SEMESTER OF

ALGORITHMIC EARTH SYSTEM SCIENCE

WORKSHOP PROGRAM

09 – 11 DECEMBER 2025
(NOON TO NOON)
COLOGNE (IN PERSON)

Smart Earth Observation System Design

WORKSHOP HOSTED BY
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Observations are and will maintain to be the key ingredient for accurate Earth system modelling on all scales. Which, how and with which priority variables of the Earth system should be observed remains open, however. With the recent revolution of machine learning and the use of novel algorithmic methods in Earth system sciences, this workshop aims to identify new approaches to optimally design Earth system observations for monitoring and forecasting the coupled Earth system.

Currently, methodologies for deriving the observational **requirements for the future Earth observation system are challenging**, non-standardized and far from optimized.

Typically, deterministic or ensemble-based approaches are used (e.g. Observation System Simulation Experiment, OSSE) in a non-systematic "trial-and-error" manner, i.e. by quantifying the impact of adding a specific observation type on the forecast.

This workshop aims to go a step further and **identify, discuss and progress novel methodologies** that could derive observation requirements in a quantitative, prioritized and systematic manner.

Thus, we invite contributions on

» novel methodologies for a **Smart Earth Observation System Design.**

» how specifically **machine learning and/or novel Algorithmic methods** can be used for

(1) determining the observational impact of actual and hypothetical observations,

(2) quantifying the forecast sensitivity to initial conditions, or

(3) using observations in the design of high-resolution AI-generated ensembles, which can themselves be used for deriving observation requirements.

We welcome contributions from **a wide range of applications**: from urban-scale forecasting via global, storm-resolving forecasts to seasonal, coupled models.

FURTHER INFO

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