Contribution ID: **274** Type: **Poster**

Advancing spatio-temporal modelling in ecology to detect and attribute ecological changes

Monday, October 13, 2025 6:00 PM (1h 30m)

The digital revolution is transforming the ecology by enabling unprecedented access to data across spatial scales and ecosystems, efficiently and cost-effectively. However, traditional analyses of big datasets expose the complexity of patterns of biodiversity change and their consequences for ecosystem dynamics, revealing gaps and surprises that demand new perspectives.

Simulation studies have proven to be a powerful tool for evaluating analytical methods and sampling designs, offering a unique opportunity to explore spatio-temporal patterns under controlled conditions. In this poster, we present synthos II, an R package designed to generate synthetic ecological data through a process driven by ecological principles. Seamlessly integrated with a modelling pipeline, synthos II supports state-of-the-art spatio-temporal models, spanning from Bayesian frameworks to advanced machine learning approaches.

We showcase the framework using a case study from the Australian Great Barrier Reef, exploring model predictive performance across various sampling design scenarios. synthos II pushes the boundaries of spatio-temporal modelling by providing a flexible framework that enables seamless testing of multiple models. This capability enhances the detection of coral trends and improves the attribution of coral loss drivers, offering deeper insights into regional reef dynamics for the real world. synthos II can be applied to ecosystems globally, across any region of the world.

Primary author: VERCELLONI, Julie (Australian Insitute of Marine Science)

Co-authors: MENGERSEN, Kerrie (QUT Centre for Data Science, Queensland University of Technology); Dr LOGAN, Murray (Australian Institute of Marine Science)

Presenter: VERCELLONI, Julie (Australian Insitute of Marine Science)

Session Classification: Poster Session