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A demonstration model of the North Sea pelagic ecosystem

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Introduction

An **ecosystem model** represents our understanding of that ecosystem. It can be used as **analysis** tools to reflect on **patterns** in collected data. Sensitivity and uncertainty analyses provide insight on which parts of the ecosystem are not fully understood or quantified, but require prior **calibration** of the model. This calibration is a tedious job. And a **graphical user interface (GUI)** that immediately visualizes the response of a model to changes in parameters can be a useful tool to get acquainted with the model's behavior and speed up this calibration process. Here, we present a demonstration model with an intuitive graphical user interface to **change parameters in an interactive manner**. The model is written in Fortran and can be called from an R scripting environment using a wrapper function. The model and accessory functionality is available as an add-on package in an R Studio Server sessions of the **Blue-Cloud Virtual lab** on **carbon-plankton dynamics**.

The model

The ecosystem model has **one vertical spatial dimension**, consisting of up to 100 boxes (Fig. 1). Vertical transport is purely dispersive (mixing) for solutes and has a dispersive and advective (sinking) component for particulate components. The ecosystem consists of two phytoplankton groups (PhyI and PhyII), one zooplankton compartment (Het), a particulate (Det) and a dissolved (react and refractory dissolved organic carbon (DOC) and nitrogen (DON)) detritus compartment. Transparent polymeric particles (marine snow) are a separate part of this organic matter. Both, **carbon (C) and nitrogen (N) cycling** are implemented. Dissolved inorganic carbon / **CO₂** is **exchanged with the atmosphere** and produced and consumed by respiratory processes and primary production, resp. **Oxygen** is also **exchanged with the atmosphere**, and produced and consumed by primary production and respiratory processes, resp. The latter are also limited by the availability (e.g. nitrification) or presence (e.g. denitrification) of oxygen. The **organic matter sinks** to the bottom and may be **buried or remineralized**.

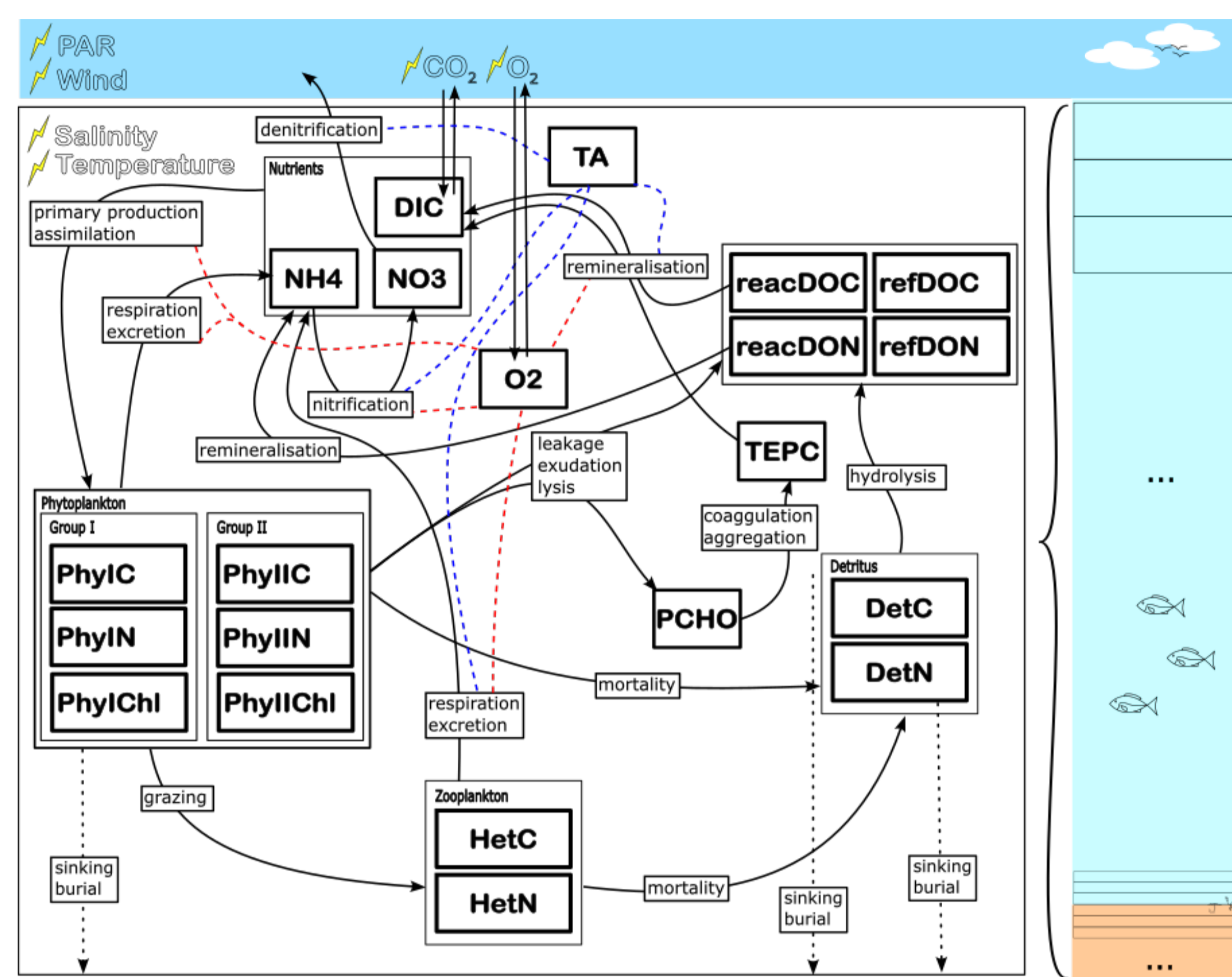


Figure 1. The conceptual model.

How use the Graphical User Interface

Figure 2. To find the model, register at BlueCloud 26, and follow this procedure.

Figure 3. Simple workflow to compare a simulation with available datasets.