SUMMARY OF ACTIONS AND ACTIVITIES

SKY QUALITY GROUP
November 2011

Items: water vapour, seeing, EELT site characterization results, use of satellites for site characterization, airborne dust counter, site testing measurements for CTA, atmospheric extinction and weather stations.

Water Vapour

-The water vapour monitor is completed and available at the URL: http://www.iac.es/proyecto/site-testing/index.php?option=com_wrapper&Itemid=122

The prototype has been tested by GTC staff, who now consider it to be a very powerful tool for the operation of CANARICAN.

After the development and validation the interface is public and online for all user institutions. The IAC will continue taking care of maintenance and further developments. Please do not forget to use the appropriate acknowledgement when using the interface.
Astronomical Characterization at the Canarian Observatories.
SUCOSIP 2011
Instituto de Astrofísica de Canarias

Seeing

Teide Observatory:

There are online data of seeing measurements at OT at the URL:

The instrument, a classical DIMM based in the IAC prototype (Vernin & Muñoz-Tuñón, PASP Astronomical Society of the Pacific Publications (ISSN 0004-6280), Vol. 107, no. 709, p. 265-272), is installed at OT between the Optical Ground Station (OGS) and the Visitors Center (see location at http://www.iac.es/proyecto/site-testing/index.php?option=com_content&task=view&id=105&Itemid=124).
Astronomical Characterization at the Canarian Observatories.
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It provides seeing values (1 data/minute). The instrument works in robotic mode and it is operated by the IAC telescope operators.

Roque de los Muchachos Observatory:

It is planned to have a similar system at the ORM in 2012 (Las Moradas site, about 300m west of the GTC. See location at http://www.iac.es/proyecto/site-testing/index.php?option=com_content&task=view&id=106&Itemid=125).

We are now dismantling the old site-testing surveys sites (MAGIC, DHV and Las Lajiitas-near helipads-). The fences installed at Las Lajitas will be installed at Las Moradas.

EELT site characterization results

The site selection for the future European Extremely Large Telescope has been undertaken within the “ELT Design Study” proposal funded by the European Union (EU) under contract number 011863 within the Framework Programme 6.

The analysis of the Site Characterization team are being published. The first paper of the series has appeared in PASP (Vol.123, Nov.2011, in press). More details in Appendix I.

Use of satellites for site characterization

We have recently published an article concerning the compilation of the key parameters retrieved from remote sensing techniques and climate diagnostic archives for astronomical site characterization and for selecting the best sites for hosting the future extremely large telescopes. Aerosol content, clouds, water vapour and tropospheric winds parameters are included in this study.

On the use of remotely sensed data for astronomical site characterization
Chapter in Aerosols: Properties, Sources and Management Practices
Editor(s): Yakov Alekseyev and Klavdiy Plisetskaya
Series: Environmental Science, Engineering and Technology
Pub. Date: 2012 1st Quarter
ISBN: 978-1-61942-182-0

Airborne dust counter

This instrument measures the number of airborne particles between 0.3 and 10µm size. Under a collaboration with the AEMET (Agencia Estatal de Meteorologia) we are calibrating the IAC dust counter (before installed at NOT site). Once calibrated, it will be installed at GTC (likely starting in November 2011).
Site testing measurements for CTA (Cherenkov Telescopes Array)

The CTA project is an initiative to build the next generation ground-based very high energy gamma-ray instrument. The Teide Observatory is one of the preselected sites in the northern hemisphere for hosting the CTA. More details at [http://www.cta-observatory.org/](http://www.cta-observatory.org/).

We are collaborating with the site testing working group of the CTA providing meteorological data: wind speed, wind direction, air temperature, barometric pressure, cloud coverage and useful time, sky brightness, etc.

IAC provides logistical support for the site testing operations at the Teide Observatory where CTA has recently installed an Automatic Weather Station (ATMOSCOPE).

Atmospheric extinction

The transparency is a key aprometer for evaluating the site seeing conditions. The atmospheric extinction mainly depends on the presence of clouds and/or aerosols (mineral dust). The Meridian Circle Telescope (CMT) at the ORM provides the atmospheric extinction coefficient ($K_V$) every night since 1984. We have published a statistical analysis for the database retrieved from the CMT (García-Gil, A., Muñoz-Tuñón, C. & Varela, A.M., *Atmosphere Extinction at the ORM on La Palma: A 20 yr Statistical Database Gathered at the Carlsberg Meridian Telescope*, 2010, Publications of Astronomical Society of Pacific, 122, pp1109–1121).

Considering the 20 year span of our database (from 1988 to 2009 - excepting 1992 and 1993), we obtain a median of $K_V$ of 0.130, a mode of 0.121 and a mean of 0.161 mag/airmass with an uncertainty of ±0.002 mag/airmass. Since long-term extinction variations due to the effects of the volcanic eruptions of El Chichón (1982) and Mt Pinatubo (1991) are observed, the periods affected are not taken into account in this study. The median extinction has not varied over the years with a slight - not statistically significant- decrease over the last five years (see next figure).
We have estimated the weather downtime with the available information in the data logs. Our global estimate of weather downtime for the period 1999 to 2003 based on the CMT log is 20.8%. This value compares reasonably well - taking into account the caveats intrinsic to the definition of weather downtime - with data provided by other telescopes at the Observatory, in particular with the number provided by the NOT and WHT.

Weather Stations

Las Moradas AWS (ORM) provides standard meteorological variables with a sample rate of 1 data/minute. Data are stored and are on-line available through the ORM miniview web page http://catserver.ing.iac.es/weather/index.php?miniview=1.

An identical automatic weather station (Casella, S.L.. model) will be installed at the OT in the early 2012. We have just bought a mast and meteorological sensors.

The IAC stores meteorological data retrieved by the Global Oscillation Network Group (GONG) at the Teide Observatory. On line data are available at http://www.iac.es/weather/otdata/. The GONG automatic station is operating at the OT since 1995.
Recall: The IAC as well as the Nice University and ESO have been involved in the Site Characterization process within the framework of the E-ELT Design Study, granted by the EC FP6. Four sites have been selected: ORM and Djbel Aklim (Morocco) in the northern hemisphere and Macon (Argentina) and Cerro Ventarrones (Chile) in the southern hemisphere. The characterization lasted 4.5 years from 2005 to mid-2009 and produced a lot of EC documents and three articles. The first one is entitled: “European Extremely Large Telescope Site Characterization I: Overview”, the second is more detailed from the point of view of High Angular Resolution astronomy and the third is devoted to the meteorological conditions. Hereafter follows the abstract of the “Overview” which will appear in PASP, 123, 2011.

Abstract:
The site for the future European Extremely Large Telescope (E-ELT) is already known to be Armazones, near Paranal (Chile). The selection was based on a variety of considerations, with an important one being the quality of the atmosphere for the astronomy planned for the ELT. We present an overview of the characterization of the atmospheric parameters of candidate sites, making use of standard procedures and instruments as carried out within the Framework Programme VI (FP6) of the European Union. We have achieved full characterization of the selected sites for the parameters considered. Further details on adaptive optics results and climatology will be the subject of two forthcoming articles. A summary of the results of the FP6 site-testing campaigns at the different sites is provided.