EUROPEAN ARC
ALMA Regional Centre

ALMA Operations and the European ALMA Regional Centre

interaction with and support to the users

Paola Andreani

Astrochemistry school, Bologna, June 13-17 2011

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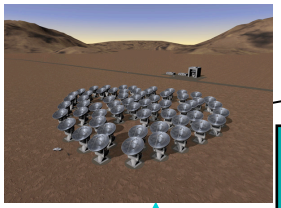
ALMA Operations Sites in Chile



Antenna Operations Site (AOS)

60 MB/s (peak)

6 MB/s (average)

Operation Support Facility (OSF)

Santiago Central Office (SCO)

array scheduling + operations
quick-look, maintenance and repair

issues of calls
PRC process
SB checks
pipeline data reduction
quality assessment
Population of the archive

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High-level concepts for Science Operations

- Observations only in service observing mode with flexible (dynamic) scheduling.
- Observations 24h/day interrupted by maintenance periods.
- All observations executed in the form of scheduling blocks (SBs).
- Default output: reliable images, calibrated according to the calibration plan.
- The Joint ALMA Observatory (JAO) is responsible for the data product quality.
- All science and calibration raw data are captured and archived.

as in the ALMA Operations Plan

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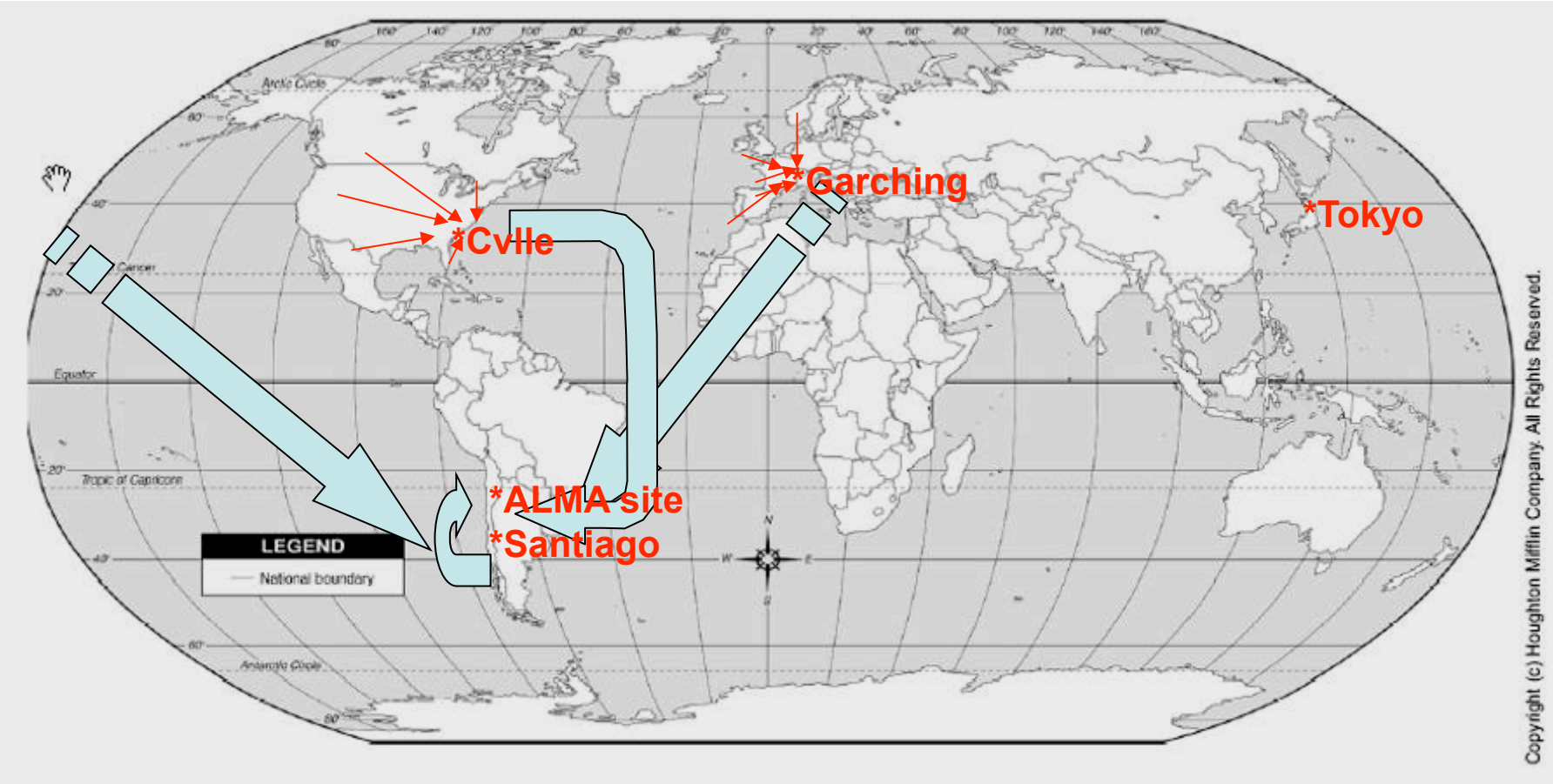
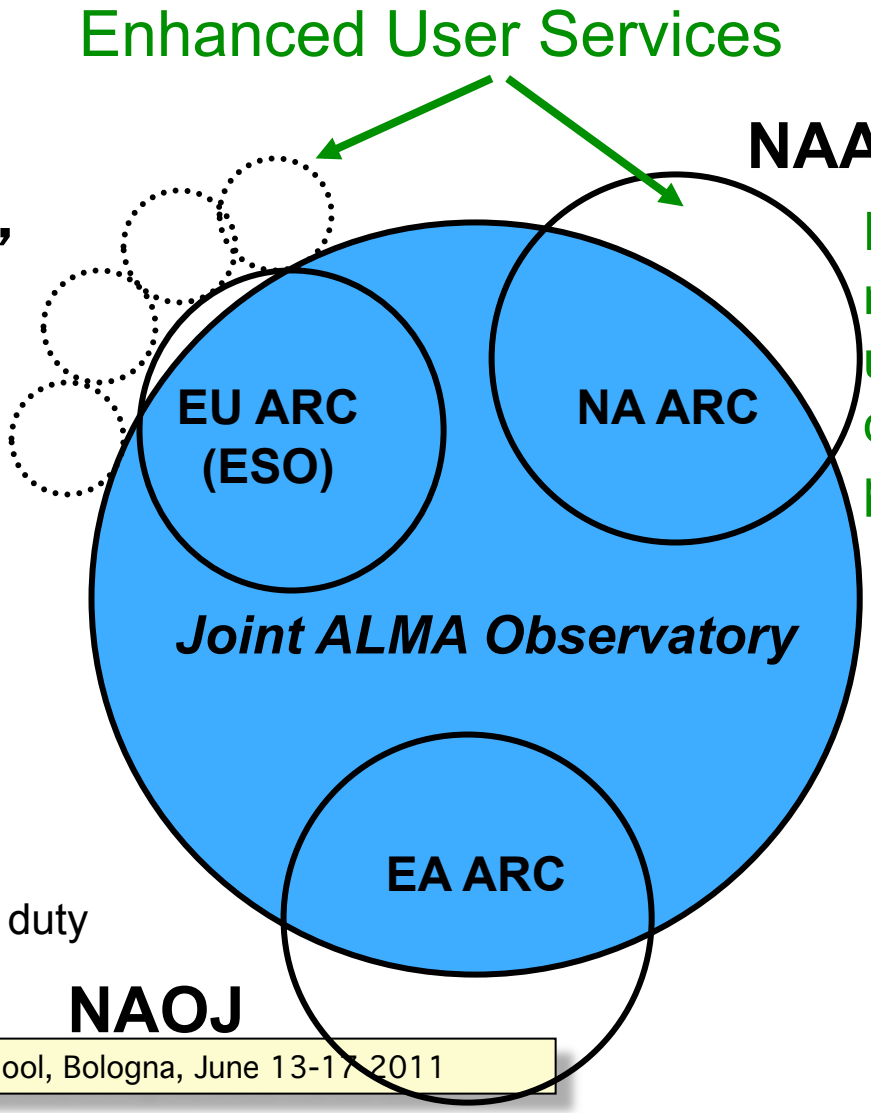
ALMA Science Operations sites
OSF, Santiago and the ARCs



ALMA Operations: Three ALMA Regional Centres - ARCs



Enhanced services are needed to provide advanced user support, algorithm development, student programs, EPO, grants

ARCs provide
user interface,
archive,
software tools
data delivery

Astronomers on duty

JAO (Science Operations) provides:
- Array operations
- Scheduling of projects
- Execution of observations
- Data quality assurance and trend analysis
- Calibration plan maintenance
- Delivery of data to the archives
- Archive operations
- Pipeline operations

Applying for ALMA time: The Science Portal: single sign-on

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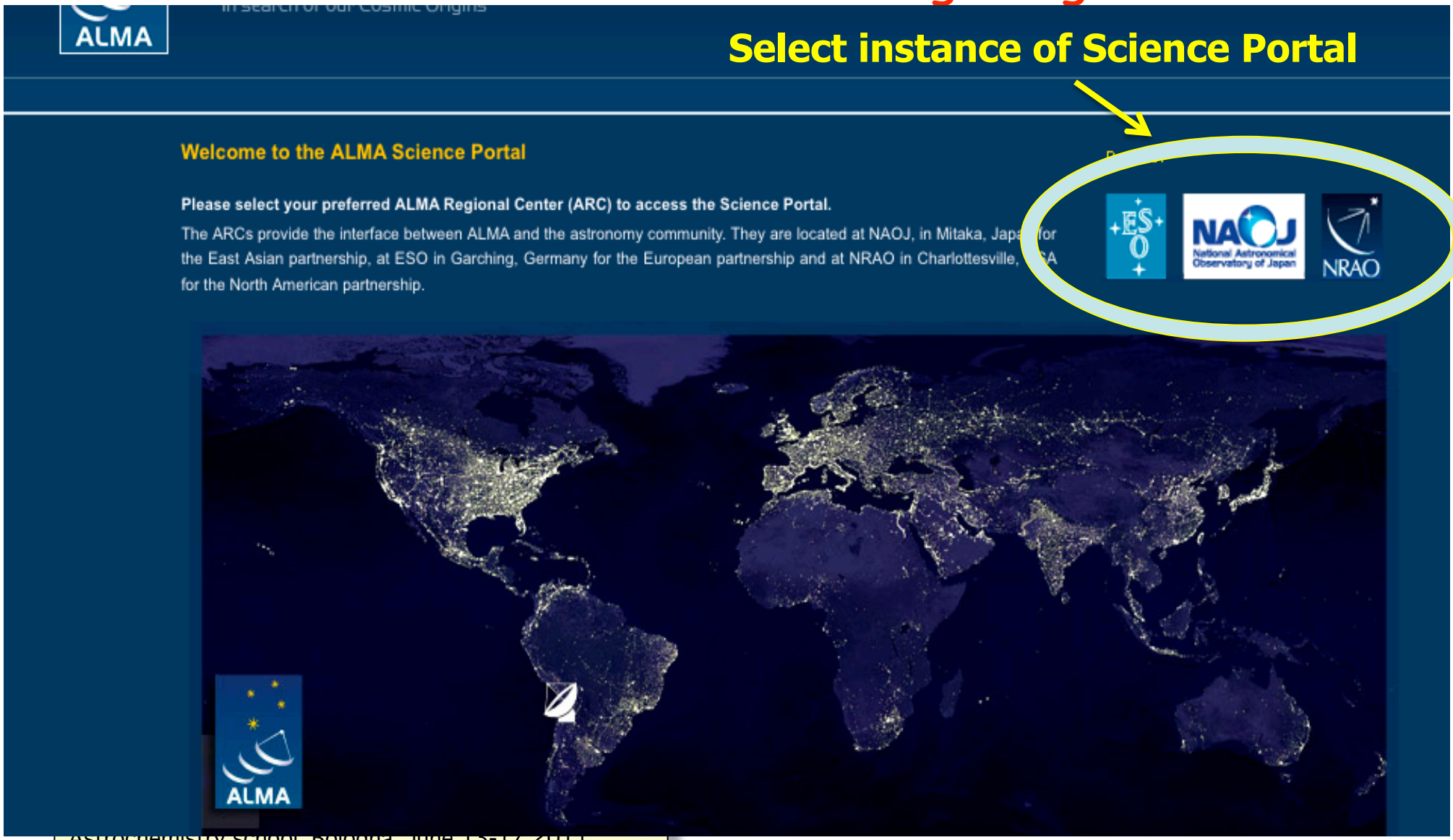


