Capturing Time-structures in Earth Observation Data with Gaussian Processes

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Abstract. In this talk I will summarize our experience in the last years on developing algorithms in the interplay between Physics and Statistical Inference to analyze Earth Observation satellite data. Some of them are currently adopted by ESA and EUMETSAT. I will pay attention to machine learning models that help to monitor land, oceans, and atmosphere through the estimation of climate and biophysical variables. In particular, I will focus on Gaussian Processes, which provide an adequate framework to design models with high prediction accuracy and able to cope with uncertainties, deal with heteroscedastic noise and particular time-structures, to encode physical knowledge about the problem, and to attain self-explanatory models. The theoretical developments will be guided by the challenging problems of estimating biophysical parameters at both local and global planetary scales.