

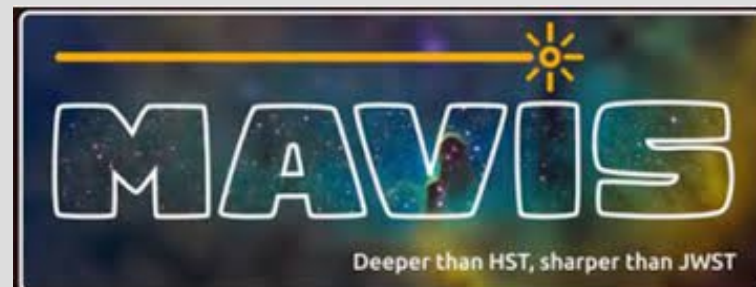
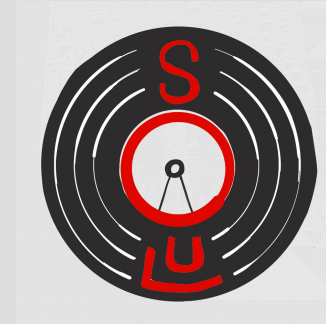
SOFTWARE FOR ADAPTIVE OPTICS

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On behalf of Arcetri AO Group

VLT/ELT SW FRAMEWORK EXPERIENCE

- We are currently participating at different ESO project in terms of SW development
 - ERIS@VLT: VLTSW framework, both high-level (i.e. IWS) and PLC software development...Currently in commissioning phase.
 - MAORY@ELT, MAVIS@VLT: ELTSW framework. Still in an early phase in terms of development...Currently refining user requirements and simulations.
- We are currently supporting the commissioning of SOUL@LBT:
 - Large experience with Pyramid WFS based AO systems.
 - Since the times of FLAO and ARGOS.



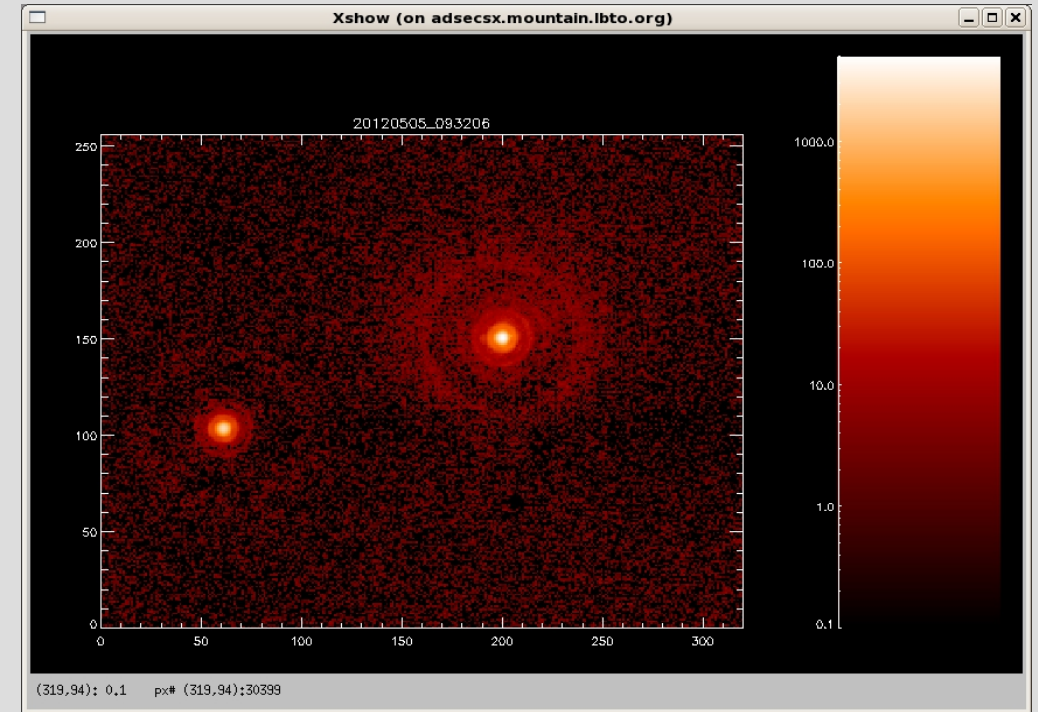
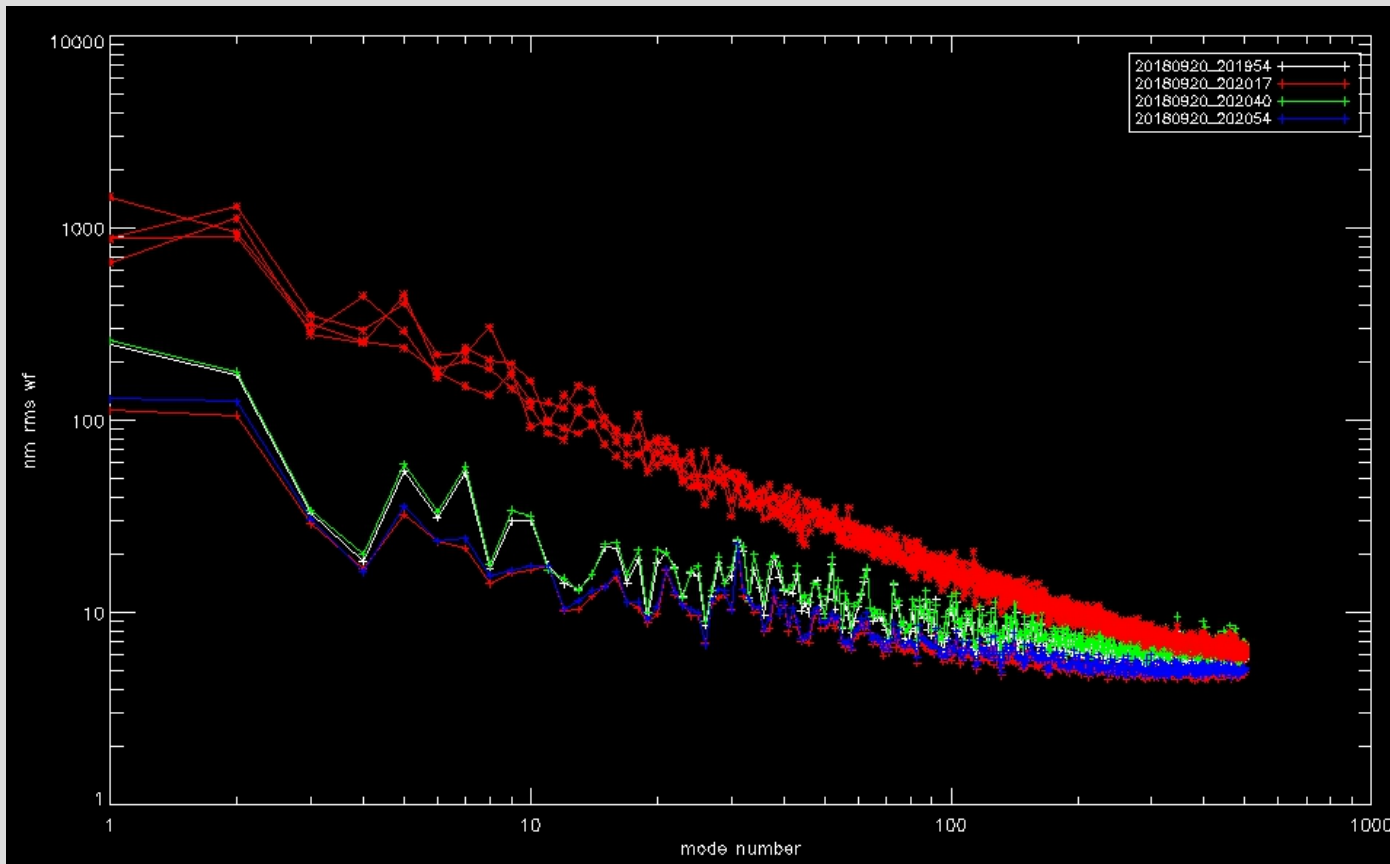
TOOLS FOR DATA REDUCTION

