

EU FP6 ALMA Enhancement: Work Package 5 Highlights since last F2F & Plans

Nikolic, Richer & Bolton

Cavendish Laboratory/Kavli Institute
University of Cambridge

10 June 2011
Cambridge



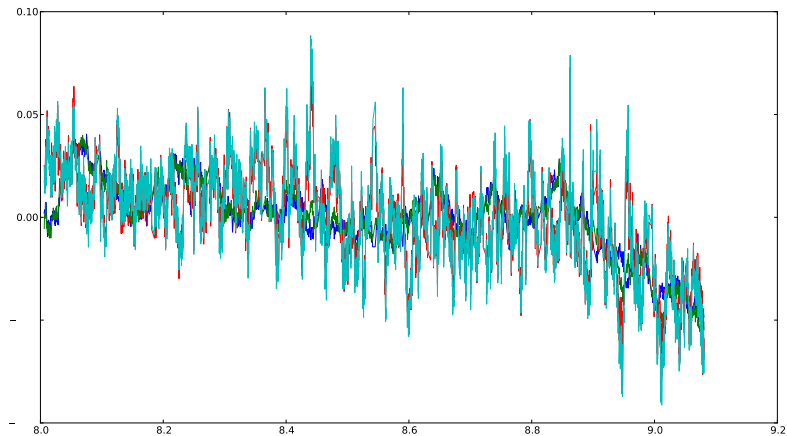
**UNIVERSITY OF
CAMBRIDGE**



Overview

- Rosie Bolton joined the team
- `wvrgcal` mailing list for community support (~20 subscribers)
- Analysis of test data → reports, JIRA tickets
- Numerous `wvrgcal` improvements, bug-fixes
- Binary distributions of `wvrgcal`
- Paper for URSI conference, ESO Messenger article
- Commissioning trip April 2011
- Analysis of statistical properties of the atmosphere
- Initial look at Science Verification data

Analysis – dry fluctuations



Green & Blue: Path estimated from WVRs; Turquoise: Observed Path; Red: Corrected Path

Improvements to `wvrgcal`

- Much improved informational output from `wvrgcal`
- Dealing with 'TSys' (i.e., hot/cold load calibration) scans
- Output of `field_ids`, `cal_descs`, etc to the calibration table
- Much better interpolation of flagged WVRs
- Realigned sign convention with ALMA V8 software
- Updates to new versions of CASA

wvrgcal diagnostic/QA output

Antenna/WVR information:

```
-----  
      Name   WVR?   Flag?   RMS (um)   Disc (um)  
0      DV01   Yes    No       283        36.5  
1      DV04   Yes    No       273        31.3  
2      DV05   Yes    No       285        28.7  
3      DV06   Yes    No       277        27.6  
4      DV07   Yes    No       282        27.3  
5      DV09   Yes    No       285        27.5  
6      DV10   Yes    No       283        27.2  
7      DV11   Yes    No       282        30.8  
8      DV12   Yes    No       281        27.9  
9      PM01   Yes    No       275        29.5  
10     PM03   Yes    No       280         29
```

Expected performance

- ```

* Estimated WVR thermal contribution to path fluctuations (micron per antenna): 13.5088
* Greatest Estimated path fluctuation is (micron on a baseline): 96.292
* Rough estimate path error due to coefficient error (micron on a baseline): 1.04389
```

# Science Verification data

- Released with `wvr_gcal`-derived phase correction tables!
  - Interacted with Crystal Brogan and Ed Fomalont on ensuring the integrity of supplied calibration tables
- 
- Starting now to look at SV data in detail, determining the impact of WVR-calibration on science quality

# Planning

| Effort   | Task                                           | Approx Dates |
|----------|------------------------------------------------|--------------|
| 1 P-M    | Completion of atmospheric statistics memo      | June/July    |
| 1 P-M    | Analysis of first few SV projects              | June/July    |
| 1 P-M    | Memo on Quality Control/Assurance              | June/July    |
| 3 P-M    | Writing a refereed paper & publication process | June-Dec.    |
| 1 P-M    | URSI General Assembly                          | August       |
| 1.5 P-M  | Commissioning trip October + All hands         | October      |
| 1 P-M    | OS-X port and check-out                        | ?            |
| 1 P-M    | wvrgcal maintenance/support                    | June-Dec     |
| 1 P-M    | wvrgcal User Manual and Design Description     | November     |
| 0.5 P-M? | Further development of wvrgcal                 | ?            |

PM=Person-Month

## Further work

- Help with planning and analysis of SV and Cycle 0:
  - Is WVR application working as expected?
  - What is the best way to apply the correction?
  - What is the impact on the scientific quality of the data?
  - When are conditions right for observing particular project?
  - What phase switching times should be used?
- Further development of `wvrgcal`
  - Baseline-based correction to work around faulty WVRs
  - Non-linear correction (better transfer of phase across the sky)
  - More quality-assurance outputs
  - Techniques to deal with clouds?
- Further analysis:
  - Dry fluctuations and can anything be done about them?
  - Evidence for more sophisticated models, e.g., multiple water vapour layers?
- Lots more...