# ALMA Data –
## what to expect after your observations are made

Sarah Wood

Authors: Sarah Wood, Devaky Kunneriath, Sabrina Stierwalt, Erica Keller

Atacama Large Millimeter/submillimeter Array
Expanded Very Large Array

# The Condensed Version

- Data delivered after passing Quality Assurance (QA)
- Download data from *Archive Query* and *Request Handler* tools on the ALMA Science Portal
- Delivered data include:
  - Calibration tables and diagnostics
  - Preliminary images (*better products may be possible with more careful continuum identification & interactive cleaning*)
- Sections 11, 12, 14, and Appendix C of ALMA Technical Handbook

**This talk will be available online for reference after this workshop.**

# Goals of Quality Assurance (QA) Process

- Ensure reliable final data product
  - Desired sensitivity (as specified by PI)
  - Desired resolution (as specified by PI)
- Ensure calibration and QA imaging free from major artifacts

- Warning: Errors in PI-supplied parameters are outside scope of QA process, including:
  - Incorrect source coordinates
  - Inadequate frequency specification
  - Inadequate sensitivity limits

See ALMA Technical Handbook for details.

# During Observations – QA0

- Monitoring of on-the-fly calibration and system performance
- Rapidly-varying parameters (~SB/EB timescales)
  - Atmospheric effects
  - Antenna issues
  - Front-end issues
  - Connectivity issues
  - Back-end issues
- Tolerances for each are explicitly laid out
  - No fewer than 40 antennas in 12m array
  - Bandpass calibrator is strong enough
- Quick reduction may be run to check flux measurements and phase stability

# Between Observations – QA I

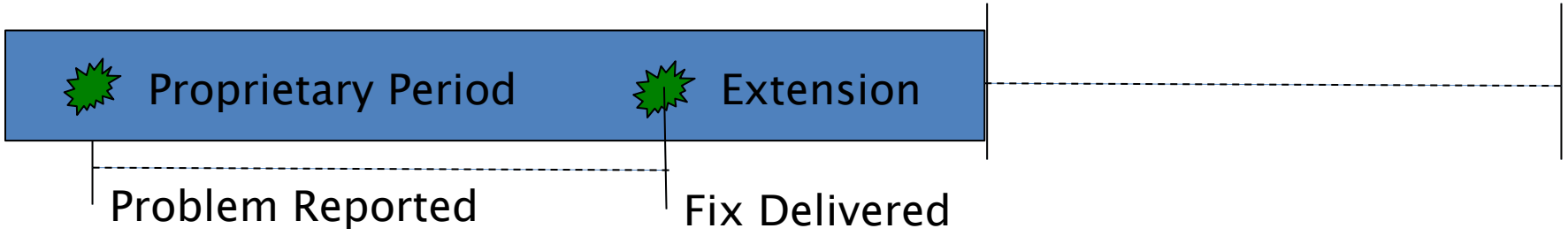
- "Regular array maintenance" timescales
- Slowly Varying Parameters (~MOUS timescales)
- General array calibration
  - Baseline measurements
  - Delays
- Antenna Calibrations
  - All-sky pointing
  - Focus curves
  - Beam patterns, etc.
- Observatory Calibrator Surveys
  - Solar-system and quasar flux monitoring

# After Observations – QA2

- Calibration by pipeline (~70%) or DA/staff.
- Final QA checks include
  - RMS of complex antenna-based gains
  - Absolute flux calibration scale
  - $T_{sys}$ within acceptable range
  - Proper phase transfer cadence
  - Proper bandpass corrections
- Assessment of Imaging Products
  - Signal-to-noise and angular resolution
  - No strong artifacts
  - Performed on the reference source/spectra
- Information about QA review is aggregated for delivery in the QA2 Report

