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Accurate PSF Analysis; exploiting data from ELT/VLT to Rubin Telescope, passing through James Webb

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The Point Spread Function (PSF) is the response of a system to a point source. It depends on many factors, such as instrument optical quality, atmospheric turbulence, gravitational effects due to telescope optics mass, and the diffraction of the telescope entrance pupil. It is generally variable across the Field of View (FoV), and the reasons for its variability have different origins. Its knowledge is crucial to maximising the exploitation of high-precision quantitative science, restricting the astrometric and photometric errors to noise limitations. We will make a journey through different use cases in which the PSF modelling has different roles in data exploitation improvement. A topical example is the case of Adaptive Optics (AO), which is considered an enabling technology for future giant telescopes like the ELT. AO data are characterised by a structured PSF, variable across the FoV, and its modelling is still one of the main limitations in AO data exploitation. Space data are also characterised by structured PSF, which, in James Webb's case, could be the origin of false detections when an accurate model of the PSF is missing. Classical seeing limited data are characterised by a smoother and larger PSF, dominated by the seeing, easy to describe with a simple analytical model. Optical field aberrations slowly varies in time with telescope pointing and these aberrations determine a variation of the PSF across the FoV. These PSF variations can be modelled and used to monitor and control the telescope aberrations: this will be the case òf Rubin Observatory.

sessioni congresso

Tecnologie avanzate e strumentazione

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