Justification statement for the paper "Underestimation of the Tambora effects in North American taiga ecosystems"

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Volcanism is the most important forcing modulating the decadal variations of the climate system. However, the effects of the major eruptions of the last millennium, the last being the Tambora in 1815, are poorly know at the regional scale. First, many discrepancies exist on the intensity and duration of the Tambora climatic impact as detected by different observed (ex. weather observations, tree-ring proxies) and simulated records (Büntgen *et al* 2015). Second, there is no consensus on the terrestrial biosphere responses and associated mechanisms at the regional level (Raible *et al* 2016). For example, we do not know how northern forest ecosystems reacted to the Tambora perturbation in terms of wood biomass assimilation and forest demography (i.e. tree mortality and recruitment), which are significant components of the regional carbon budget.

In this study, we collected a large amount of data from different and complementary sources over Eastern Canada, to provide an in-depth evaluation of the Tambora impact on climate and forest processes. Our results show that the Tambora impacts on the terrestrial biosphere were stronger than previously thought, and not only affected tree growth and carbon uptake for a longer period than registered in the regional climate, but also determined forest demography and structure. We also show that the Tambora signal is more persistent in observed data (temperature, river ice dynamics, forest growth, tree mortality) than in simulated ones (climate and forest-growth simulations), indicating that our understanding of the mechanisms amplifying volcanic perturbations on climates and ecosystems is still limited, notably in the North American taiga.

Büntgen U *et al* 2015 Tree-Ring Amplification of the Early Nineteenth-Century Summer Cooling in Central Europe *J Climate* **28** 5272-88

Raible C C *et al* 2016 Tambora 1815 as a test case for high impact volcanic eruptions: Earth system effects *Wiley Interdisciplinary Reviews: Climate Change* n/a-n/a