# After Delivery – QA3

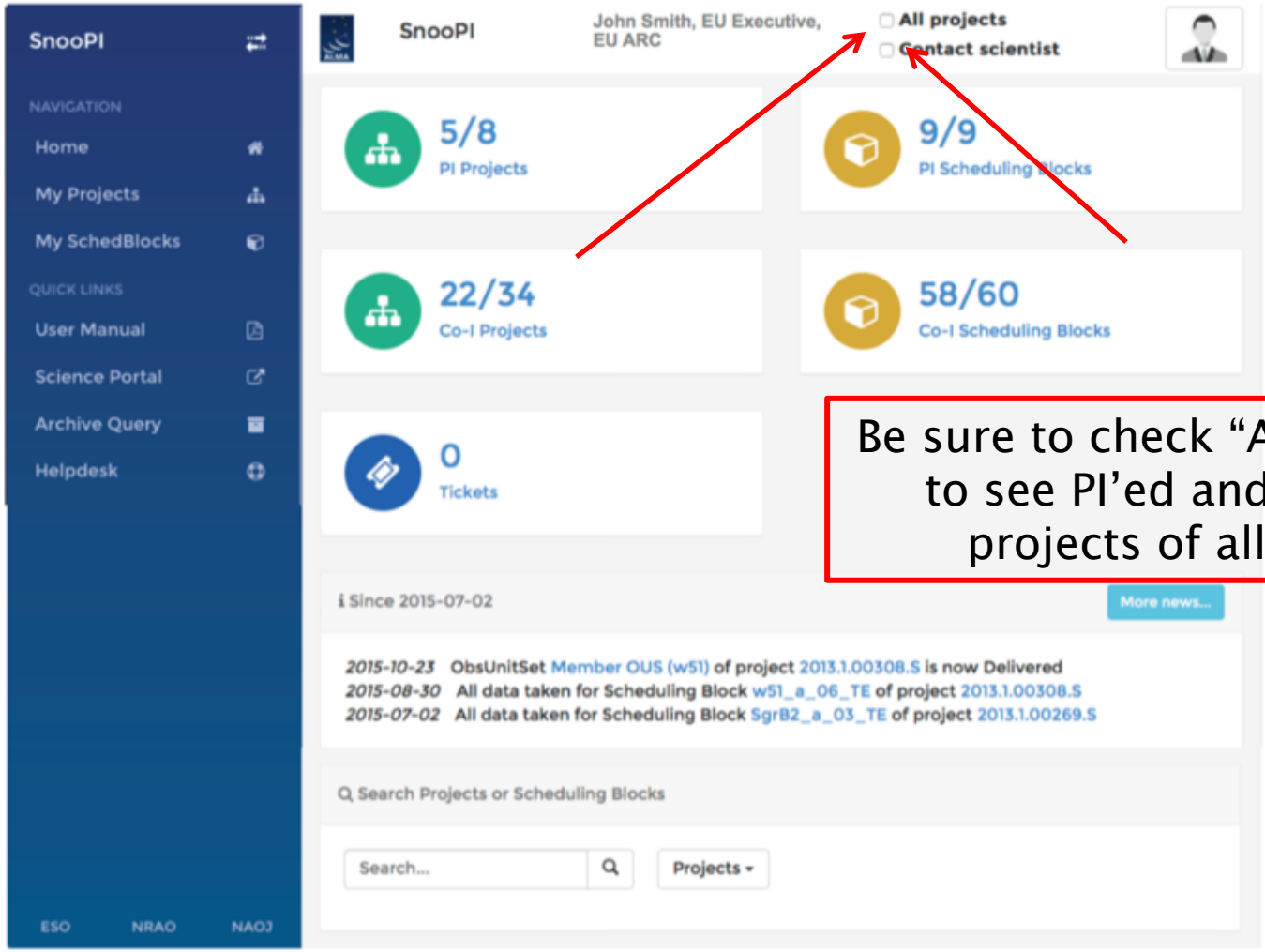
- Additional QA stage possibly triggered by PI reporting any issues underlying:
  - Data, observing procedure, calibration
- Re-evaluation of calibrated data products
  - Only occurs if QA0 -> QA2 miss something
- Likely results in fix being implemented and products re-ingested into ALMA archive
- Proprietary period extension *(within two months of delivery)*




- After two months, extension only until fix is delivered

# Monitor Project Status: *SnooPI*

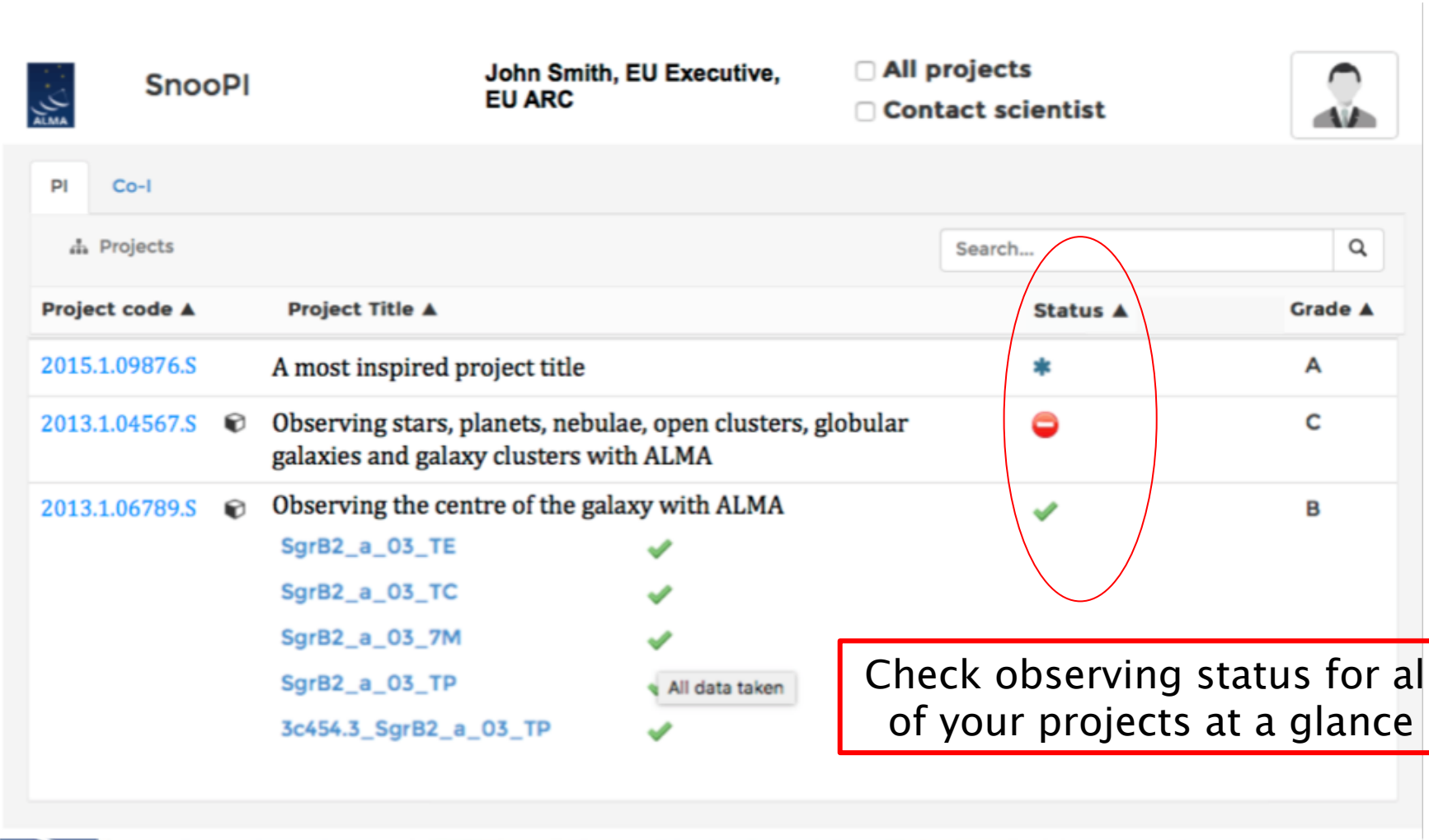
https://almascience.eso.org/observing/snoopi




