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Title: Adaptive Optics calibration strategies in the ELT context

Abstract:
The design of the European Large Telescope will provide a new and constraining environment for the AO calibration. This will be particularly true concerning the Interaction Matrix of the system that defines the link between the Deformable Mirror (DM) actuators and the Wave-Front Sensor (WFS) signals. Indeed, the telescope will include a new concept of DM integrated in the telescope itself, with a new geometry, a large number of actuators and mostly no calibration source. The DM location will also require to regularly update the Interaction Matrix during the operation, as the registration between the two systems may evolve dynamically with the telescope (shifts, rotation, magnification or higher order of pupil distortion) and depend on the seeing conditions (optical gains).

In this context, developing new methods and optimizing the calibration procedures becomes necessary to overcome these constraints. Some strategies based on synthetic models and/or on-sky measurements have already been identified and tested on 8-meters facilities such as the VLT-AOF and the LBT-FLAO. The first results of these experiments seem to lead to a Pseudo-Synthetic method, merging on-sky measurement for the accuracy and synthetic models for fast computation. This highlights two critical goals for the AO calibration in the ELT context: developing accurate and complex models and fast mis-registrations tracking methods, if possible with no impact on the observations.

After introducing these different AO calibration strategies for the ELT, we will present the actual developments of a synthetic model to reproduce the LBT-FLAO Pyramid WFS behavior in the end-to-end AO simulator OOMAO with the goal to generate Interaction Matrix that can be successfully used on the telescope and study the sensibility of the model.