Weather and Seeing Statistics

Nils Turner

28 February 2011 / CHARA Array Winter Meeting, Atlanta
Outline

1. Weather
   - What’s New?
   - Stats

2. Seeing
   - $r_0$
   - $t_0$

3. Infrastructure Changes
   - Server Upgrade
   - Telescope Control
   - Other Control System
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Davis Instruments remote weather station
- Rain gauge adversely affected by “roof winds”
- Tends to record only about 2/3 the rainfall amount as the NWS-sanctioned method

RF chokes now installed on all bunker humidity/temperature sensors
- All but W2 are consistently within a few percent of each other
- W2 is closer than it used to be
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<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
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<tbody>
<tr>
<td>E1</td>
<td>83.4</td>
<td>96.0</td>
<td>96.1</td>
<td>91.1</td>
<td>95.7</td>
<td>96.6</td>
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<tr>
<td>E2</td>
<td>74.9</td>
<td>92.9</td>
<td>94.9</td>
<td>93.8</td>
<td>94.3</td>
<td>97.4</td>
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<tr>
<td>S1</td>
<td>88.8</td>
<td>96.3</td>
<td>91.2</td>
<td>94.0</td>
<td>95.9</td>
<td>98.2</td>
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<tr>
<td>S2</td>
<td>90.0</td>
<td>96.1</td>
<td>91.3</td>
<td>93.0</td>
<td>89.5</td>
<td>94.2</td>
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<tr>
<td>W1</td>
<td>91.1</td>
<td>95.3</td>
<td>96.9</td>
<td>94.7</td>
<td>93.8</td>
<td>99.4</td>
</tr>
<tr>
<td>W2</td>
<td>90.1</td>
<td>96.7</td>
<td>101.7</td>
<td>94.7</td>
<td>89.2</td>
<td>87.3</td>
</tr>
</tbody>
</table>

**Table**: Weather station uptimes as a percentage of time.
## Cross-year Vital Stats

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
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<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
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<tbody>
<tr>
<td>Measurable Wind</td>
<td>11.6</td>
<td>14.0</td>
<td>12.9</td>
<td>16.2</td>
<td>19.2</td>
<td>23.2</td>
</tr>
<tr>
<td>High Wind †</td>
<td>0.8</td>
<td>0.4</td>
<td>0.8</td>
<td>0.2</td>
<td>0.2</td>
<td>0.7</td>
</tr>
<tr>
<td>High Humidity ‡</td>
<td>20.0</td>
<td>18.1</td>
<td>10.9</td>
<td>14.0</td>
<td>16.5</td>
<td>21.6</td>
</tr>
</tbody>
</table>

**Table:** Table entries are percentages of time. Values quoted are the largest of the six bunker weather stations. † High wind is defined as being above 20 kph. ‡ High Humidity is defined as being above 90%.
Rainfall Amounts
– data courtesy of L. Webster

Cumulative Rainfall, Mount Wilson

Days since July 1
Rainfall (inches)

2009-2010
2010-2011
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Seeing
2006-2009 and 2010, 2 to 8 hours after sunset

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Seeing
2004-2009 versus 2010

2004-2009 data versus 2010 data

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Seeing Statistics
2004-2010, Sunset to Sunset+2 hour Correlation

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Seeing
2004-2010, Sunset+2 to Sunset+4 hour Correlation

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Seeing
2004-2010, Sunset+4 to Sunset+6 hour Correlation

No. Meas. (Area Normalized) vs. Seeing (t0, msec) for different time periods:
- All times
- Sunset+4 to sunset+6 hours

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Seeing

2004-2010, Sunset+6 to Sunset+8 hour Correlation

No. Meas. (Area Normalized)

Seeing (t₀, msec)

t₀, sunset+6 to sunset+8 correlation

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Server Upgrade

Current Servers

- Bought 4 identical machines in 2006
- One motherboard has failed
- Motherboard requires non-standard power supply
- Ridiculously noisy
Server Upgrade
New Servers

- Two machines based on 6-core AMD processors
- 16 GB of memory each
- Hot-swappable external drive bays
- Plan to install before beginning of observing season
Expand the KVM switch to remove the monitor/keyboard clutter
Move the fiber panel out of the racks to improve rack accessibility
Improve electrical distribution – too few circuits
Upgrade racks
Move the control system to gigabit ethernet
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TCS Replacement

Process well-underway

- Driver for dome encoder written
- Driver for DIO/counter/timer card tested and working
- Combined to create a dome server and GUI
TCS Replacement

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TCS Replacement
– Dome Control

Position: 359.9
Target: 5.0
Dome: Homed
Motion: Off
Moving: No
Slit: Closed
Servo: Off

Position: 0

INIT | GOTO
ANTICW | CW
STOP | HOME
OPEN | CLOSE
REOPEN DRV5
PING | REOPEN
QUIT
TCS Replacement

Process well-underway

- Driver for dome encoder written
- Driver for DIO/counter/timer card tested and working
- Work continues on the counter/timer aspect
TCS Replacement

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TCS Replacement
– Terminal Block
Process well-underway

- Driver for dome encoder written
- Driver for DIO/counter/timer card tested and working
- Work continues on the counter/timer aspect
- Work still needed on the telescope encoder
- Hope to be testing on the sky by June
TCS Replacement

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Cylinder Control

- Original cylinder control would only run on Linux 2.2 kernels
- Rewrote it in the CHARA client-server model
## Cylinder Control

– Standard GUI

<table>
<thead>
<tr>
<th>Cylinder</th>
<th>Open/Close</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO SERVER</td>
<td>STOP</td>
<td>STOP</td>
</tr>
<tr>
<td></td>
<td>STOP</td>
<td>STOP</td>
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</tr>
<tr>
<td></td>
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<td>STOP</td>
</tr>
</tbody>
</table>

### Buttons:
- **All Close**
- **Ping**
- **Reopen**
- **Quit**

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## Cylinder Control

### Engineering GUI

<table>
<thead>
<tr>
<th>NO SERVER</th>
<th>NO SERVER</th>
<th>NO SERVER</th>
<th>NO SERVER</th>
<th>NO SERVER</th>
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</tr>
</thead>
<tbody>
<tr>
<td>STOP</td>
<td>STOP</td>
<td>STOP</td>
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<tr>
<td>CLOSE</td>
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<tr>
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<td>OPEN</td>
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<tr>
<td>PS 1</td>
<td>GO</td>
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<tr>
<td>HOME</td>
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<tr>
<td>ENABLE</td>
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<table>
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<table>
<thead>
<tr>
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<tr>
<td>ALL CLOSE</td>
<td>PING</td>
<td>REOPEN</td>
<td>QUIT</td>
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</table>

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