ALMA
Search Site
Portals: ESO NRAO NAOJ
Log in Register Reset password
Welcome to the ALMA Science Portal at ESO
About ALMA
ALMA Science
Call for Proposals
ALMA Data
Documents & Tools
User Services at ARCs
Helpdesk
ALMA@ESO
ALMA@NRAO
ALMA@NAOJ
Switch science portals
Access ALMA user documents, tools, technical information
Access helpdesk or ARC webpages
Local ARC news
Overview
The Atacama Large Millimeter/submillimeter Array (ALMA) is a major new facility for world astronomy. When completed in 2013, ALMA will consist of a giant array of 12-m antennas, with baselines up to 16 km, and an additional compact array of 7-m and 12-m antennas to greatly e
that cover atmospheric windows
d in 2013. Science observations
laboration between Europe, Eas
the About ALMA link in the left
This is the website for The ALMA Science Portal, served from one of the ALMA Regional Centers (ARCs) of the ALMA p
ay switch between the different instances of the portal through the links
rough this portal you can find details about the technical capabilities of ALMA, how to
ALMA data. It includes links to all official ALMA documents and tools, including those
cessing ALMA data. In order to access some of the tools, users must register with the
top banner.
Each of the three ARCs provides additional User Services, including a Helpdesk for all user queries. Each ARC maintains additional web pages with information on region-specific user services, such as visitor and student programs, schools, workshops, financial programs and public outreach activities. These are accessed via the links under the User Services at the ARCs area in the
General News
ALMA Cycle 0 Call for Proposals is now open
Mar 30, 2011
More...
Local News
invites applications for an indefinite Staff Astronomer position.
Feb 16, 2011
ALMA Community Days 6-7 April 2011: Towards Early Science
Dec 17, 2010
ESO Takes Delivery of State-of-the-art Receiver
Leiden, Netherlands, 20-21 April 2011
Dec 10, 2010
ESO hands over the ALMA Santiago Central Office headquarters to the Joint ALMA Observatory

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ALMA Road Map

- **ALMA Cycle 0 Proposers' guide**
- **Proposal planning**
  - ✓ Observing with ALMA: primer
  - ✓ ALMA scientific calculator
  - ✓ Notice of intent (it was **not mandatory**, you can still submit your proposal, valid only for cycle 0)

- **Proposal preparation (Phase I)**
- ALMA Observing Tool
  - documentation:
    - ✓ OT Phase I quickstart guide
    - ✓ OT User Manual
    - ✓ Video tutorials
- ALMA Simulator(s): simdata + OST

ALMA sensitivity calculator

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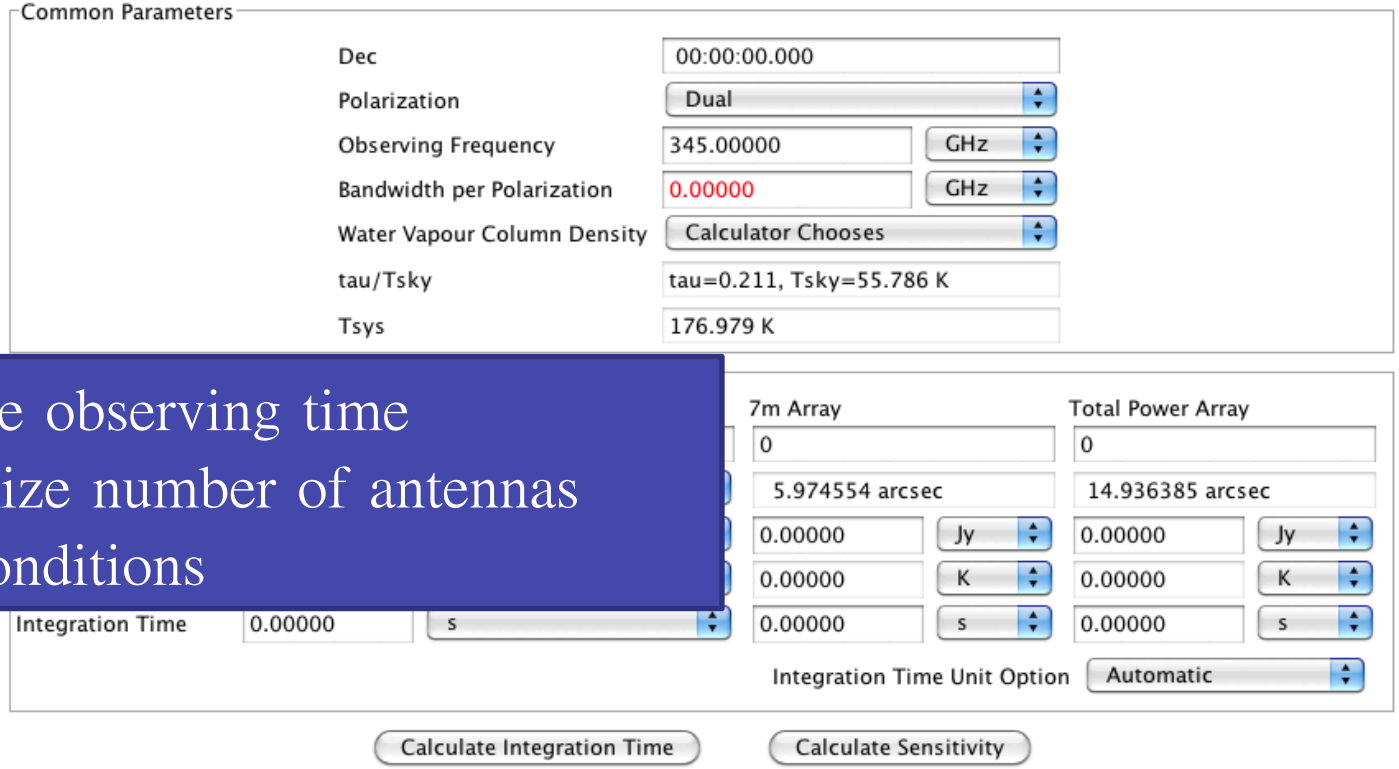
Sensitivity Calculator

This tool will calculate the necessary integration times for a given sensitivity (or vice versa) for your ALMA observing project. Input and output parameters are explained below. Additional information is available to users on the valid range for each parameter by hovering your mouse pointer over each field in the calculator applet (this does not currently work in Safari). The ALMA Sensitivity Calculator Guide gives a brief description of how the ASC works.

The calculator defaults to the number of antennas available during Cycle 0, but the user can select a higher number of antennas in order to compare the capability in future cycles. **The resulting integration times refer only to the on-source time and do not take any kind of overheads into account.** Furthermore, the ASC calculates the integration time/sensitivity for a single pointing. The case of pointed mosaics is discussed in the Technical Guide.

A Java Plug-in must be installed in order to run the calculator. If the calculator is not displayed, then it is likely that this plug-in is not installed. Instructions for installing the plug-in may vary, depending on the browser and operating system used. A Plug-in compatible with the Java Development Kit version1.5 or 1.6 (i.e. Java 5 or 6) is required. Users should contact their local IT department for installation help if necessary.



Estimate observing time
Customize number of antennas
Vary conditions

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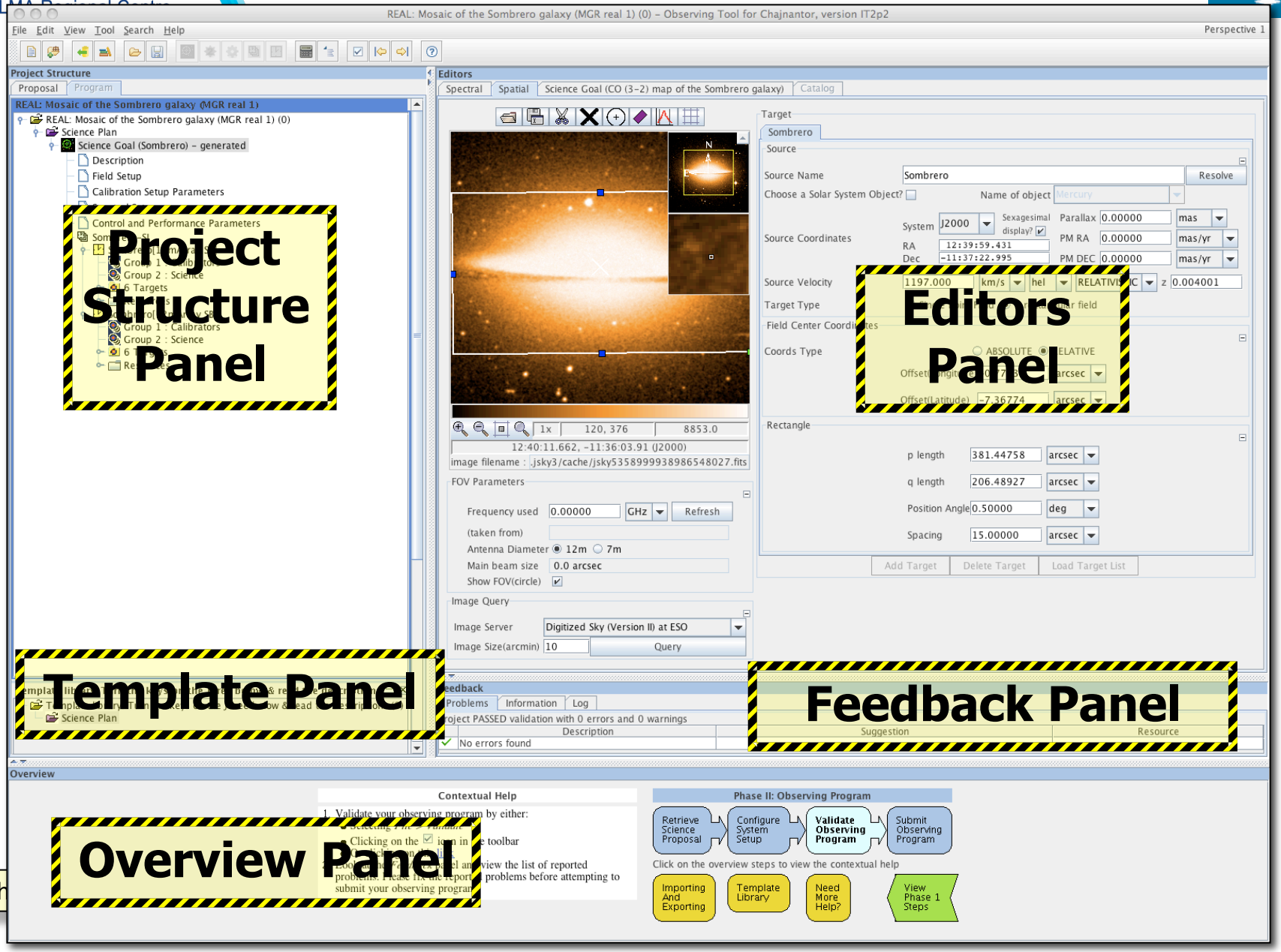
Quick OT overview

- OT is used to prepare ALMA proposals
  - Scientific intent is captured in a Science Goal
    - Angular resolution, sensitivity, largest angular scale, frequencies, etc.
  - A Science Goal is designed to be novice user-friendly
- OT is also used to prepare the telescope runfiles
  - These are called Scheduling Blocks
    - They are automatically generated from the Science Goals
  - SBs are designed to be infinitely configurable by experts

The ALMA observing tool



Astroch

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ALMA road map

- **Proposal Review Process**
  - International review committee → scientific merit
  - ARC/JAO staff → technical feasibility
- **Phase II**
  - Successful PIs submit observing programme using the Observing Tool
  - Preparation of the scheduling blocks
  - European ARC helps with observation planning and validates observing schedule
- **Observations**
- **Data reduction**

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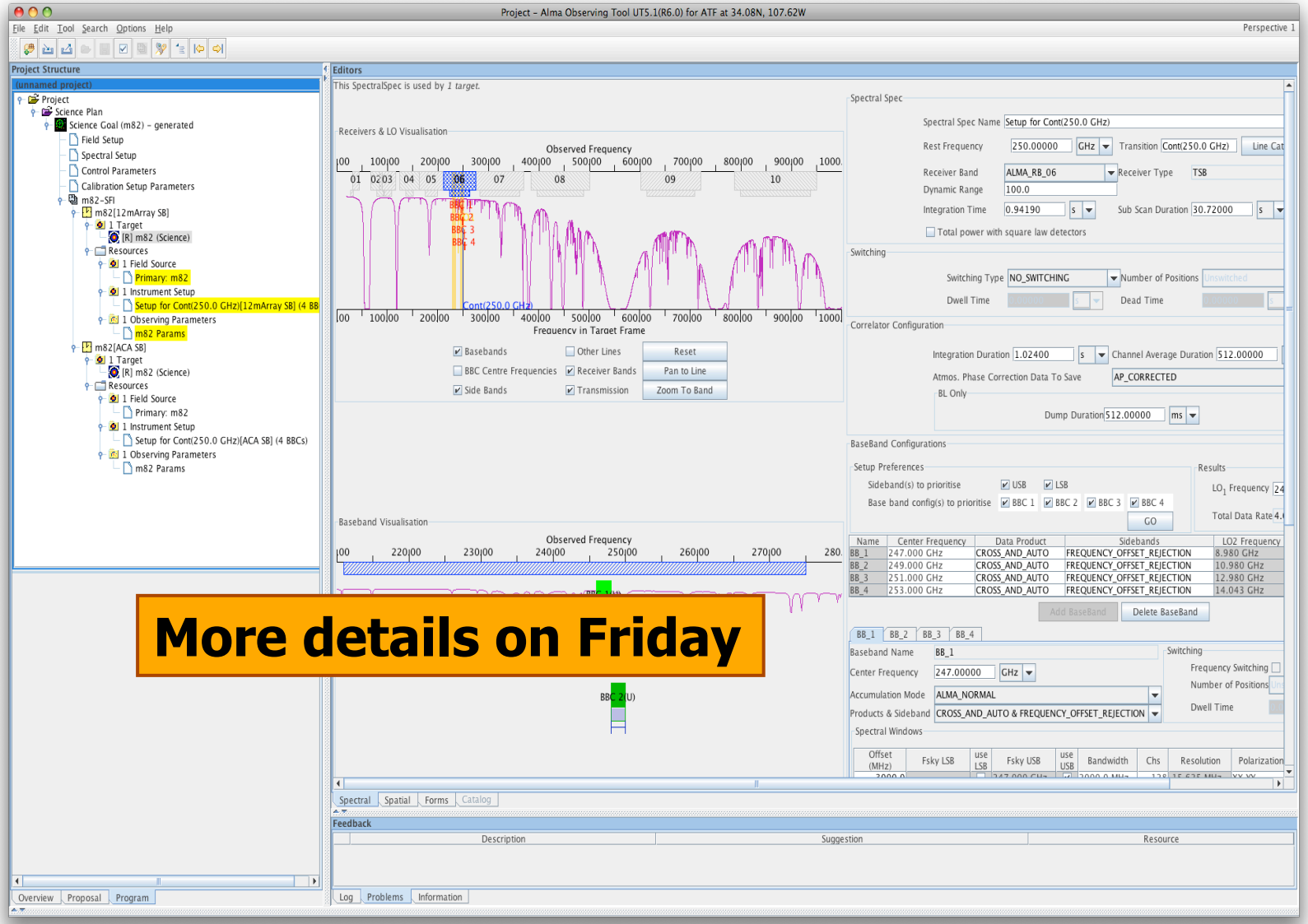
The ALMA observing tool