Be sure to check “All projects” to see PI’ed and co-I’ed projects of all ranks

# Monitor Project Status: *SnooPI*

## Listing of PI'ed projects




Check observing status for all of your projects at a glance

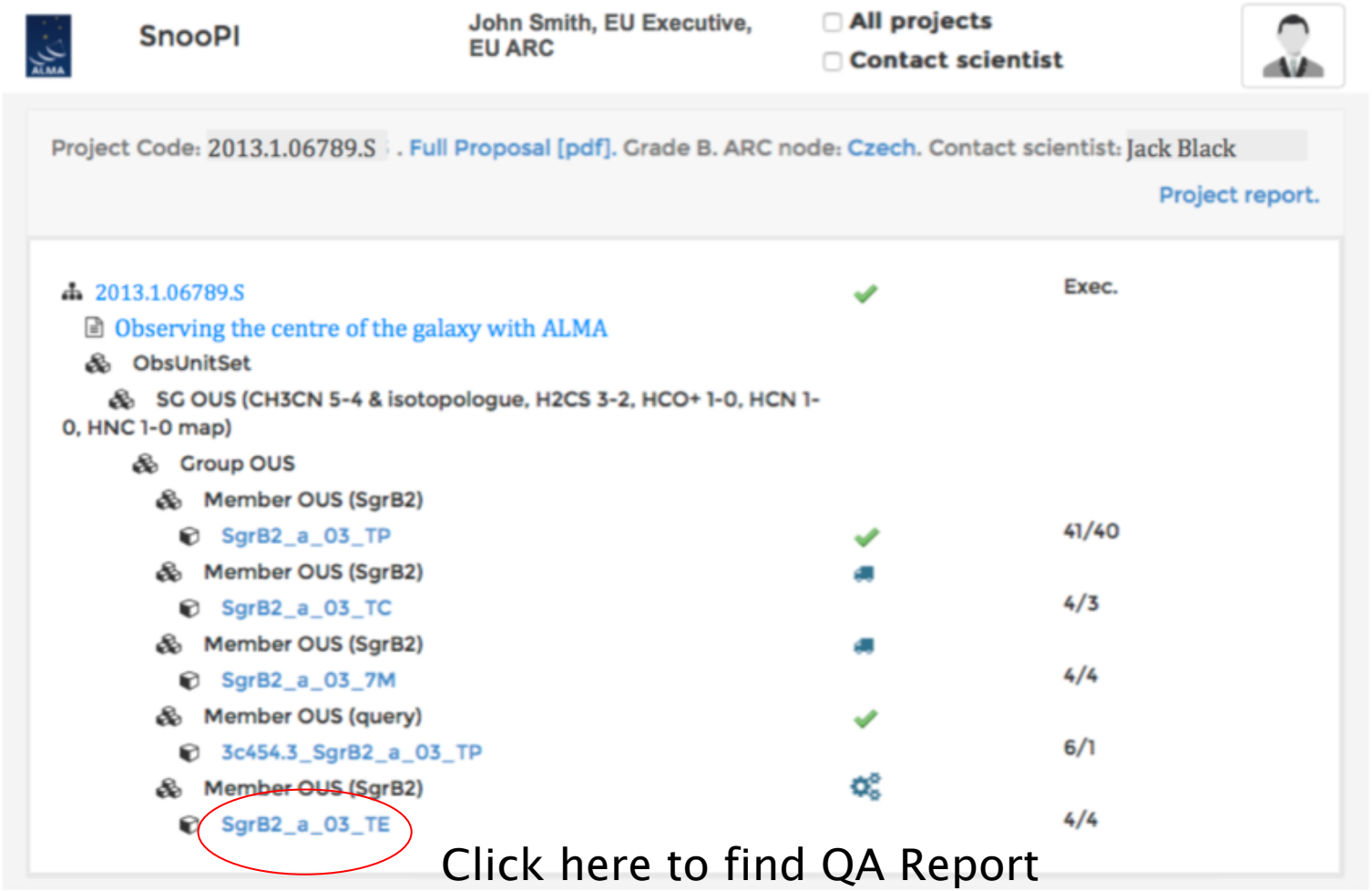
# Monitor Project Status: *SnooPI*

## Listing of PI'ed projects

- Approved but SBs not yet prepared
- SBs prepared but are not yet in the observing queue
- SBs are in the observing queue but not yet taken
- Some data has been taken
- All the data has been taken
- Completed and delivered
- Project is timed out
- Rejected at proposal review stage
- Unknown status

