<u>ALTA Center</u>: an operational system for the forecast of the optical turbulence and atmospheric parameters to support the LBTO queue mode

ALTA

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■ ALTA Center: scientific goals

- Structure of the web-site (i.e. the "tool" conceived to support LBT observations in queue mode)
- State of the art of the model validation for the optical turbulence
- Conclusions and perspectives



ALTA Center: scientific goals

Implementation automatic and operational system for the *forecast* of:

- ★ All classical atmospherical parameters:
- Temperature
- Wind Speed and Direction
- Relative humidity
- Water vapor
- ★ Optical Turbulence: C_N^2 , ε , ϑ_0 , τ_0

















RELATIVE HUMIDITY (%)



PRECIPITABLE WATER VAPOR (mm)



LBTO Users' Meeting, 20-23 J _...,,,













0 120 180 240 300 0 60 120 17/5/29 Wind direction (deg)

WIND DIRECTION

15

2017/5/29

Height (km) a.g.l.

WIND SPEED @ 200mb (jet-stream level)

60km











INTEGRATED ASTROCLIMATIC PARAMETERS









average on the whole night + animation

average on the three parts of the night (first, central, final) + animation



MODEL CALIBRATION for the OPTICAL TURBULENCE

DIMM is inside the LBT dome Generalized SCIDAR @ VATT DIMM **TOY MODEL** before calibration Model related to GS (43n) 2005-2008 600m ~ Model related to **DIMM (42n)** 2017

POSSIBLE CAUSES

2005-2008 (43 nights)

Masciadri et al. 2010, MNRAS

- Sample of 43 nights of GS not enough representative but we can not increase the sample of GS
- Some climatologic changes passed on the summit during 10 years
- The initialization data provided by the GCMs changed because in the meanwhile the resolution of GCMs improved.

2016 - today



MODEL CALIBRATION for the OPTICAL TURBULENCE

Generalized SCIDAR @ VATT



2005-2008 (43 nights) Masciadri et al. 2010, MNRAS NEW PROCEDURE for the model calibration

It assumes DIMM has no off-set

It uses GS <u>and</u> DIMM

- ★ Non-simultaneous measurements from GS and DIMM (different nights/periods)
- \star GS controls the turbulence for h > 600m
- \star DIMM controls the turbulence for h < 600m



2016 - today













CONCLUSIONS & PERSPECTIVES

★ ALTA Center is now a reality and it can currently supports LBTO observations in queue mode !

OPTICAL TURBULENCE:

- ★ We identified a **new method/procedure** for the model calibration that guarantees consistent values of seeing ($\boldsymbol{\varepsilon}$), isoplanatic angle (θ_0), wavefront coherence time (τ_0).
- ★ Model validation has to be completed mainly by increasing the statistical sample but main goal has been achieved
- * Independent estimations of seeing (image quality, AO) are extremely important to improve the model performances in predicting the OT
- ★ It is important to identify more precisely which are the spurious effects of the DIMM if any (preliminary analysis done by J. Hill et al., SPIE, 2016)

Plans/Perspectives:

- Studying of the "wrong cases" (the most interesting thing to improve the model performances)
- We plan to insert in the web-page "Trends" the forecasts information on site charcateristic on climatologic time scale
- Inclusion of measurements (DIMM) in the web-site ? (to be discussed with LBTO...)
- Implementation in the code of the integration of the seeing with respect to different line of sights
- Kalman filter with real-time measurements to improve model performancesto be evaluated