More details on Friday

Astrochemistry school, Bologna, June 13-17 2011

Simulating the observations: simdata

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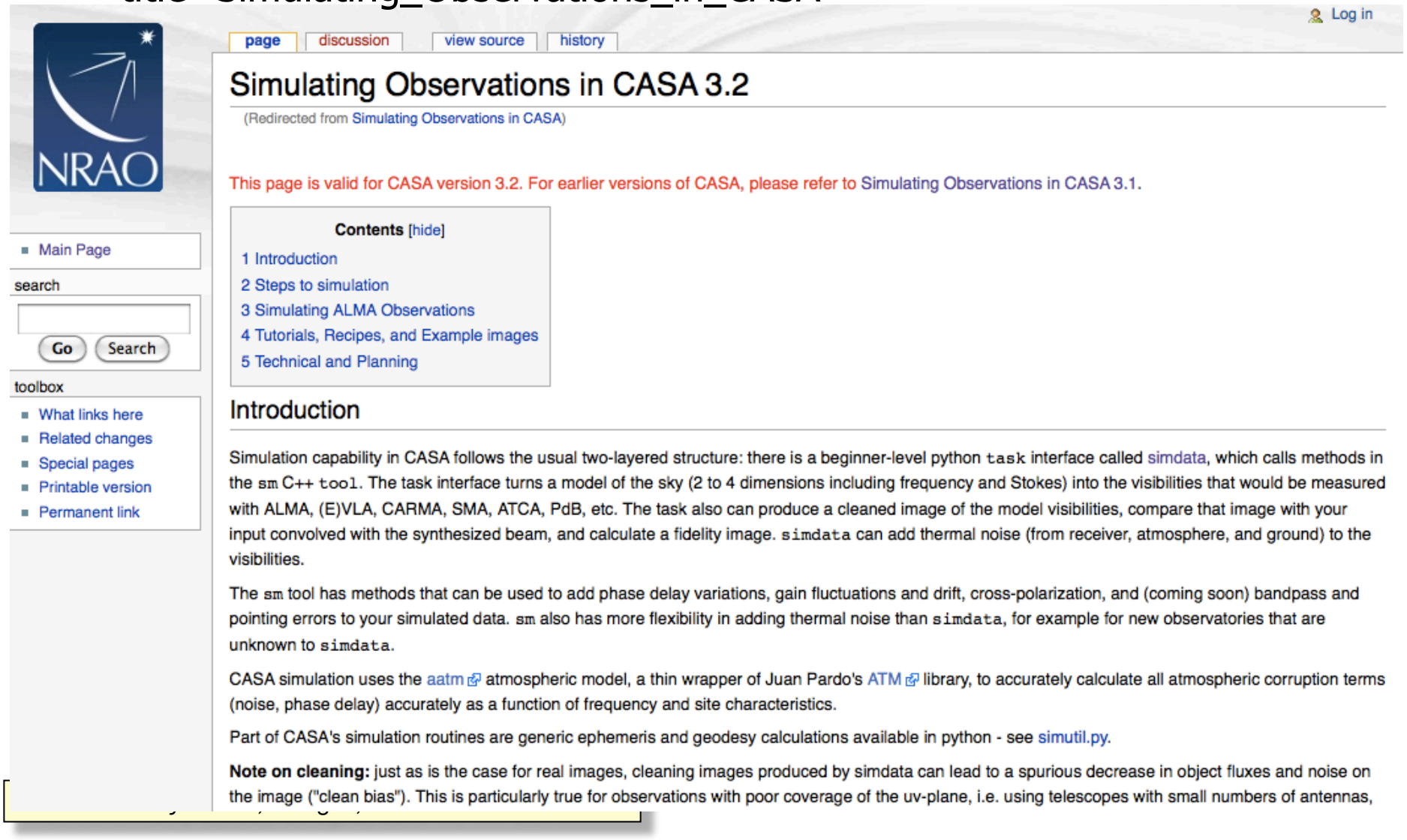
http://casaguides.nrao.edu/index.php?title=Simulating_Observations_in_CASA



Log in

page | discussion | view source | history

Simulating Observations in CASA 3.2

(Redirected from Simulating Observations in CASA)

This page is valid for CASA version 3.2. For earlier versions of CASA, please refer to Simulating Observations in CASA 3.1.

Contents [hide]

1 Introduction
2 Steps to simulation
3 Simulating ALMA Observations
4 Tutorials, Recipes, and Example images
5 Technical and Planning

- Main Page

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toolbox

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- Related changes
- Special pages
- Printable version
- Permanent link

Introduction

Simulation capability in CASA follows the usual two-layered structure: there is a beginner-level python `task` interface called simdata, which calls methods in the `sm` C++ `tool`. The task interface turns a model of the sky (2 to 4 dimensions including frequency and Stokes) into the visibilities that would be measured with ALMA, (E)VLA, CARMA, SMA, ATCA, PdB, etc. The task also can produce a cleaned image of the model visibilities, compare that image with your input convolved with the synthesized beam, and calculate a fidelity image. `simdata` can add thermal noise (from receiver, atmosphere, and ground) to the visibilities.

The `sm` tool has methods that can be used to add phase delay variations, gain fluctuations and drift, cross-polarization, and (coming soon) bandpass and pointing errors to your simulated data. `sm` also has more flexibility in adding thermal noise than `simdata`, for example for new observatories that are unknown to `simdata`.

CASA simulation uses the aatm atmospheric model, a thin wrapper of Juan Pardo's ATM library, to accurately calculate all atmospheric corruption terms (noise, phase delay) accurately as a function of frequency and site characteristics.

Part of CASA's simulation routines are generic ephemeris and geodesy calculations available in python - see simutil.py.

Note on cleaning: just as is the case for real images, cleaning images produced by simdata can lead to a spurious decrease in object fluxes and noise on the image ("clean bias"). This is particularly true for observations with poor coverage of the uv-plane, i.e. using telescopes with small numbers of antennas,

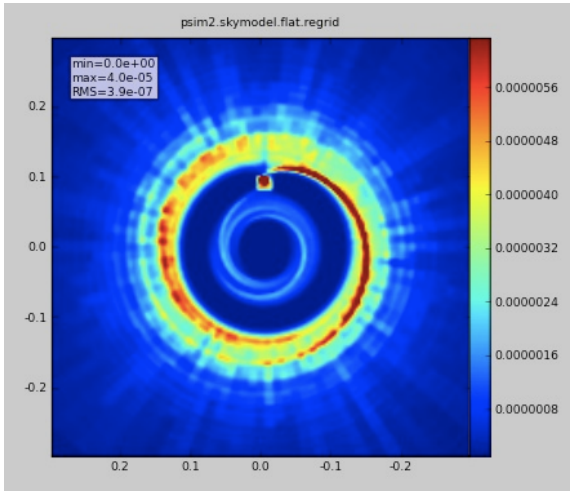
Default simdata parameters

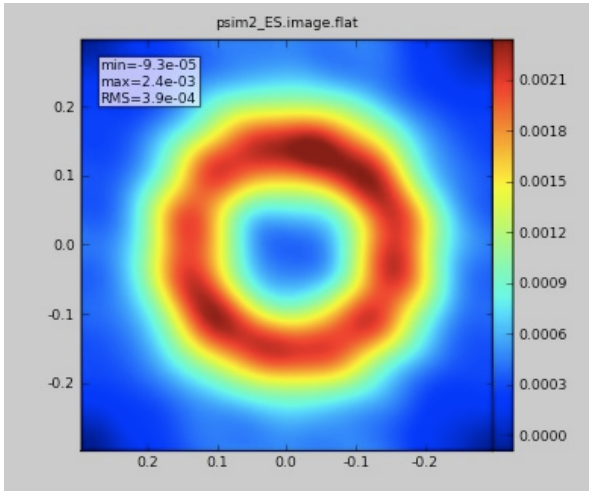
xterm

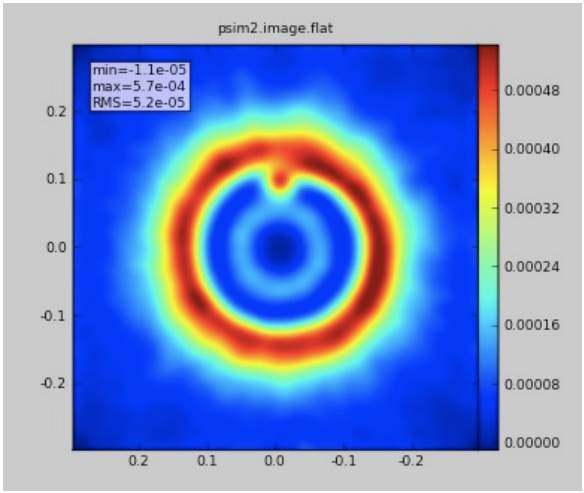
```
CASA <5>: inp
--------> inp()
#  simdata :: mosaic simulation task:
project             =      'sim'        #  root for output file names
modifymodel         =      False        #  modify model image
     skymodel       = '$project.skymodel' #  model image to observe or modify

setpointings        =       True
     integration    =      '10s'        #  integration (sampling) time
     direction      =         ''        #  "J2000 19h00m00 -40d00m00" or "" to center on model
     mapsize        = ['1arcmin', '1arcmin'] #  angular size of map or "" to cover model
     maptype        = 'hexagonal'        #  hexagonal, square, etc
     pointingspacing =  '1arcmin'       #  spacing in between pointings or "" for 0.5 PB

predict             =       True        #  calculate visibilites using ptgfile
     complist       =         ''        #  optional componentlist to observe with skymodel
     compwidth      =     '2GHz'        #  optional bandwidth if simulating from components only
     antennalist    = 'alma.out10.cfg'  #  antenna position file or "" for no interferometric MS
     refdate        = '2012/05/21/22:05:00' #  time/date of observation *see help
     totaltime      =    '7200s'        #  total time of observation
     caldirection   =         ''        #  pt source calibrator [experimental]
     calflux        =      '1Jy'
     sdantlist      =         ''        #  single dish antenna position file or "" for no total power MS
     sdant          =          0        #  single dish antenna index in file

thermalnoise        =         ''        #  add thermal noise: [tsys-atm|tsys-manual|""]
leakage             =        0.0        #  cross polarization
image               =      False        #  (re)image $project.ms to $project.image
analyze             =      False        #  (only first 6 selected outputs will be displayed)
graphics            =   'screen'        #  display graphics at each stage to [screen|file|both|none]
verbose             =      False
overwrite           =      False        #  overwrite files starting with $project
async               =      False        #  If true the taskname must be started using simdata(...)

CASA <6>:
```

Simulating the data
Proto-planetary disk (ALMA band 9)

A simulation by Sebastian Wolf (Wolf and D'Angelo 2005)





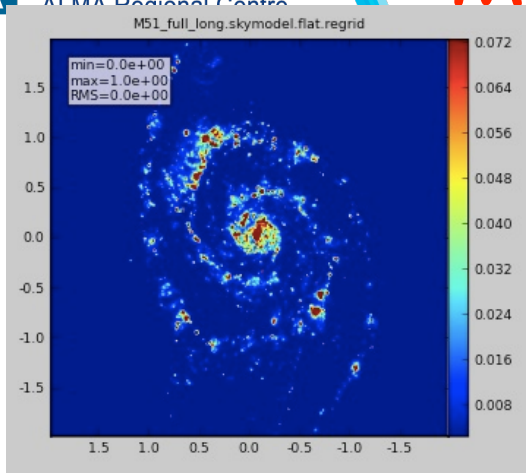


Skymodel

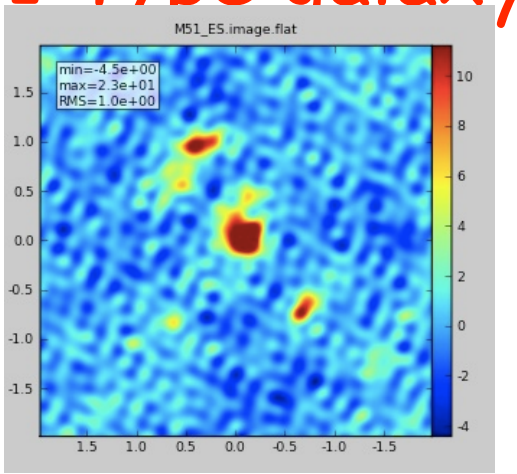
Early Science (30 min)