# Monitor Project Status: *SnooPI*

## Single Project View:




Click here to find QA Report

# Monitor Project Status: *SnooPI*

## Single Project View:

- a set of gears indicate that the MOUS is being processed;
- a smiling face shows that the MOUS are ready to be delivered;
- a truck indicates that the MOUS has been delivered

# Monitor Project Status: Optional emails

- Subscribe to email notification for updates on changes to project status through your Science Portal user profile
  - …
  - Phase2Submitted
  - Running
  - Partially Observed
  - Fully Observed
  - Pipeline Processing
  - …
- With or without optional emails, PIs always receive notification when new data are available

# Optional emails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**Observatory News**

Additional Information for Cycle 6 Proposals
Feb 01, 2018

New Science Verification data are now available for download
Jan 22, 2018

Announcement of intent to release a new installment of Science Verification data

More...

**EU ARC News**

Researcher position available at the Nordic ARC node
Jan 10, 2018

Post-doc position available at the Italian ARC-node
Dec 20, 2017

2017 European Radio Interferometry School
May 11, 2017

More...

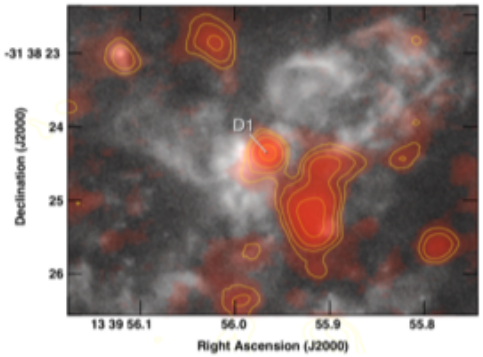
**Status**

ALMA Cycle 5 Config Schedule

Refereed publications: 916
Last observed source: W43-MM1
Current configuration: C43-5

More...

**Science Highlights - Molecular Gas Within the Supernebula of the Dwarf Galaxy NGC 5253**




One of the areas of extragalactic research which makes great use of ALMA's resolution and sensitivity is the study of the molecular gas properties of dwarf galaxies. In a recent study by Dr. Jean Turner and her collaborators, they make use of Band 7 ALMA observations to detect warm $^{12}$CO(3-2) and $^{13}$CO(3-2) emission (Cloud D1) from the core of a giant star-forming region, in the dwarf galaxy NGC 5253. This "supernebula" is the source of one-third of the galaxy's infrared luminosity and is in proximity to optical clusters with measured stellar ages of ~ 1 Myr. From radio recombination line analysis, the region is estimated to have 1400-1800 O stars..

Full Summary...

# Optional emails

Click Name

Click Profile

Atacama Large Millimeter/submillimeter Array

In search of our Cosmic Origins

Erica Keller

Profile

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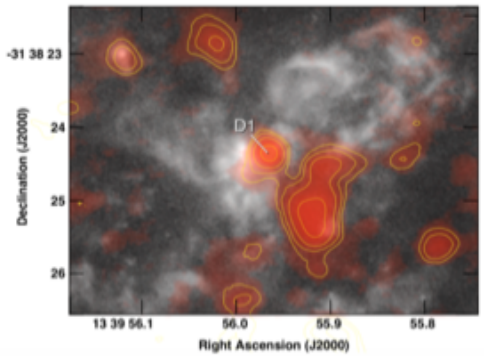
by Portal Admin — last modified Nov 30, 2017 09:38 PM

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Full Summary...

