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Exploring Ecological Network Analysis Uncertainties : a methodological test case and applications to the Sylt-Rømø Bight ecosystem.

In order to explore ecological interactions, e.g. within a benthic community, or to understand the organisation of an ecosystem, ecologists aim at a unique description of the characteristics (state) of the complex food web they observe. Ecological Network Analysis (ENA) has been shown to be a powerful and quantitative tool for portraying the structure and dynamics of elemental cycling (e.g. of carbon) within a food web. Still, many basic uncertainties of ENA are neither well understood nor have they been sufficiently explored. In my thesis, I address three major questions. (1) How does the structure of a given network influences the ENA procedure and the indices derived? (2) How do the uncertainties (e.g. measurement variability) contained in the input parameters (e.g. standing stocks, respiration, consumption flows) transfer to ENA results? (3) Since steady state is a fundamental assumption for ENA, how do the subjective and objective mass balancing procedures affect the flow values and thus the ENA outcomes?

A simplified artificial mass-balanced network allows me to methodically investigate these questions. Preliminary results show that ENA indices generally respond well to data uncertainties, some being more robust (e.g. Finn Cycling Index) than others (e.g. Development Capacity). I will relate the findings to an expanded, more complex structure of the original model in order to provide a more systematic analytical approach before performing any ENA on real data. Finally, using the knowledge gained, I concentrate on the Sylt-Rømø Bight ecosystem, in collaboration with Harald Asmus (AWI, Sylt), to specify uncertainties in data and their impact on ENA indices, thus refining and expanding the research at AWI List.

Conference talks:

Comparison of the food web Properties of Semi enclosed Soft Bottom Littoral Ecosystems, La Rochelle March 2007: Linking a dynamical model to a complex network of the benthic macrofauna in the Sylt-Romo Bight.

CO symposium 2007, Helgoland: Linking a dynamical model to a complex network of the benthic macrofauna of the Sylt-Rømø Bight

AMEMR 2008, Plymouth : Coupling a dynamical model to a flow network a new ecosystem modelling approach