

SPECIAL PROJECT PROGRESS REPORT

Reporting year 2011

Project Title: Optical turbulence modelling for astronomical applications: towards the Extremely Large Telescopes (ELTs).

Computer Project Account: SPITFOT

Principal Investigator(s): Elena Masciadri

Affiliation: INAF – Istituto Nazionale di Astrofisica

Name of ECMWF scientist(s) collaborating to the project (if applicable)

Start date of the project: 1/1/2011

Expected end date: 31/12/2013

Computer resources allocated/used for the current year and the previous one (if applicable)

Please answer for all project resources

		Previous year		Current year	
		Allocated	Used	Allocated	Used
High Performance Computing Facility	(units)			200000	198847
Data storage capacity	(Gbytes)			150	150

Summary of project objectives

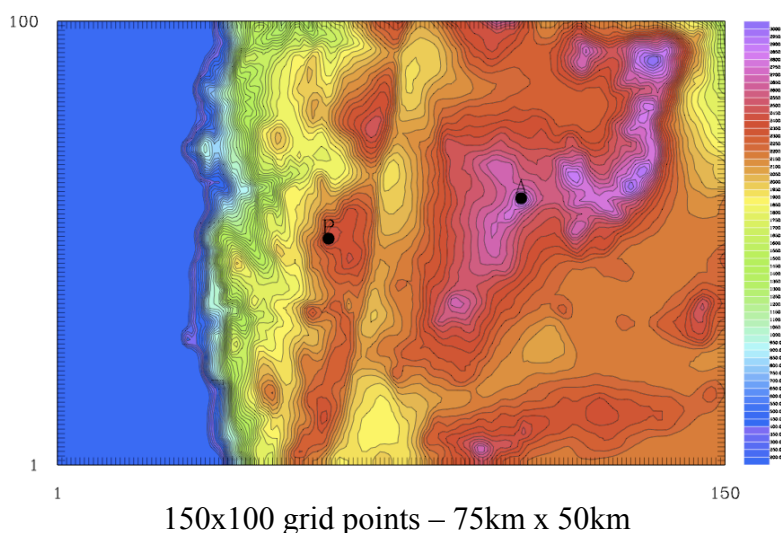
The project is centred on the employment of a numerical mesoscale model (Meso-NH) for the forecast of the optical turbulence in astronomical applications. Optical turbulence is the main source of deterioration of the image quality for ground-based telescopes. We are at present mainly involved in two projects.

(1) We are in charge of a feasibility study (MOSE) for the European Southern Observatory (ESO) for the optical turbulence forecast at two main sites of ESO for ground-based facilities working in the near infrared and infrared ranges: Cerro Paranal (site of the Very Large Telescope) and Cerro Armazones (the selected site for the European Extremely Large Telescope E-ELT). Both sites are located in the north part of Chile.

(2) The second project, supported by the Large Binocular Telescope (LBT) Consortium, aims to set-up an operational forecast system of the optical turbulence at Mt. Graham (Arizona) to support astronomical observations and management of instrumentations to be placed at the focus of the telescope.

Summary of results of the current year (January 2011 - June 2011)

No major problems has been encountered. A good part of the allocated resources for the 2011 have been used (198847 over 300000) mainly in the context of the point (1) of the extended abstract. We are in the phase of the model calibration. The program is progressing as it has been planned. We are almost sure to use all the allocated resources for the 2011. Our results will be reviewed in autumn 2011 in the context of a progress-meeting review of the project MOSE (point 1 of the extended abstract). Simulations performed so far refer mainly to a period of 20 nights in November/December 2007. We applied our calculation above the Chilean regions covering the Cerro Paranal and Cerro Armazones sites. The configuration of the model has been defined and fixed. At the same time an intense effort has been done in analysing measurements (atmospheric parameters as well as optical turbulence) used to validate/constraint the model. Preliminary results are satisfactory and let us suppose that the project can proceed as originally planned. Fig.1 reports the orography of the two regions that have been studied.



List of publications/reports from the project with complete references

REPORTS:

- MOSE (MOdeling Sites ESO) Kick-off Meeting taken at the European Southern Observatory, Garching, Germany on 14/3/2011.
- MOSE Technical Annex (14/3/2011)

Summary of plans for the continuation of the project

Next step includes model calibration (proposed in Masciadri & Jabouille, 2001) and applied later on (Masciadri et al. 2004, Masciadri & Egner, 2006, Hagelin et al. 2010) using measurements from a Generalized-Scidar and a MASS. Measurements for the two instruments present some different characteristics. We plan to implement, for the first time, a new calibration method for the MASS and, depending on the results obtained, to decide for a final calibration strategy. The final goal is to test the performances of the model on a benchmark sample not used for the calibration of at least 30 nights. The number of measurements available is particularly extended and we expect to be able to achieve important new insights in this domain. We have not yet used ECMWF SBUs for the project (2).

Masciadri, E. & Jabouille, P., 2001, A&A, 376, 727

Masciadri, E., Avila, R., Sanchez, L. X., 2004, RMxAA, 39, 249

Masciadri, E. & Egner, S., 2006, PASP, 118, 1604

Hagelin, S., Masciadri, E., Lascaux, F., 2010, MNRAS, 412, 2695