**Contrasted hindcast performances calls for more realistic models**

*V. Van der Meersch, E. Armstrong, F. Mouillot, H. Davi, F. Saltré, A. Duputié, C. Randin, I. Chuine*

While process-based models are expected to provide better species range shift predictions under novel environmental conditions than correlative approaches, this hypothesis has yet to be properly tested.

We used both process- and correlative-based species distribution models to hindcast the range shift of 5 tree species across Europe since 15,000 years BP and evaluate the model outputs against fossil pollen records. Drawing upon these results and considering the expected magnitude of climate novelty, we quantified model uncertainties under future scenarios.

We show that long-term hindcast decreases overall model performances and even the most promising approach (process-based models calibrated using occurrence data) is unlikely to provide any reliable projections under future non-analogues conditions.

Our results (*i*) challenge the concept of transferability in species distribution modelling, (*ii*) highlight the main principles ensuring model robustness and (*iii*) provide a promising framework to scale up complex models and promote their use in an ever-changing world.