MOSE: A demonstrator for an automatic operational system for the optical turbulence forecast for ESO sites (Cerro Paranal and Cerro Armazones)

Most of the observations performed with new-generation ground-based telescopes are employing the Service Mode. To optimize the flexible-scheduling of scientific programs and instruments, the optical turbulence (OT) forecast is a must, particularly when observations are supported by adaptive optics (AO). Reliable OT forecast are crucial to optimize the usage of AO facilities which is not possible when using only optical measurements. Numerical techniques are the best placed to achieve such a goal.

The MOSE project (MOdeling ESO Sites) aimed at proving the feasibility of the forecast of **(1)** all the classical atmospheric parameters (such as temperature, wind speed and direction, relative humidity) and **(2)** the optical turbulence i.e. the C_N^2 profiles and all the main integrated astro-climatic parameters derived from the C_N^2 (the seeing, the isoplanatic angle, the wavefront coherence time) above the two ESO sites of Cerro Paranal and Cerro Armazones. The proposed technique is based on the use of a non-hydrostatic atmospheric meso-scale model and a dedicated code for the optical turbulence. The final goal of the project aimed at implementing an automatic system for the forecasts of the aforementioned parameters to support the astronomical observations above the two sites.

MOSE Phase A and B have been completed (Final Review in October 2015). Model performances have been extensively quantified with several dedicated figures of merit and we proved that our tool is able to provide reliable forecasts of optical turbulence and atmospheric parameters with very satisfactory score of success. These results open new scenarios for the operation of the most sophisticated AO systems (WFAO). A conceptual design as well as an operational plan of the automatic operational system has been presented to ESO as integral part of the feasibility study.

In this seminar I will review the principles on which the proposed technique is based on; I will briefly review the most important challenges associated to the optical turbulence forecast for ground-based observations, I will summarize the most important results we achieved at conclusion of the feasibility study and the next steps for the implementation of a demonstrator.

Elena Masciadri

INAF-Arcetri Astrophysical Observatory, Florence, Italy