EL ROQUE DE LOS MUCHACHOS SITE CHARACTERISTICS
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THE OBSERVATORY
The Observatorio del Roque de Los Muchachos (ORM) is located on La Palma Island (Canaries). The very good astronomical conditions of the island are mainly due to a stable subduing maritime air mass. All the telescopes are located well above the inversion layer (occurring between 800–1200 m), along the northern edge of the Callosa de Taburiente, at the northwest side of La Palma (Table 1. Figure 7 shows the irregular shapes and the complex topography. As a consequence, the local microclimate differs from site to site, making it difficult to foresee in advance the precise local meteorological parameters.

THE DATA
Meteorological data are obtained from TMG, CAMC and NOT weather stations located in places not influenced by the presence of the dome. The three telescopes are lines on an imaginary straight line in NE direction. TMG and CAMC are about 1000 m far, while NOT is placed in the middle at about 500 m from TMG. The database of TMG is 7 yr long (1998-2005), NOT is 8 yr long (1997-2005), while CAMC is 22 yr long (1983-2004). Figure 8 shows analyzed temperature (T), wind speed (U), relative humidity (RH) and air pressure (P). From each raw data series, we compute the hourly averages, and then from each of these sets, we compute the monthly averages and finally the annual averages. Vectorial wind direction is evaluated by calculating the annual percentage of hours in which the wind comes from fixed directions.

MICROMETEOROLOGICAL DIFFERENCES BETWEEN THE THREE SITES
The CAMC 20 yr annual temperature baseline (Fig. 2) shows an increasing trend (about 3.0 deg per 10 yr). In this the first confirmation of global warming above the inversion layer? CAMC and TMG trends are remarkably similar, with average temperatures differing by no more than 0.6 deg (2001; Lombardi et al. 2006). CAMC is the largest site, maintaining a RH < 40% in winter time (Fig. 3, top) and RH < 50% in summertime (Fig. 3, bottom), while both TMG and NOT have comparable trends and appear to dampen 15% on average in summertime and 15% in summertime (Lombardi et al. 2007). CAMC has the highest pressures (775–776 hPa). Figure 4 shows an increasing behaviour of the Dome in dry-point temperatures, indicating that TMG shows lower pressures (775–776 hPa). TMG displays big differences compared to NOT in 2000 and 2001, but very similar values in 2003, 2004, and 2005. The barometric pressure correlation applied to NOT for the three sites demonstrates that ORM is dominated by high pressure (Lombardi et al. 2007).

TEMPERATURE, WIND SPEED AND ASTRONOMICAL SIGHTING
The image quality in terms of FWHM is compared to the difference DT between the ground temperature and the temperature at the level of the TMG primary mirror:

\[ DT = T(0) - T(M) \]

Figure 4 shows that seeing deteriorates when DT > -0.6 deg. This can be explained as a consequence of the higher pressure at the level of the primary mirror of the telescope (Lombardi et al. 2007).

The FWHM are also compared to the wind speed (Fig. 5). We see that 50% of the points are distributed below a wind speed of 3.3 m/s (red dashed line), with median FWHM of 1.5 arcsec. For wsp > 3.3 m/s, the distribution of the points has a median value of 0.5 arcsec. This indicates that we have optimal observing conditions when wsp < 3.3 m/s (Lombardi et al. 2007).

We use 118 images obtained with the Optical Image of Galileo at TMG in V-band, pointed near the zenith (and corrected to true zenith by a small amount) from 2000 January 31 to February 0.

SHORT-TERM SCALE THERMALIZATION FORECASTING
Figure 8 and Figure 9 show that pressure changes anticipate changes in temperature, typically by 2-4 h, in both the wintertime and summertime (years 1992 and 2004 are taken as examples).

The relationship between P and T suggests the following question: is it possible to foresee the changes in temperature a few hours in advance, on the basis of the changes in air pressure?

If YES, it could be possible to optimize the thermalization of the telescope with the instruments, reducing the instrumental seeing.

The correlation between air pressure and the temperature measured 2 hr later has a confidence level 99%. This correlation typically decreases if temperatures are measured 1 hr before (0.86) or 1 hr (0.15) later. The ability to make predictions based on hour-to-hour analyses vanishes on timescales higher than a few hours (Lombardi et al. 2007).

REFERENCES

Table 2 shows the percentage of time computed for four wsp (Lombardi et al. 2007). TMG and NOT have optimal observing conditions (1.5 < wsp < 4.5 m/s, see Figure 7) about 70% of the time, compared to 16% at CAMC. The evaluation of air pressure time in which wsp < 2.5 m/s gives an estimation of the duration due to high wind velocity. The last time at TMG is only 0.3% of the total. CAMC never shows wsp > 12 m/s, and NOT is more affected by high wind speed (44%).

Table: Percentage of Time Computed for Four wsp

<table>
<thead>
<tr>
<th>wsp</th>
<th>TMG (%)</th>
<th>CAMC (%)</th>
<th>NOT (%)</th>
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</thead>
<tbody>
<tr>
<td>&lt; 0.5</td>
<td>13.4</td>
<td>12.4</td>
<td>11.8</td>
</tr>
<tr>
<td>0.5–1</td>
<td>13.4</td>
<td>12.4</td>
<td>11.8</td>
</tr>
<tr>
<td>1–1.5</td>
<td>13.4</td>
<td>12.4</td>
<td>11.8</td>
</tr>
<tr>
<td>&gt; 1.5</td>
<td>13.4</td>
<td>12.4</td>
<td>11.8</td>
</tr>
</tbody>
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