- Fast data processing: **ERMELAB** (ERIS@VLT): python library developed through the usage of Jupyter notebooks. **ELAB_LIB** (ARGOS and FLAO/SOUL@LBT): similar to ermelab but developed in IDL:
 - Monitoring AO system functionalities on short time frames.
 - Collect data from telescope, AO system (WFS, DM, electronics...) and instrument.
 - Performance estimation (from instrument images and slopes).
 - Can be part of a PSF-Reconstruction pipeline.
 - Very useful during commissioning and MAIV phase.
- SOUL@LBT slow telemetry: data reduction auxiliary loop:
 - Monitoring AO system, performance (from slopes) and turbulence parameters.
 - Useful during standard operations.



DATA REDUCTION EXAMPLES

- Some examples of usage of fast data reduction tool:
 - Modal plots, PSF analysis, Pupil checks, etc ...



SIMULATIONS, CALIBRATIONS AND OPTIMIZATIONS

- SW for numerical simulations (SOUL and ARGOS@LBT, ERIS and MAVIS@VLT, MAORY and ANDES@ELT, SPLATT, CaNaPy/ALASCA, KPIC@KECK, GPI@GEMINI N.):

PASSATA - end-to-end Montecarlo simulations. IDL + CUDA object oriented (Python TBD).

TIPTOP - analytical (Fourier based) simulations. Python and Cupy. In collaboration with LAM.

Useful for many things:

- System performance (PSF estimation/analytical calculation, modal residuals, etc ...)
 - Testing of control/calibration techniques (truth sensing, NCPA, interaction/reconstruction matrix, etc ...)
 - Sensibility analysis (misalignments, atmospheric parameters, telescope parameters, etc ..)
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- SW for optimization of AO system parameters and temporal control:
 - Optical gain compensation for Pyramid AO systems (FLAO/SOUL@LBT).
 - Optimization of temporal filters for vibration rejection.
 - On-line optimization of modal integrator gains (FLAO/SOUL@LBT and ERIS@VLT).



OSSERVATORIO ASTROFISICO DI ARCETRI

THANKS TO ALFIO AND GUIDO FOR THEIR INPUTS

and

THANK YOU FOR YOUR ATTENTION !!!