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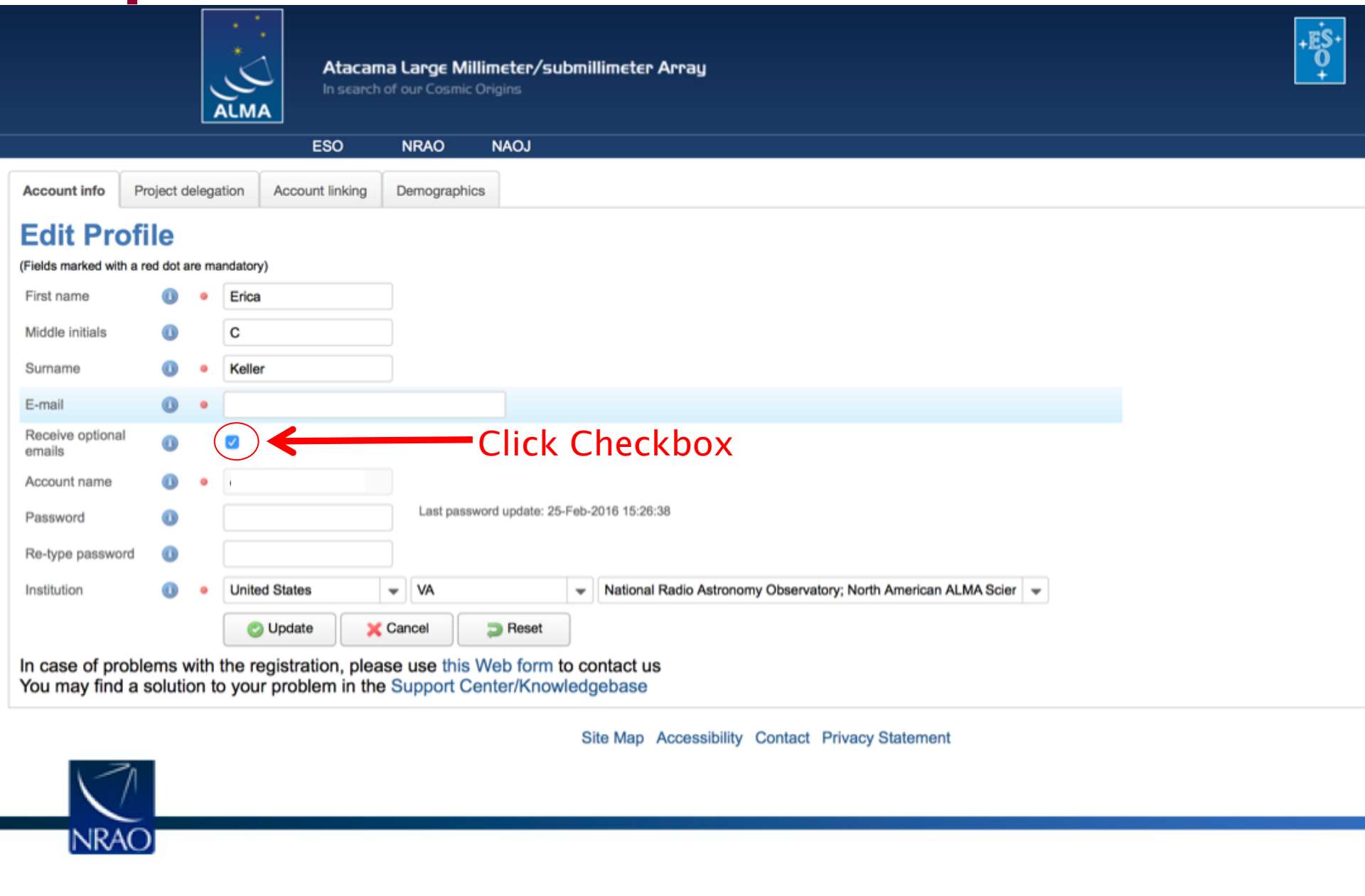
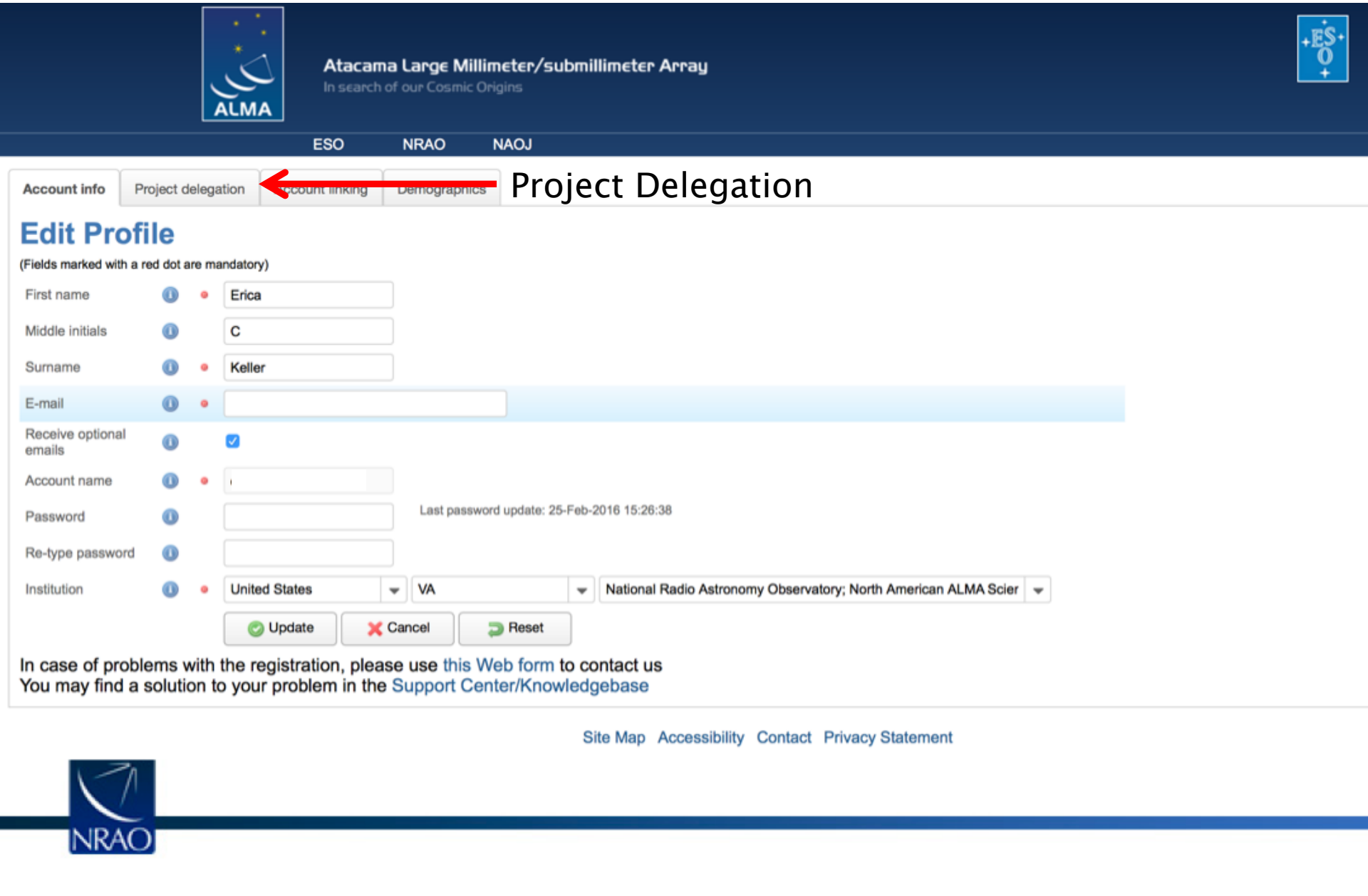