Full Array (10 mins)

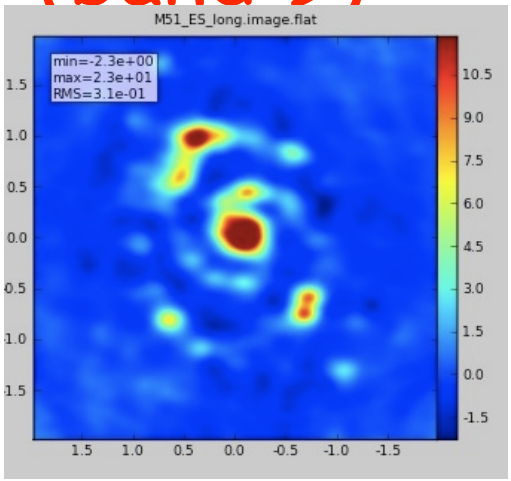
Simulating the data
M51-type galaxy (band 9)



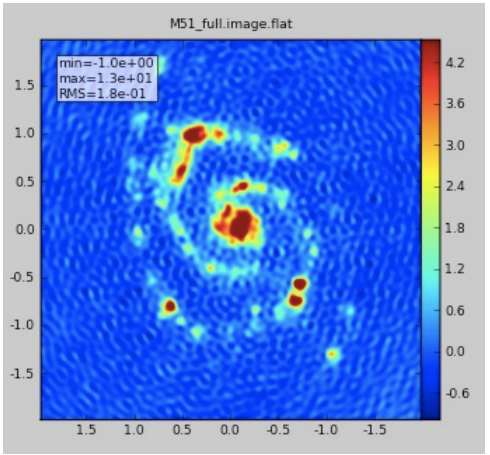
Skymodel



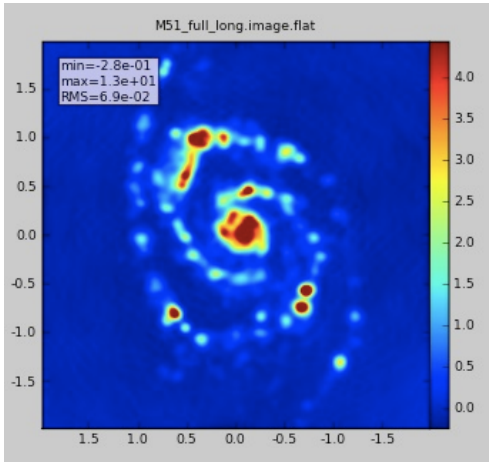
ES (30 min)



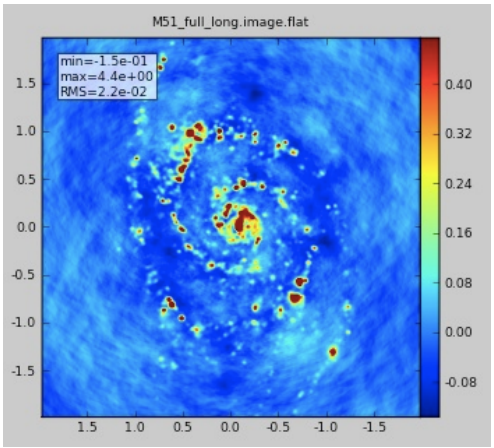
ES (4h)



Full 2 km array (30 min)

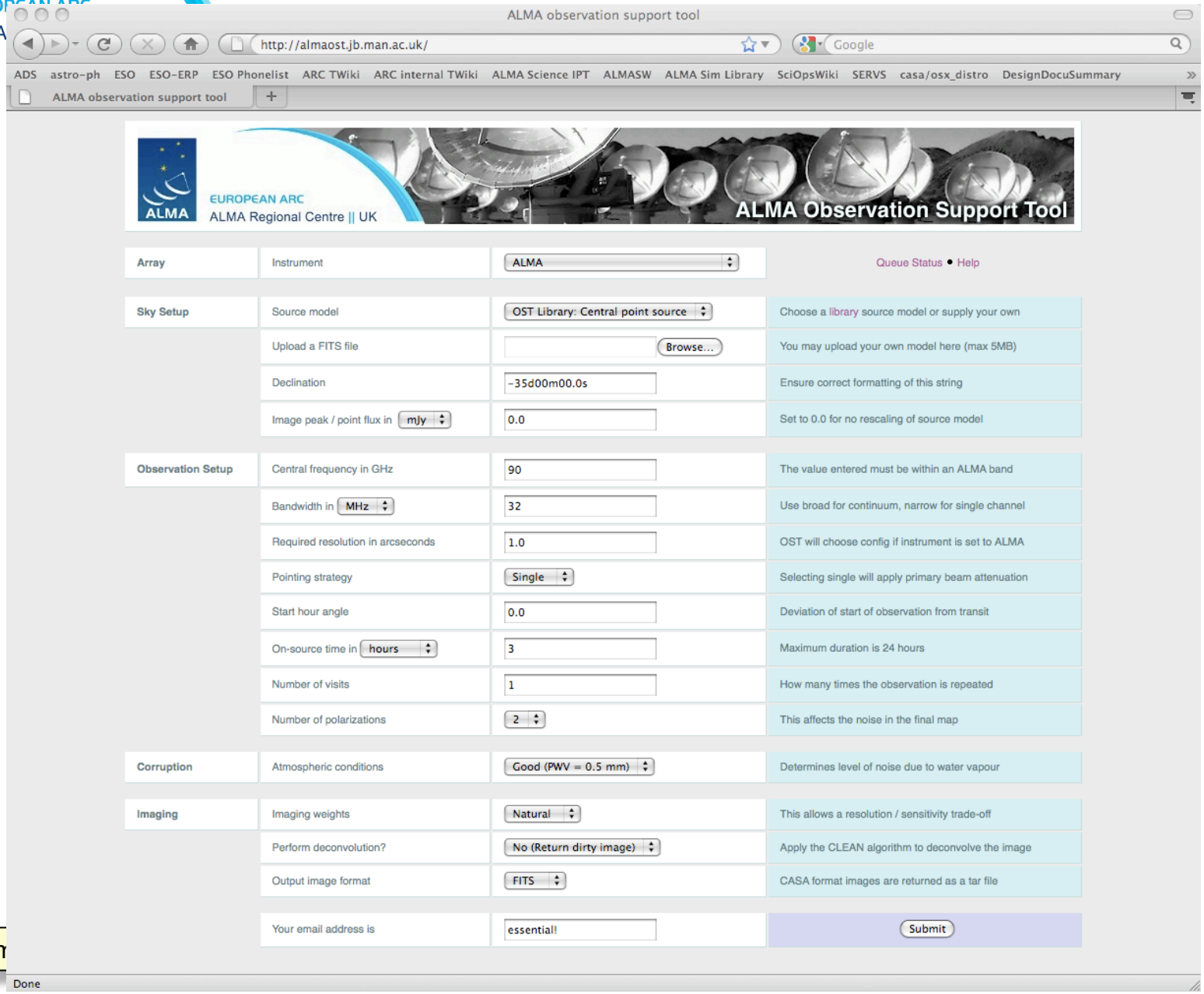


Full 2 km array (4h)



Full 6 km array (4h)

The OST (Observation Support Tool)



Astrochem

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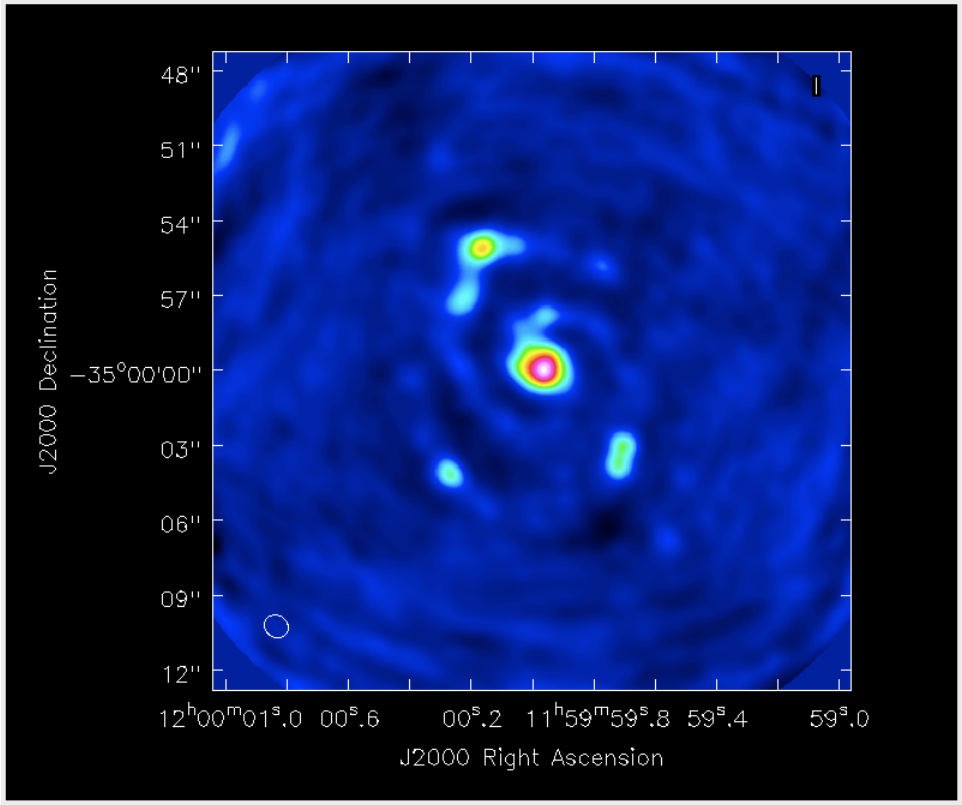
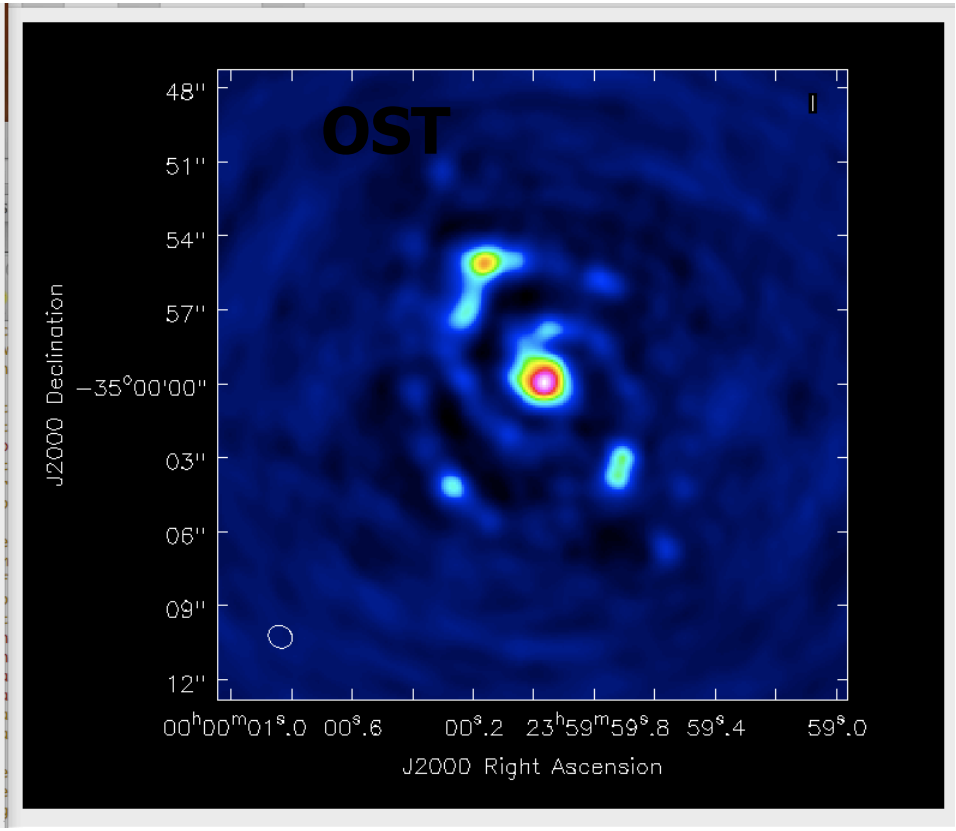
Simdata versus OST: imaging

