

Understanding Modelling Terminologies

When dealing with the topic of Earth system modelling, some words might arise that can be confusing for non-experts. Here we present brief explanations for basic modelling vocabulary.

Data Assimilation

- Describes a method where **observational data** (from satellites, radiosondes, buoys, ocean profilers, ...) is **fed into a model** on a regular time basis
- This method is used to produce **realistic state estimates** of the ocean/sea-ice/atmosphere system
- These can be used for example as **initial states for forecasts**

Subgrid-Scale (SGS)

- Each model has a defined **spatial grid** and **temporal resolution**
- All processes & interactions that occur on a **smaller scale than the model grid**, belong to the subgrid-scale

Parameterization

- On the model grid, the **smallest/fastest processes** have to be **expressed in terms of the variables the model can resolve**
- This process often **follows physical intuition** and is called parameterization
- **Machine Learning techniques** might help identifying these **physical relationships**

Bias

- In order to test how well a model is working, it goes through several **test runs with observational data**
- The bias **describes the model error** with respect to the given observational data
 - Low bias = low model error
 - High bias = high model error

Boundary layer

- In fluid mechanics, **the area where a fluid is in contact with a surface** is called the boundary layer
- The atmosphere itself is a fluid, so there is an **atmospheric boundary layer (ABL)** above the Earth's surface
- There is also a boundary layer **in the upper levels of the ocean and at its bottom**

Forcing

- A model can simulate everything **within its boundaries**; but to do that, it needs **information on external forces** hitting these boundaries
- **Prescription of external data** to a model is called forcing
- It is a bit like playing domino: You need to **put some action to the model first before it runs on its own**