

#### **S4 File. Final linear mixed-effects model of the CO<sub>2</sub> efflux rate.**

The final optimal model was selected after a stepwise backwards model selection using the likelihood ratio test:

$$CO_2 \text{ efflux rate}_{iup} \sim \alpha + Time_{icp} + a_p + a_{u/p} + \varepsilon_{iup}, \quad \varepsilon_{iup} \sim N(0, \sigma^2)$$

CO<sub>2</sub> efflux rate<sub>iup</sub> is the observation *i* for each sediment sampling unit *u* at each plot *p*, where *u* runs from 1 to 4, *p* from 1 to 12 and *i* is the observation for each sampling units at the different plots that goes from 1 to 8 (the number of samplings over time). The final model above means that CO<sub>2</sub> efflux rate is modelled as a function of Time. Time is a categorical covariate. The terms *a<sub>p</sub>* and *a<sub>u/p</sub>* are random effects representing the between-plot and between-core variation and are significant (L. Ratio = 26.3, df = 1, *p*-value < 0.001, nested term: L. Ratio = 1968.8, df = 1, *p*-value < 0.001). The unexplained variance  $\varepsilon_{iup}$  is assumed to be normally distributed with mean 0 and variance  $\sigma^2$ . The intercept of the model is represented with  $\alpha$ .