simdata





M51@z=0.5, Early Science configuration, band 6

Accessing the Helpdesk

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Accessing the Helpdesk

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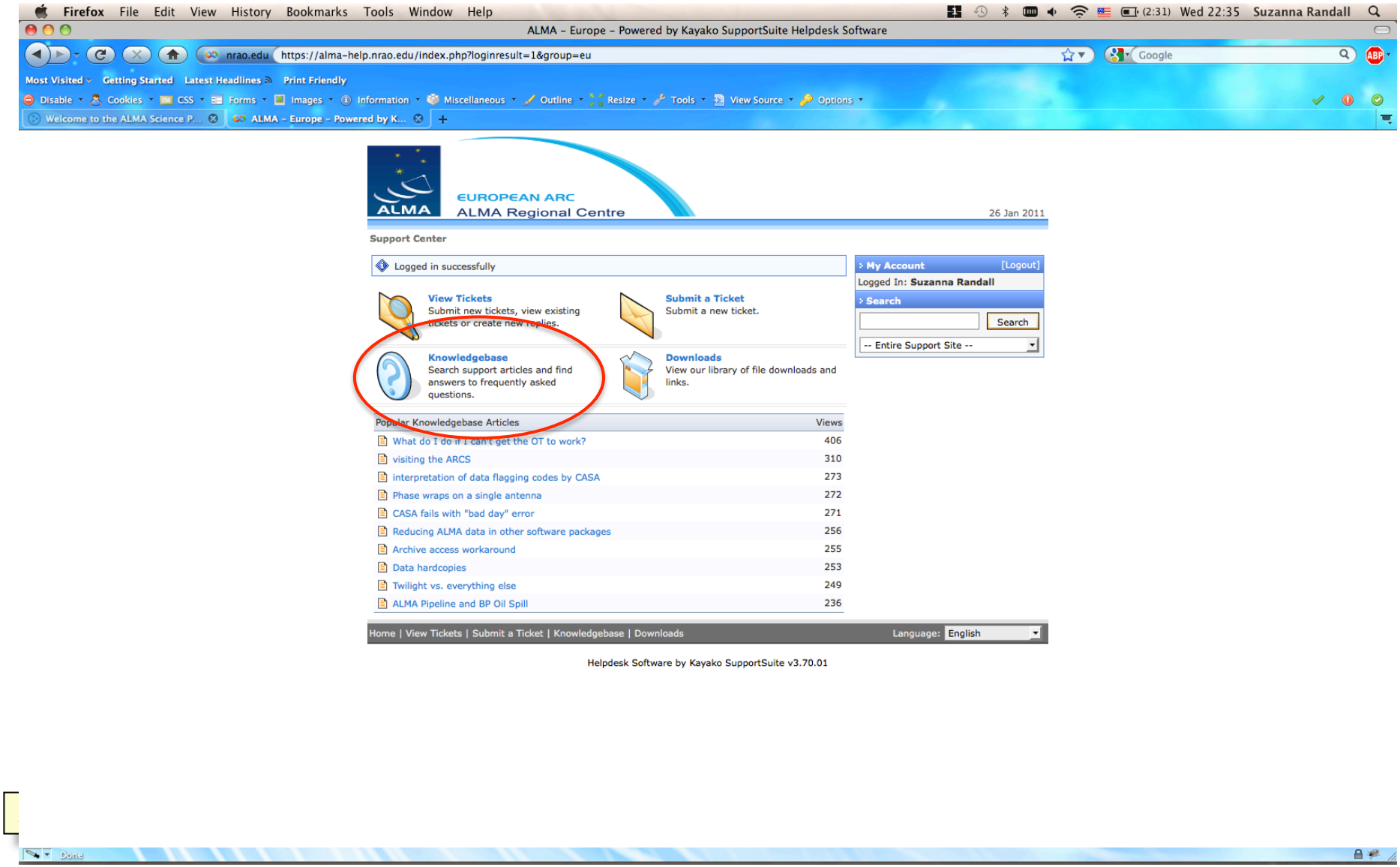
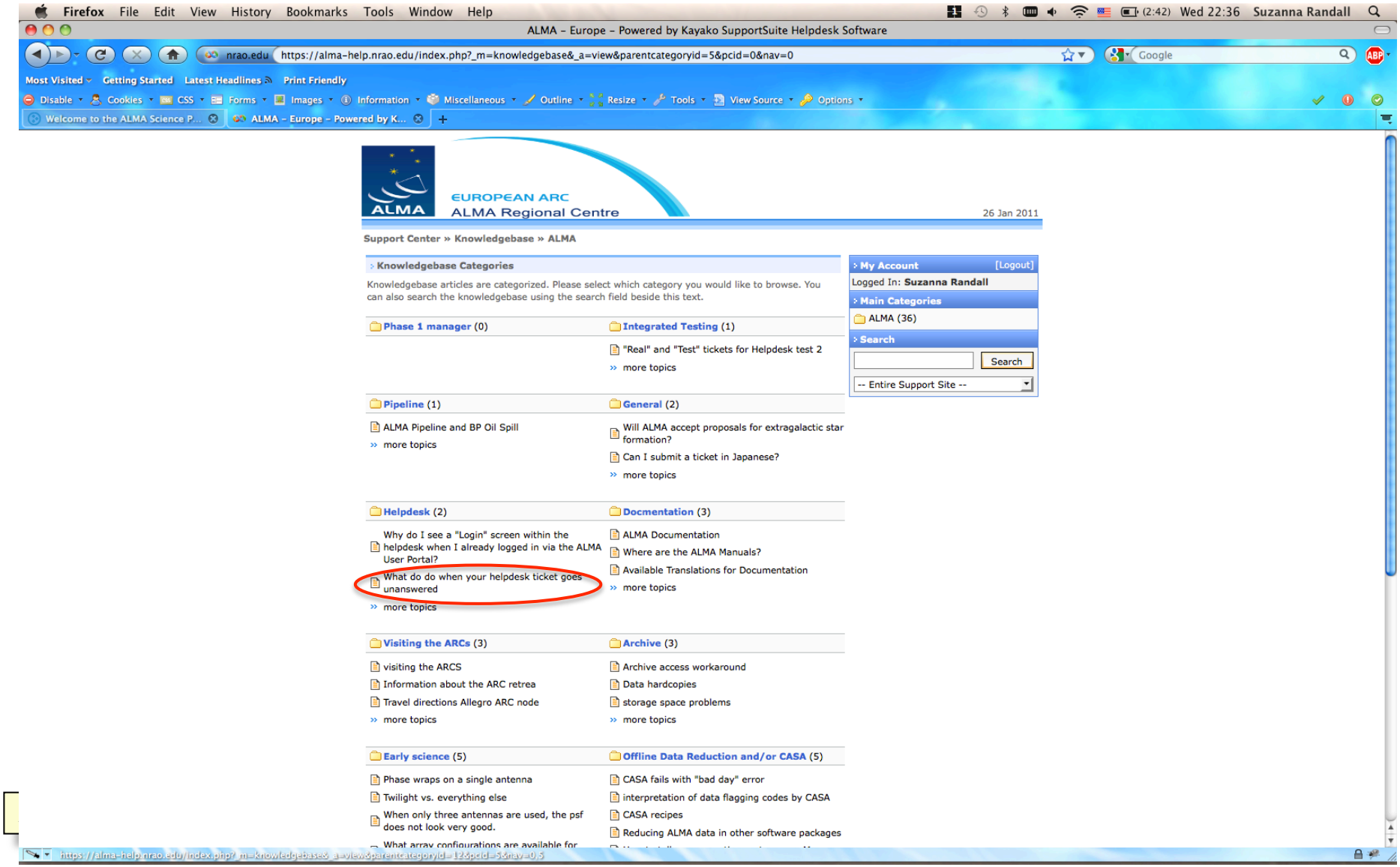
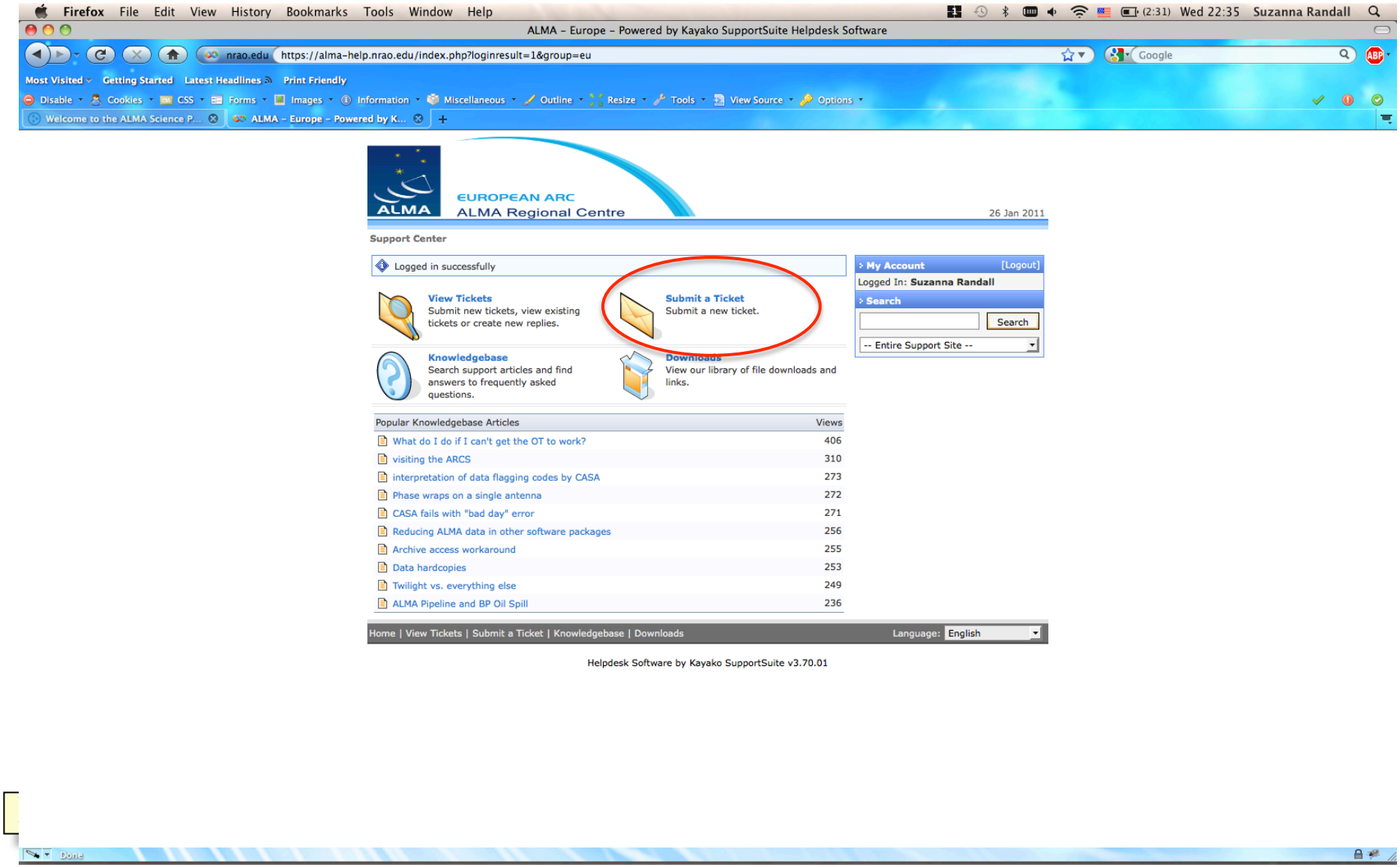
Accessing the Helpdesk



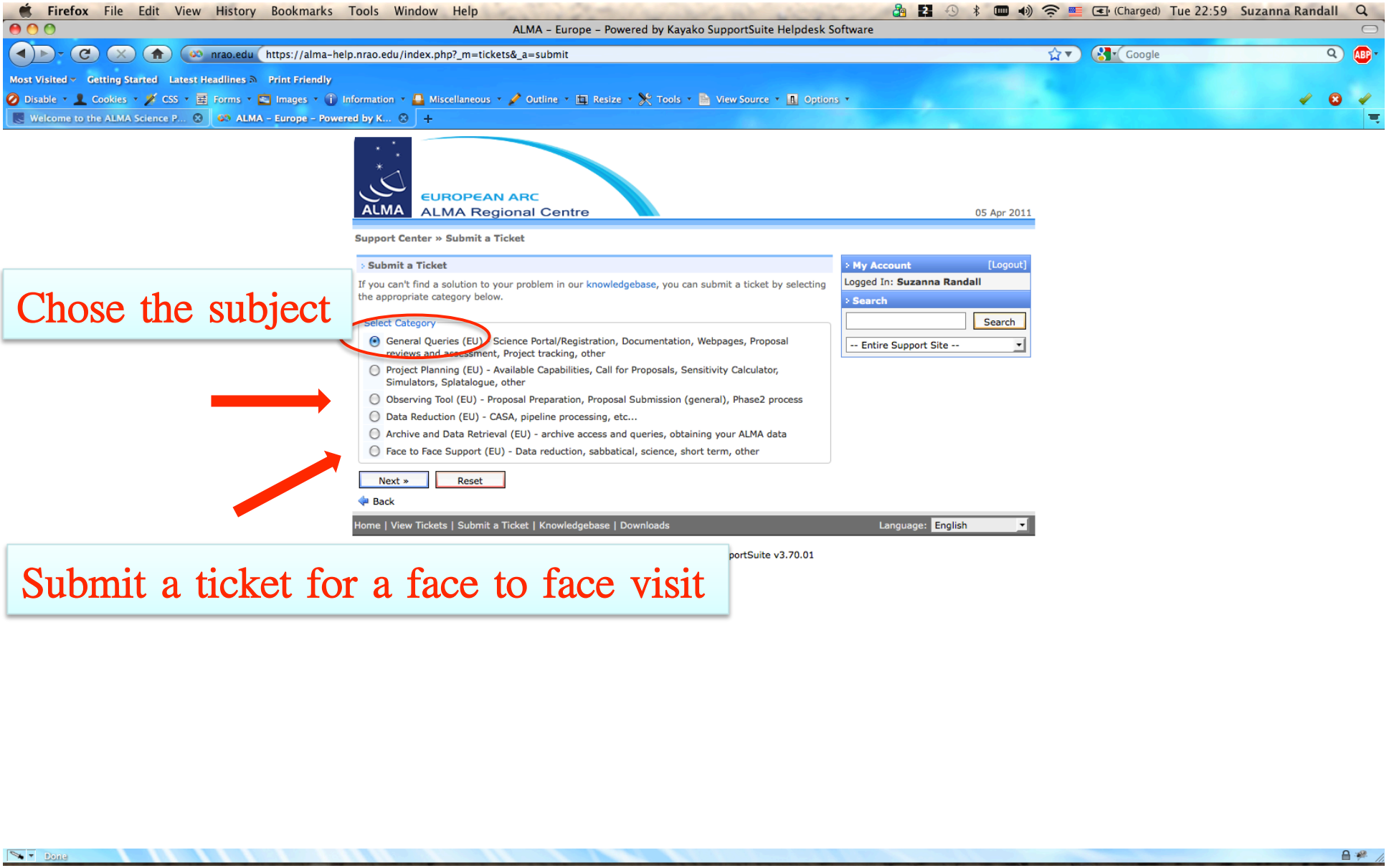
The Knowledgebase



Submitting a Ticket



Submitting a Ticket



Chose the subject

Submit a ticket for a face to face visit

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Guidelines

Tickets must be written in English

They should contain as much information as possible, including screenshots, problematic data sets etc.

