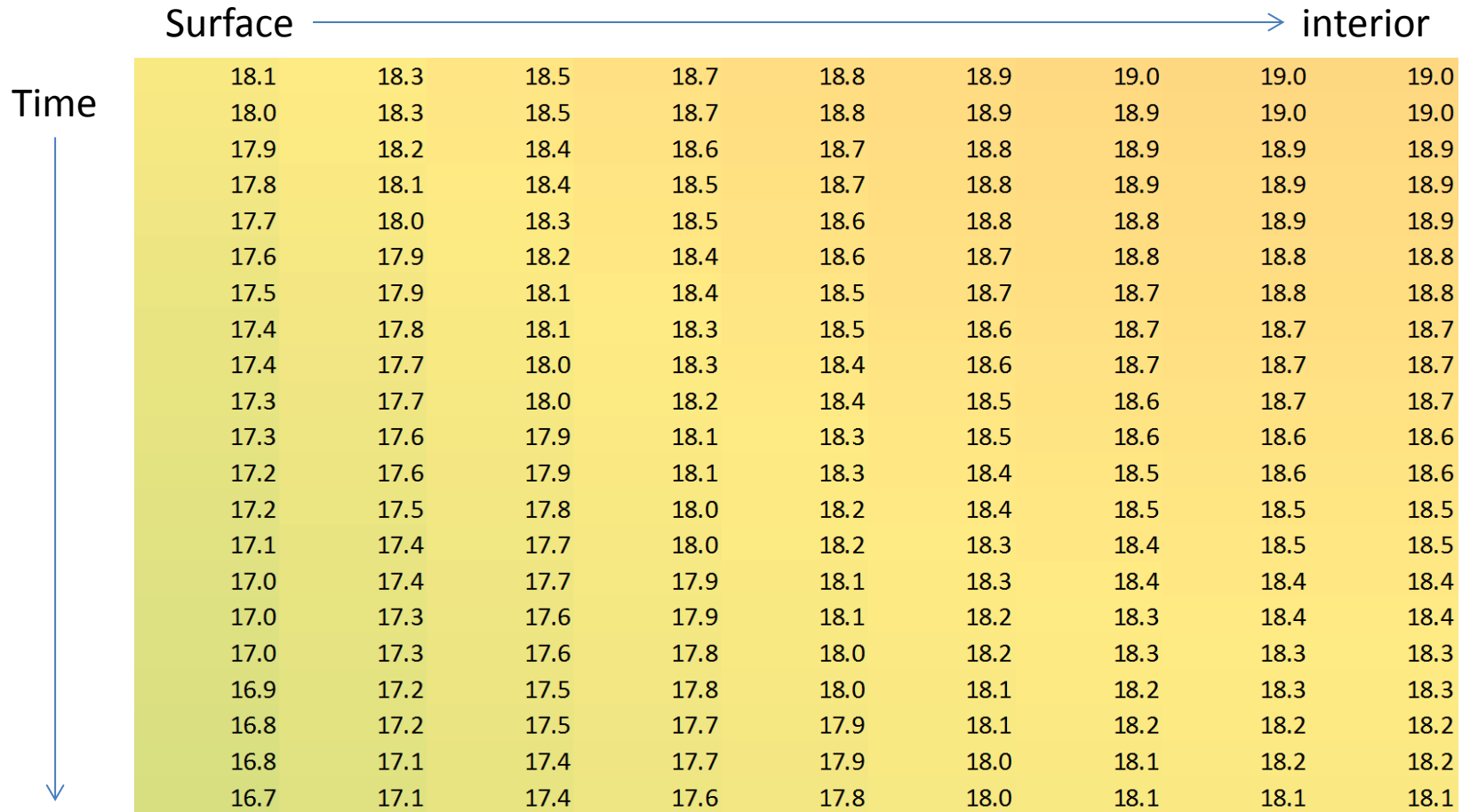
Surface MC estimation



Example of diurnal RH fluctuation



Moisture movement





Conclusions

- RH and temperature measurements combined with an appropriate model could be used to estimate the MC of large wooden structures
- Such models could be used to provide advanced warning of potential decay



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