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# UNCERTAINTY QUANTIFICATION FOR MATHEMATICS OF PLANET EARTH: ADAPTIVE STRATEGIES AND THEIR APPLICATIONS

**CHIARA PIAZZOLA[*], LORENZO TAMELLINI[†] AND LAURA RINALDI[†]**

[*] ETS de Ingeniería de Caminos, Canales y Puertos, Universitat Politècnica de Catalunya
Barcelona, Spain
chiara.piazzola@upc.edu

[†] CNR-IMATI
Via Ferrata 5/a, 27100 Pavia, Italy
laura.rinaldi@imati.cnr.it, lorenzo.tamellini@imati.cnr.it

## ABSTRACT

Mathematics of planet earth is a broad term that focuses on the modeling and prediction of a wide range of natural and anthropic-related phenomena, that are often interconnected and whose relevance is hardly underestimated. A non-exhaustive list includes fluid/solid mechanics environmental problems (earthquakes, landslides and rockfalls, erosion, subsidence, groundwater and surface flows, land and sea ice dynamics, sea level rise and saltwater intrusion, tsunamis), weather/climate predictions, and ecological topics such as pollution, vegetation growth (and its counterparts: desertification and wildfires), and population dynamics.

All these phenomena are significantly impacted by uncertainties in every step of the mathematical workflow: modeling, prescription of parameters, boundary and initial conditions, geometry and time-scale of the phenomena, measurement errors and data quality in general.

Reliably accounting for these uncertainties is key in the decision-making process (planning, hazard control, disaster mitigation). The typical temporal and spatial scales of the phenomena above, their non-linearity and coupled nature, as well as possibly chaotic aspects of the associated dynamics, further exacerbate the theoretical and computational complexities for obtaining meaningful, uncertainty-aware predictions in feasible time.

In doing so, adaptivity in its many declinations plays a central role in keeping computational costs affordable. In this MS, we welcome methodological and application-oriented contributions that focus on adaptivity in the treatment of uncertainty: for example, sampling, exploration of the uncertainty domain and active learning, multi-fidelity approaches, construction of surrogate/reduced-order models, data assimilation/filtering and bayesian inversion.