You will receive an e-mail confirmation for ticket submission and e-mail alerts for any status change (e.g. a reply from a member of Staff)

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Guidelines

Users will normally receive a reply within 2 working days, ideally answering the question

If a resolution to a problem is not immediately available, the User will be informed or asked for more information

If the ticket reply is satisfactory, Users should close the ticket.

The emergency department is available only immediately before the proposal submission deadline and will be staffed 24/7

ALMA DATA FLOW

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PS Phase 1

Technical feasibility

PRC

JAO

Medium Term Queue

Long Term Queue

JAO

ARCs

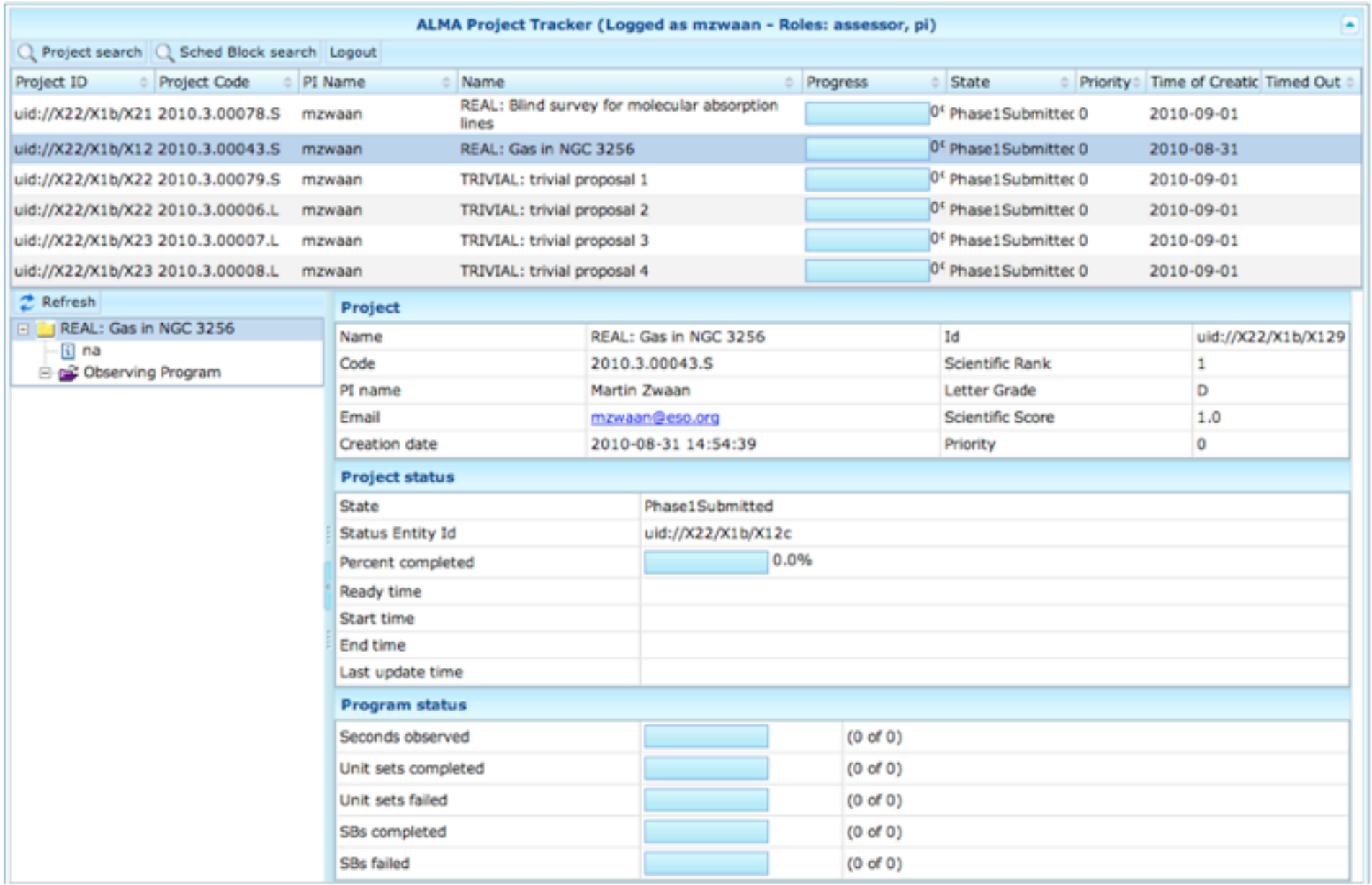
PS Phase 2

Project

Scheduling Blocks

Archive

The **Project Tracker**



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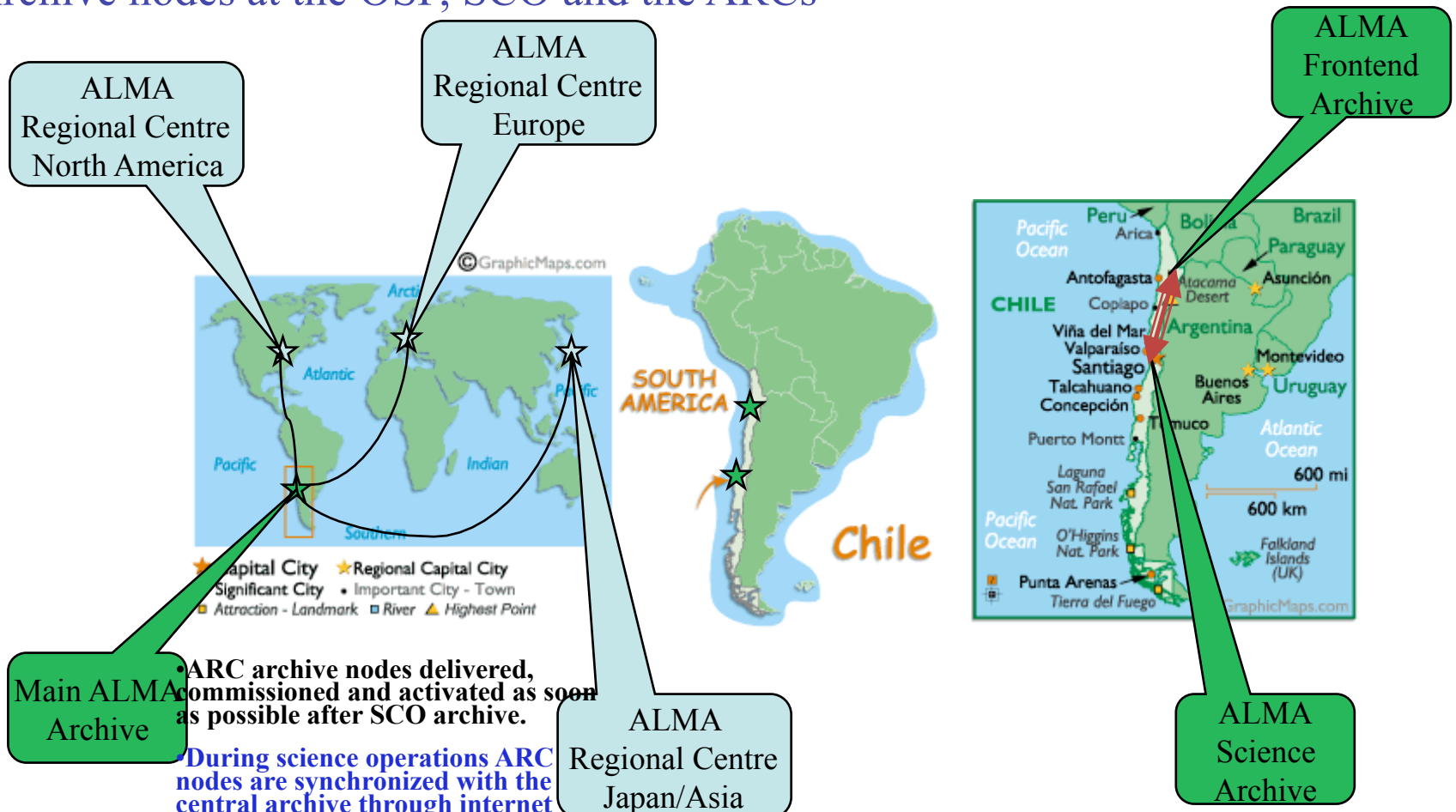
Getting data: ALMA archives and data distribution

Archive nodes at the OSF, SCO and the ARCs



- **ARC archive nodes delivered, commissioned and activated as soon as possible after SCO archive.**
- **During science operations ARC nodes are synchronized with the central archive through internet (small data sets) or via physical media.**

OSF connected to SCO via high-bandwidth. It MUST be always possible to operate ALMA even if the internet link does not work

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Data Available for download and/or on media

- Available data:
  - Raw UV visibilities
  - Calibration & flagging tables
  - Casapy reduction scripts
  - Imaging products (calibrated cubes & reference images)
    - Source visibilities with calibration & flagging applied

The ALMA offline reduction package (CASA)