# Data Delivery Email

- Sent when an individual MOUS passes QA2
- Data are ingested into the archive and made available at all Regional Centers
- Triggers Start of Proprietary Period
  - Usually 12 months
- Only Sent to PI
- Included Metadata:
  - MOUS ID, Scheduling Block (SB) name, project title
- Included Instructions:
  - Downloading data
  - Delegating access for registered ALMA users
- Included Descriptions:
  - Proprietary period


Atacama Large Millimeter/submillimeter Array
In search of our Cosmic Origins
ESO NRAO NAOJ
Account info
Project delegation
Project Delegation
Edit Profile
(Fields marked with a red dot are mandatory)
First name
Erica
Middle initials
C
Surname
Keller
E-mail
Receive optional emails
Account name
Password
Last password update: 25-Feb-2016 15:26:38
Re-type password
Institution
United States
VA
National Radio Astronomy Observatory; North American ALMA Scier
Update
Cancel
Reset
In case of problems with the registration, please use this Web form to contact us
You may find a solution to your problem in the Support Center/Knowledgebase
Site Map Accessibility Contact Privacy Statement

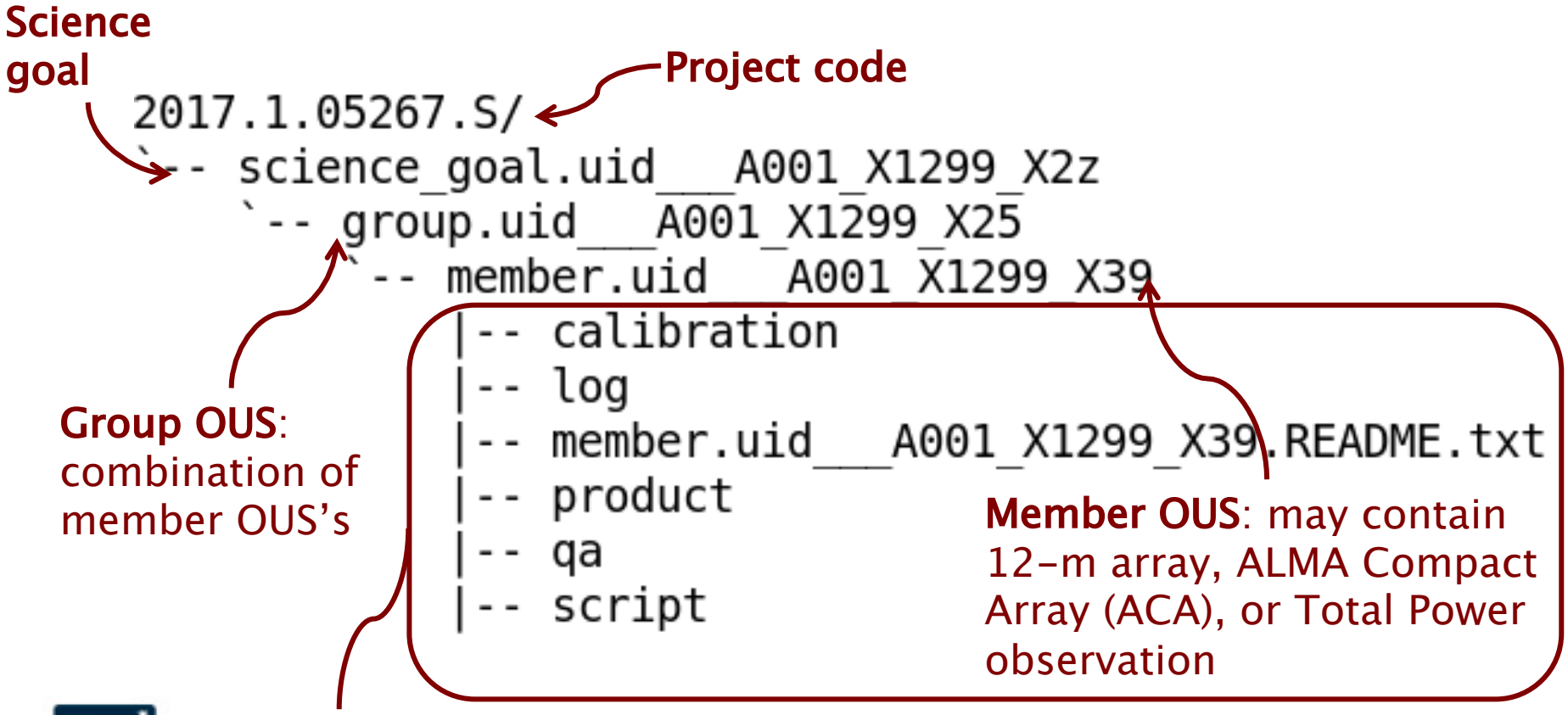
# Data Delivery Email

- Included Links:
  - Archive query for MOUS package
  - Fully-calibrated MS (North America Only)
  - CASA download and mailing lists

- Publication Requirements:
  - ALMA acknowledgement
  - ARC specific acknowledgement
- Additional Support:
  - Funded face-to-face reduction visits to your home ARC
  - Contact info for ARC Helpdesk

# QA2 Data Products Package: the processed data

After un-tarring the processed data we have a directory tree:



