
TipTop4ELT: Toward a single tool for all ELT instruments PSF prediction

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Abstract

One crucial aspect for the science observations assisted by Adaptive Optics is the knowledge of the Point Spread Function (PSF). The PSF delivered by AO systems has a complex shape, combining spatial, spectral and temporal variability, such that it is difficult to predict. The AO PSF also highly depends on the atmospheric parameters and the Natural Guide Stars (NGSs) selected. Finally, the AO-PSF can also have a very different behavior depending on the AO flavor. To assist the AO community in preparing their AO observations, we have developed a fast algorithm - called TIPTOP - producing the expected AO Point Spread Function (PSF) for any of the existing AO observing modes (SCAO, LTAO, MCAO, GLAO), and any atmospheric conditions. Called from a simple API, TIPTOP provides the estimated AO-PSFs for any of these AO configurations, in a fast enough way (few seconds per PSF) so that users can predict the performance for as many configurations as needed, at any sampling, position in the field and wavelengths. As such, TipTop will guide you in the best Guide Star asterism selection, and it will be interfaced with an instrument simulator to predict the final SNR expected for your favorite target.

And beyond observation preparation, TipTop being fast enough it will also serve for queue scheduling, on-line quality checks and to provide a first PSF estimation associated with each science observation block. This last step is foreseen as a first PSF-Reconstruction approach, simple but accurate enough to serve several science cases. In preparation for the ELT, TipTop is currently deployed and tested for VLT instruments, with ERIS, MUSE (NFM and WFM), CRISP, SPHERE and eventually MAVIS. It has also been tested with LBT and Gemini AO instruments. The team is currently actively working toward the fine tuning of the algorithm vs. on-sky observations and first results will be presented. TipTop is available for beta-testing, so don't hesitate to play with it, and send feedback!

Keywords: PSF reconstruction, data processing, TipTop

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