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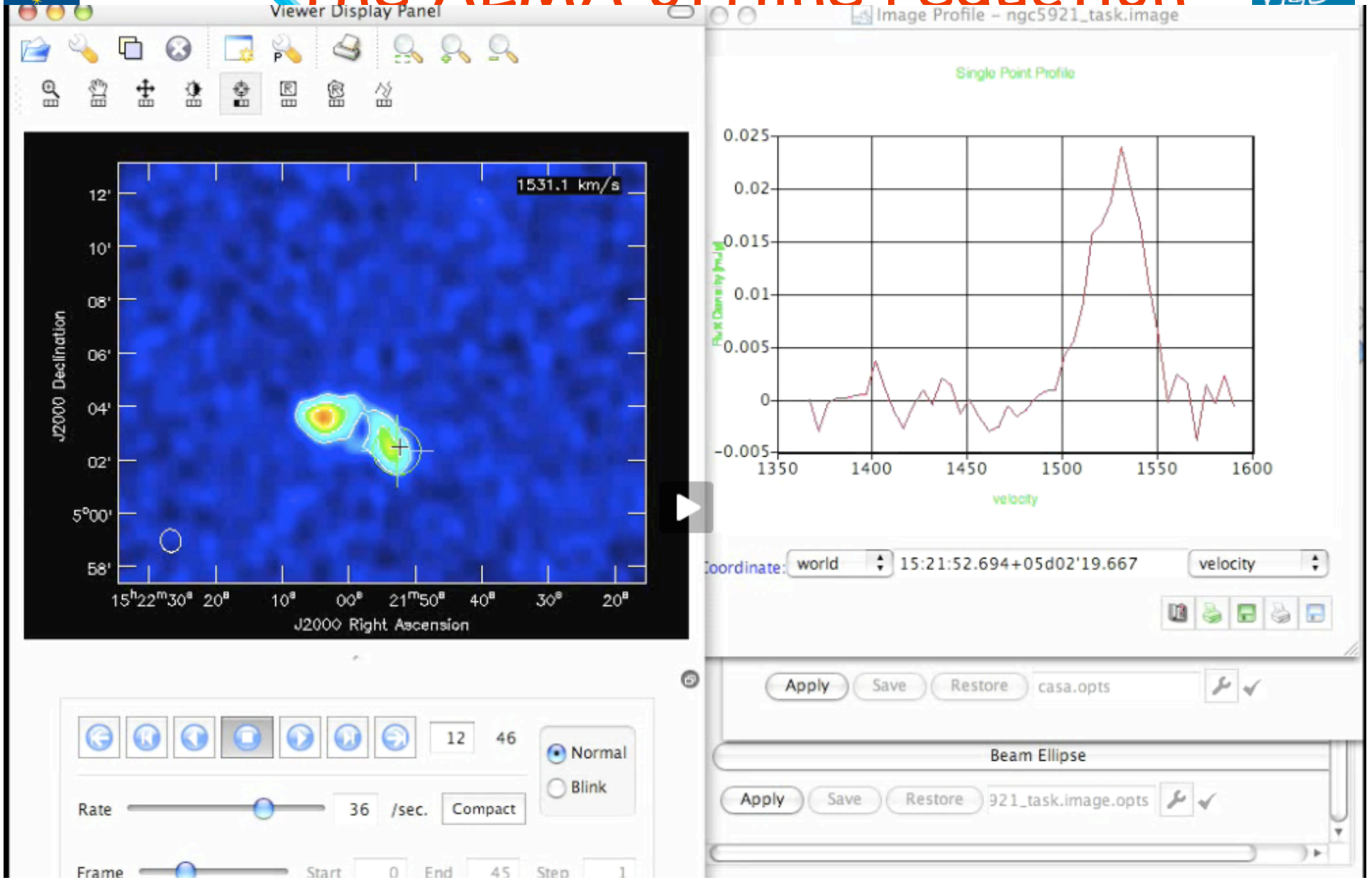
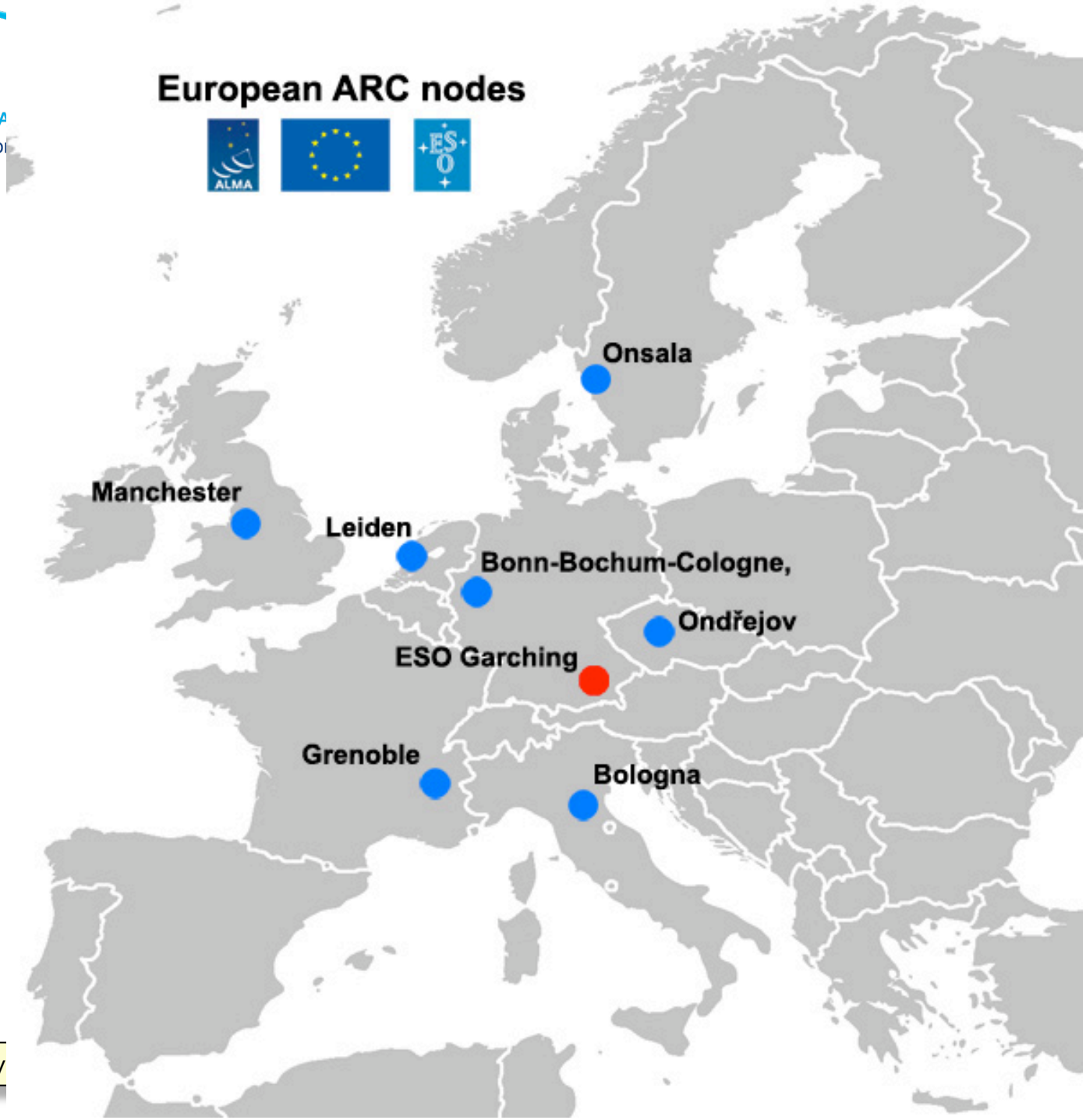
IPy:Jupiter

```
CASA <3>: tget('clean')
Restored parameters from file clean.last

CASA <4>: inp()
#  clean :: Deconvolve an image with selected algorithm
vis                 = 'ngc5921.usecase.ms.contsub' #  name of input visibility file
imagename           = 'ngc5921.usecase.clean' #  Pre-name of output images
field               =         '0'           #  Field Name
spw                 =          ''           #  Spectral windows:channels: '' is all
selectdata          =       False           #  Other data selection parameters
mode                =   'channel'           #  Type of selection (mfs, channel, velocity, frequency)
     nchan          =          46           #  Number of channels (planes) in output image
     start          =           5           #  first input channel to use
     width          =           1           #  Number of input channels to average

niter               =        6000           #  Maximum number of iterations
gain                =         0.1           #  Loop gain for cleaning
threshold           =         8.0           #  Flux level to stop cleaning.  Must include units
psfmode             =     'clark'           #  method of PSF calculation to use during minor cycles
imagermode          =          ''           #   Use csclean or mosaic.  If '', use psfmode
multiscale          =          []           #  set deconvolution scales (pixels), default: multiscale=[] (standard CLEAN)
interactive         =       False           #  use interactive clean (with GUI viewer)
mask                = [108, 108, 148, 148] #  cleanbox(es), mask image(s), and/or region(s)  used in cleaning
imsize              = [256, 256]            #  x and y image size in pixels, symmetric for single value
cell                = [15.0, 15.0]          #  x and y cell size, default unit arcsec
phasecenter         =          ''           #  Image phase center: position or field index
restfreq            =          ''           #  rest frequency to assign to image (see help)
stokes              =         'I'           #  Stokes params to image (eg I,IV, QU,IQUV)
weighting           =   'briggs'            #  Weighting to apply to visibilities
     robust         =         0.5           #  Briggs robustness parameter
     npixels        =           0           #  number of pixels to determine uv-cell size 0=> field of view

uvtaper             =       False           #  Apply additional uv tapering of  visibilities.
modelimage          =          ''           #  Name of model image(s) to initialize cleaning
```

The ALMA offline reduction



EUROPEAN A
ALMA Regio



Astrochemistry

EUROPEAN ARC
ALMA Regional Centre

The ALMA Regional Centre Nodes

- The ALMA Regional Centres (ARCs) are the **interface** between the user communities and the observatory
- The European ARC is unique for having a **distributed network** of **ARC nodes**
- These ARC nodes
  - have close ties with the community (active research environments)
  - host many of the mm/submm experts in Europe
  - have been preparing themselves for optimal ALMA user support!

The ALMA Regional Centre services

ESO ARC

Core functions

- **Scientific support services**
  - Proposal & observation preparation user support
  - Basic data analysis
  - ALMA Archive operations: host copy, data delivery
- **Astronomer on duty shifts**
- **Science community development**

Additional functions

- **Extended archive & data reduction support**
  - Advanced pipeline
  - Archival research projects
- **Support for special projects**
- **Science community development**
  - basic training, schools, workshops

- **Face-to-face help**

ARC nodes

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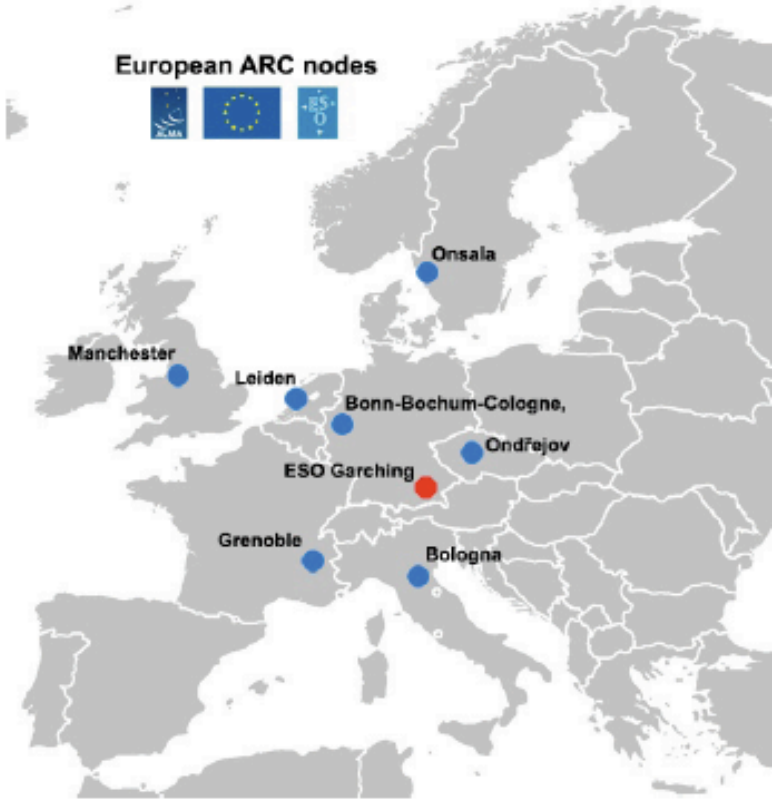
Role of the ARC nodes

- Provide **face to face user support**
  - proposal and SBs preparation
  - data reduction,
  - archive research
- Participate in the ALMA helpdesk
- New software and techniques
- Advanced data reduction
- Scientific community development
- Public relations and outreach
- Support for special projects



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The ARC and ARC node staff

Astrochemistry school, Bologna, June 13-17 2011

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What the ARC nodes can do for you during your proposal life time

face to face help with proposal preparation

Use helpdesk

if proposal approved

face to face help with project preparation

Use helpdesk

if project observed

face to face help with data reduction

Use helpdesk

any time

Tutorials, schools, workshops

Newsletters, science portal, web pages

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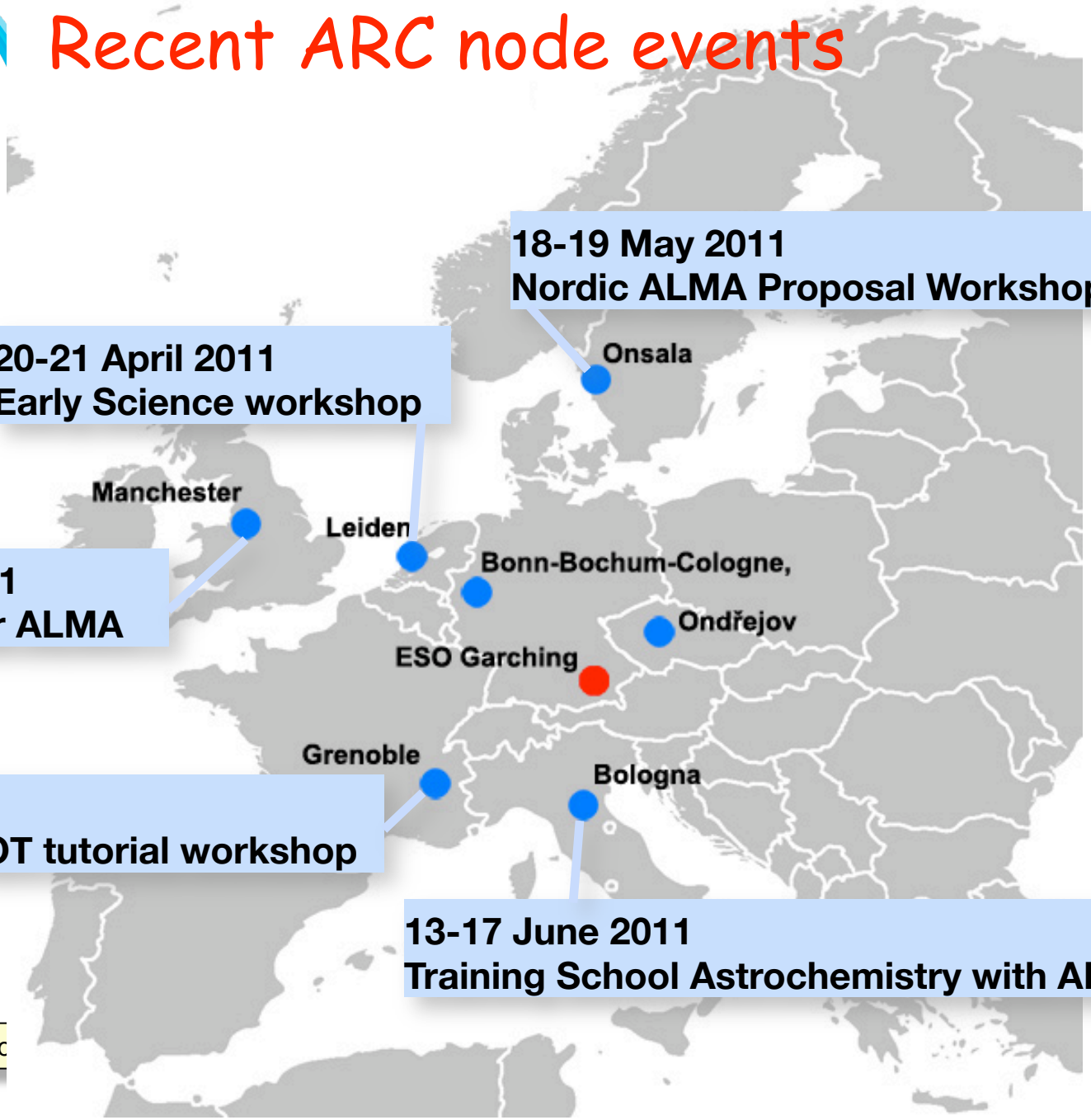
Recent ARC node events