# QA2 Data Products Package: the processed data

## Calibration Directory:

**Calibration tables generated by the pipeline**

**Contains manual flagging commands, continuum selection, flux measurements for calibrators**

```
|-- calibration
|    |-- member.uid___A001_X1299_X39.hifa_calimage.auxproducts.tgz
|    |-- member.uid___A001_X1299_X39.session_1.auxcaltables.tgz
|    |-- member.uid___A001_X1299_X39.session_1.caltables.tgz
|    |-- uid___A002_Xc8ed15_X1a9.ms.calapply.txt
|    |-- uid___A002_Xc8ed15_X1a9.ms.flagversions.tgz
|    `-- uid___A002_Xc8ed15_X1a9_target.ms.auxcalapply.txt
```

**All flags will be restored during calibration**

# QA2 Data Products Package: the processed data

## Calibration Products:

Log of equivalent CASA commands (non-executable)

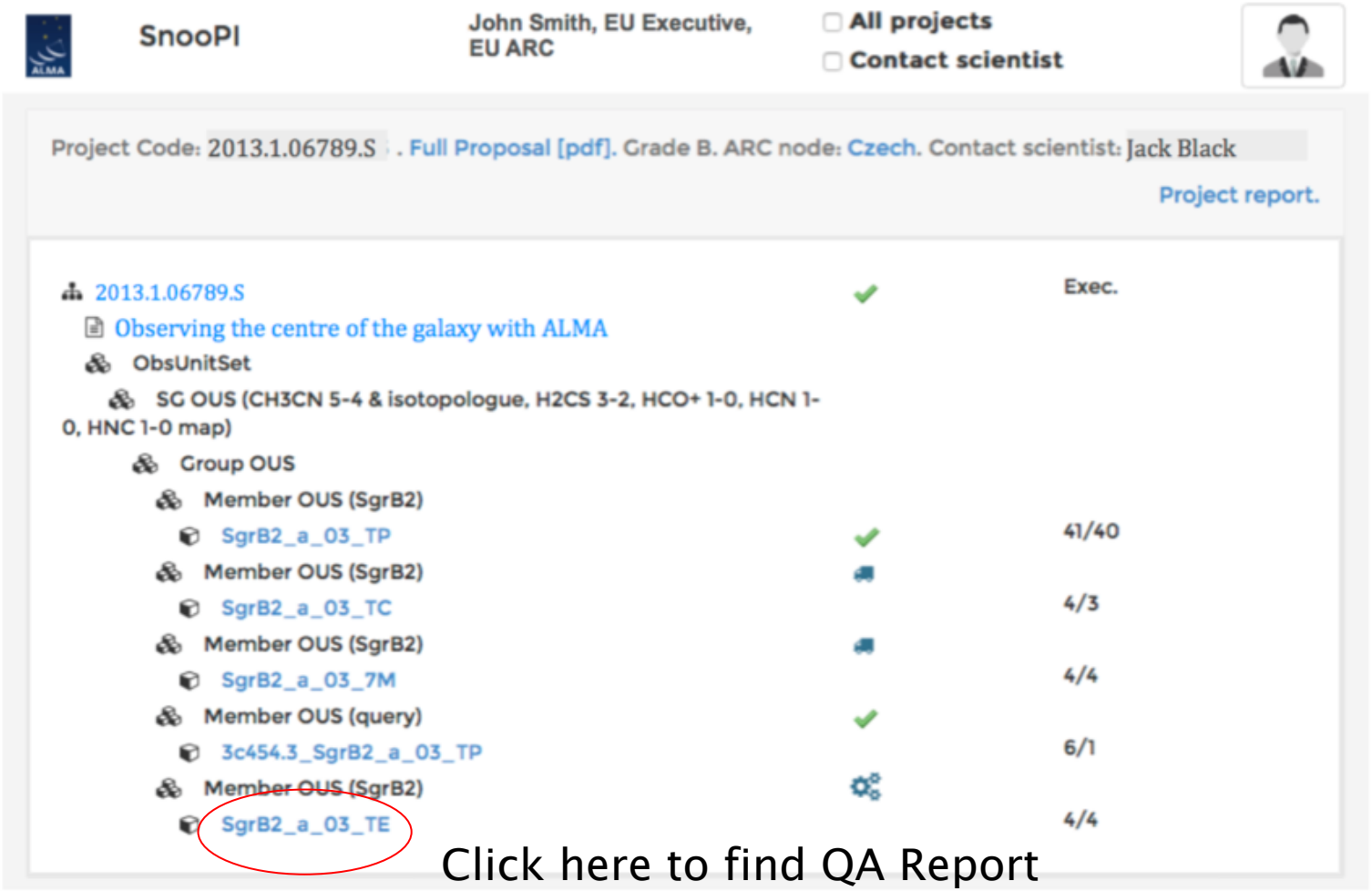
```
|
|-- log
|    `-- member.uid___A001_X1299_X39.hifa_calimage.casa_commands.log
|-- member.uid___A001_X1299_X39.README.txt
|-- product
|    |-- member.uid___A001_X1299_X39.SOURCE_sci.spw25_27_29_31.cont.I.pb.fits
|    |-- member.uid___A001_X1299_X39.SOURCE_sci.spw25_27_29_31.cont.I.pbcor.fits
|    |-- member.uid___A001_X1299_X39.SOURCE_sci.spw25.cube.I.mask.fits
|    |-- member.uid___A001_X1299_X39.SOURCE_sci.spw25.cube.I.pbcor.fits
|    |-- member.uid___A001_X1299_X39.SOURCE_sci.spw25.cube.I.pb.fits.gz
|    |-- member.uid___A001_X1299_X39.J0117p1418_ph.spw31.mfs.I.pbcor.fits
|    `-- member.uid___A001_X1299_X39.J0117p1418_ph.spw31.mfs.I.pb.fits.gz
```

Directions to access QA comments and restoration instructions

Calibration and Target images produced during reduction (may be representative)

# Monitor Project Status: *SnooPI*

## Single Project View:




Click here to find QA Report

# QA2 Data Products Package: the processed data

## Calibration Scripts and Weblog:

**Weblog contains plots and images from reduction and imaging. Unpack this for lots of information!**

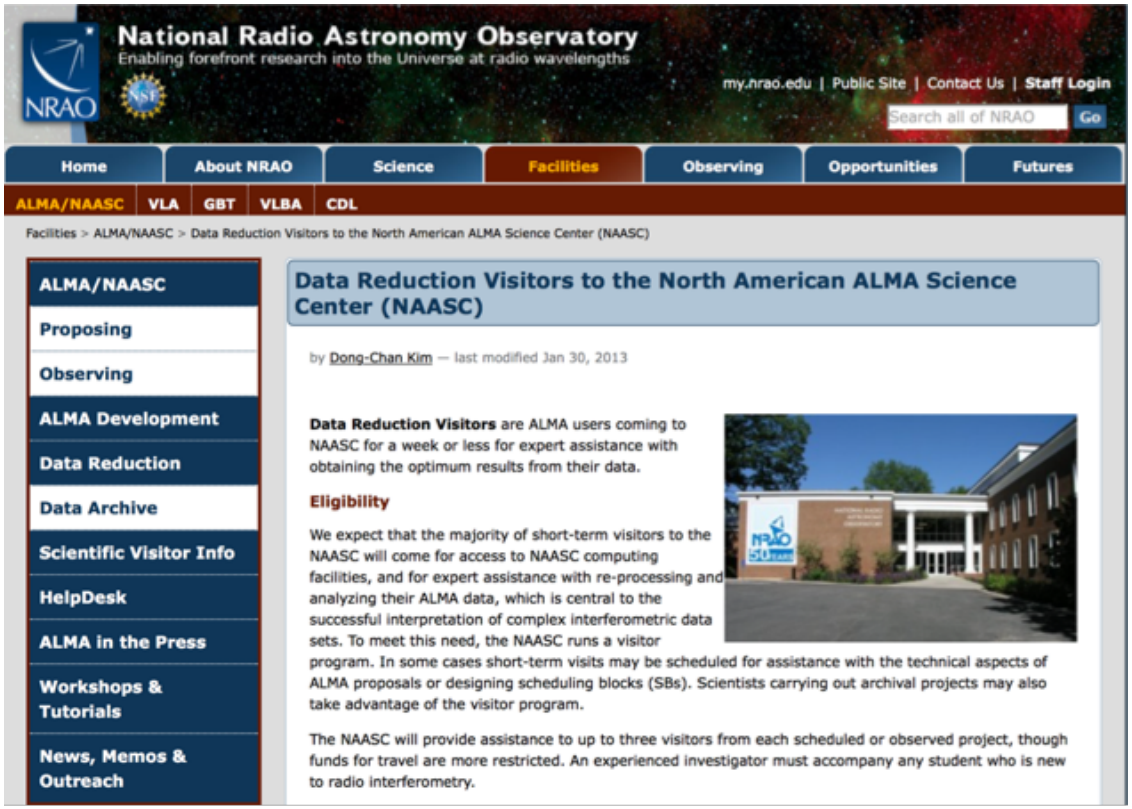
```
|-- qa
|   `-- member.uid___A001_X1299_X39.hifa_calimage.weblog.tgz
`-- script
    |-- member.uid___A001_X1299_X39.calimage.pipeline_manifest.xml
    |-- member.uid___A001_X1299_X39.calimage.product_rename.txt
    |-- member.uid___A001_X1299_X39.hifa_calimage.casa_piperestorescript.py
    |-- member.uid___A001_X1299_X39.hifa_calimage.casa_pipescript.py
    |-- member.uid___A001_X1299_X39.hifa_calimage.pprequest.xml
    `-- member.uid___A001_X1299_X39.scriptForPI.py
```

**Run scriptForPI.py to restore calibration**

**Commands to re-run the pipeline**

# Resources After Delivery

- HelpDesk
- Face to Face visits in Charlottesville: https://science.nrao.edu/facilities/alma/visitors-shortterm



ALMA

## For more info:

https://almascience.nrao.edu/

The Atacama Large Millimeter/submillimeter Array (ALMA), an international astronomy facility, is a partnership of Europe, North America and East Asia in cooperation with the Republic of Chile. ALMA is funded in Europe by the European Organization for Astronomical Research in the Southern Hemisphere (ESO), in North America by the U.S. National Science Foundation (NSF) in cooperation with the National Research Council of Canada (NRC) and the National Science Council of Taiwan (NSC), and in East Asia by the National Institutes of Natural Sciences (NINS) of Japan in cooperation with the Academia Sinica (AS) in Taiwan. ALMA construction and operations are led on behalf of Europe by ESO, on behalf of North America by the National Radio Astronomy Observatory (NRAO), which is managed by Associated Universities, Inc. (AUI), and on behalf of East Asia by the National Astronomical Observatory of Japan (NAOJ). The Joint ALMA Observatory (JAO) provides the unified leadership and management of the construction and operation of ALMA.

NRAO