Astrochemistry school, Bolc

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What ARC nodes offer

- All ARC nodes offer
  - Computer facilities for guests
  - Accommodation in guest house or local hotels
  - Fast internet links (to Garching)
- Funding for travel to ARC nodes:
  - Some ARC nodes have funds available (check local web pages)
  - Funding for cross-ARC node travel available through RADIONET
  - In general, visiting an ARC node is like going on an observing trip

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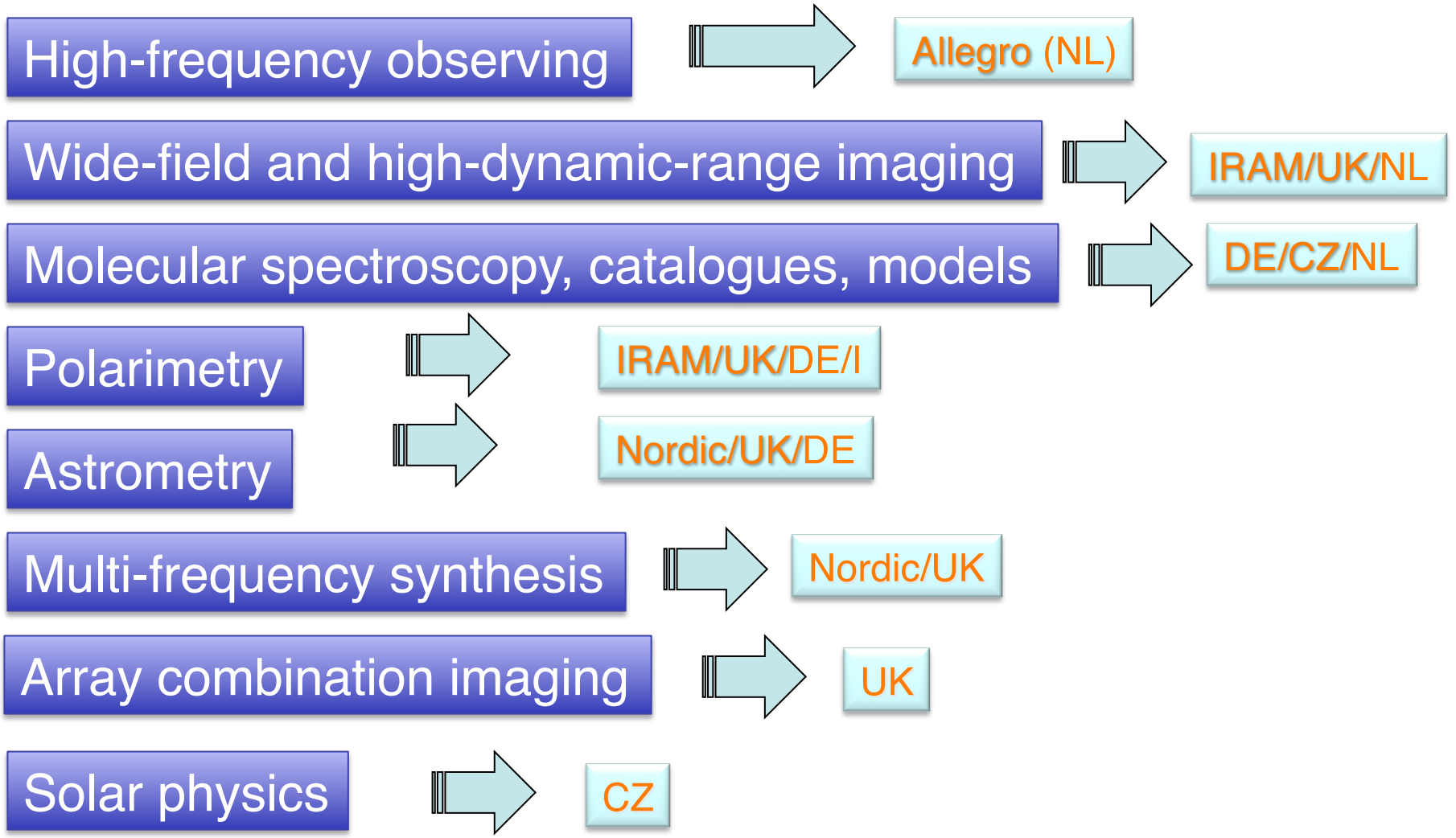
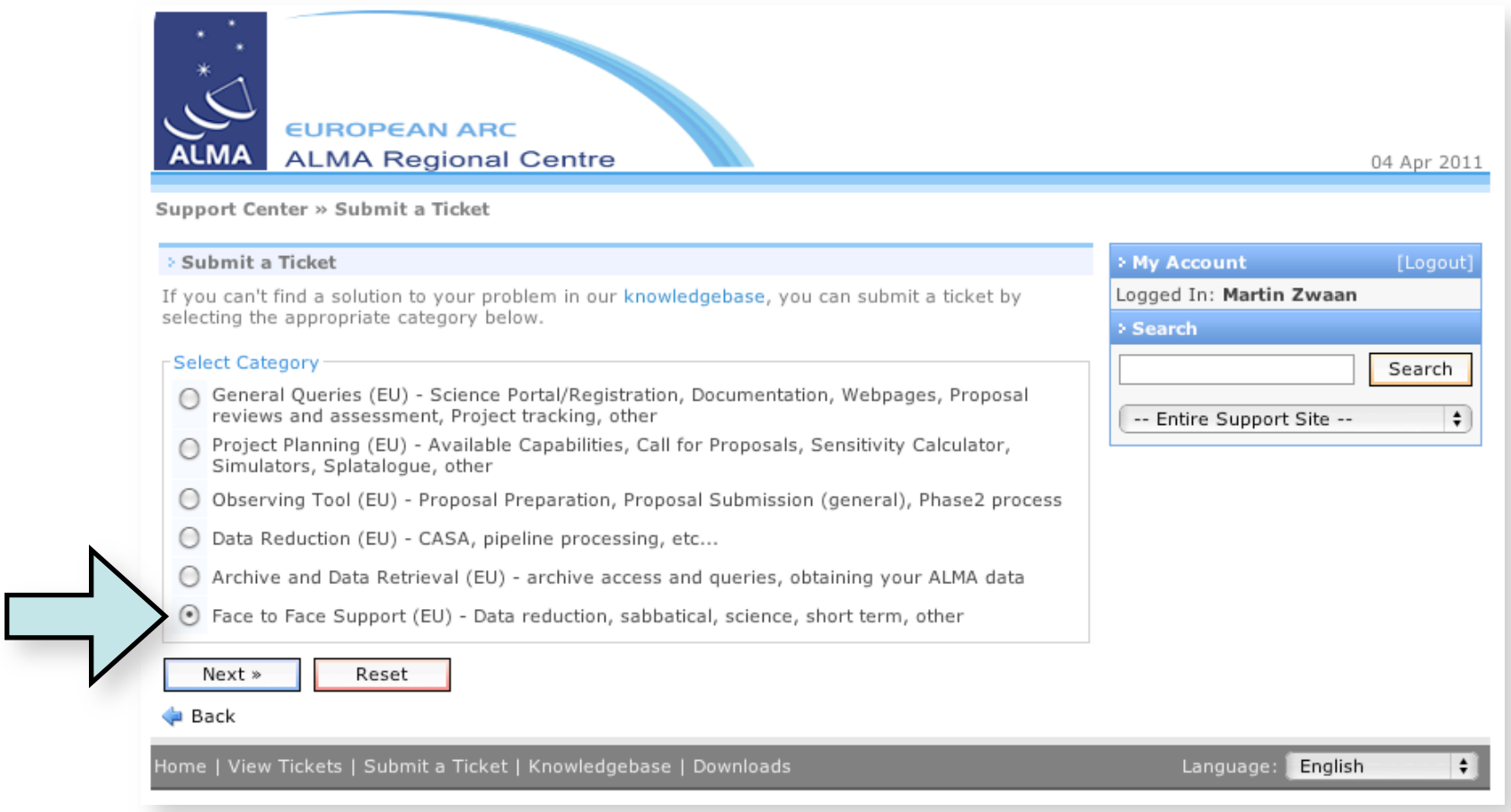
Helpdesk @ the EU ARC



Organise face-to-face visit through the Helpdesk



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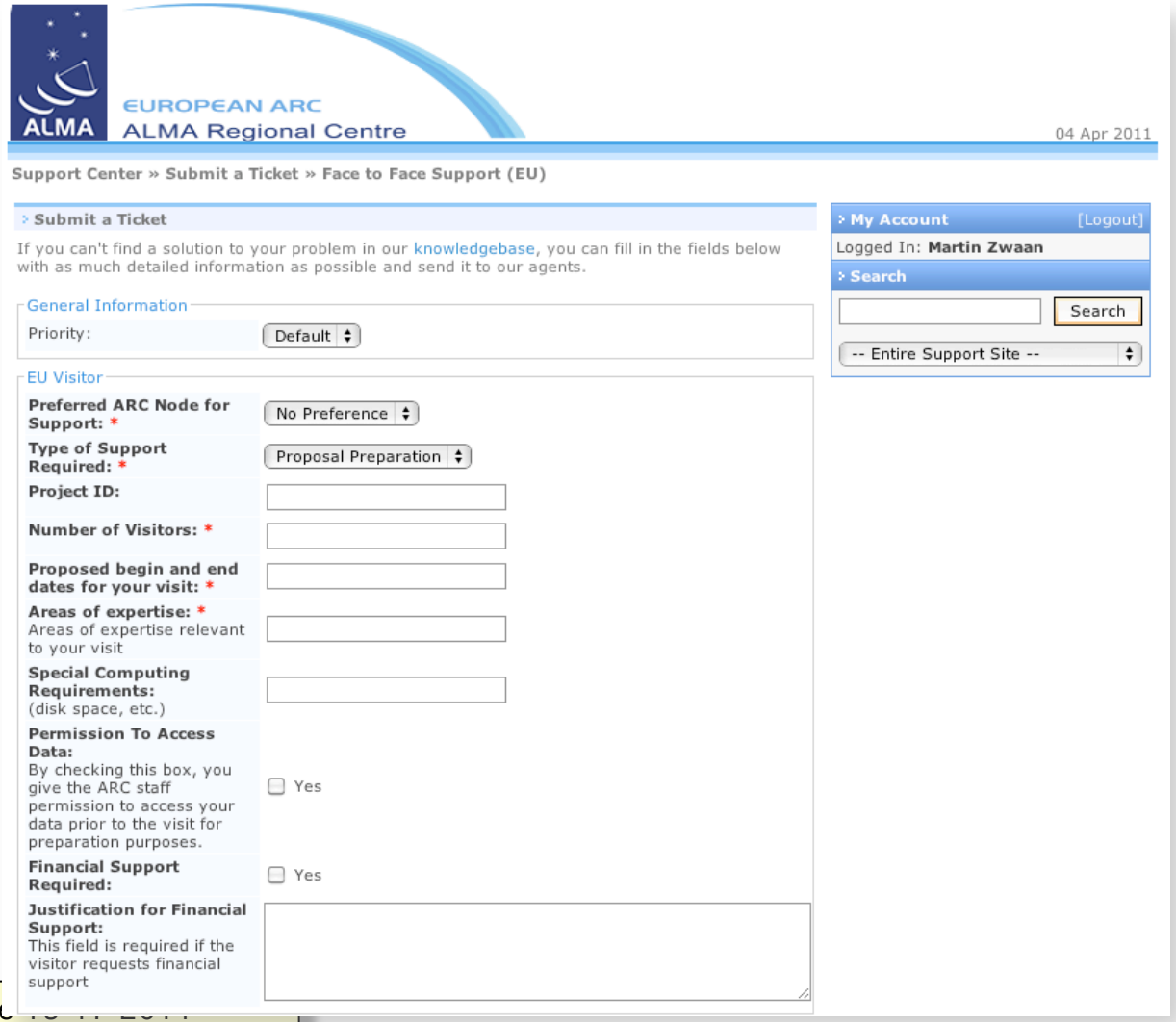
Organise face-to-face visit through the Helpdesk

Specify the needs of your visit



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Guide to the European ARC

EUROPEAN ARC
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Guide to the European ALMA Regional Centre

Version: 19 November 2010

Authors: European ARC and ARC nodes, edited by Martin Zwaan

Available from:
http://www.eso.org/sci/facilities/alma/arc/

Astrochemistry school, Bologna, June 13-17 2011

Quality Assurance at the ARC nodes

- Final stage of quality assurance (QA3) is done by ARC nodes
- QA3 is post-reduction evaluation of the data products
- Represent deeper problems not been detected in tests of some specific observing modes, set-ups, etc
- If a problem is present, the ARCs will report the problem to DSO for resolution
- Depending on the steps required for resolution, it may require re-reduction of some of the data

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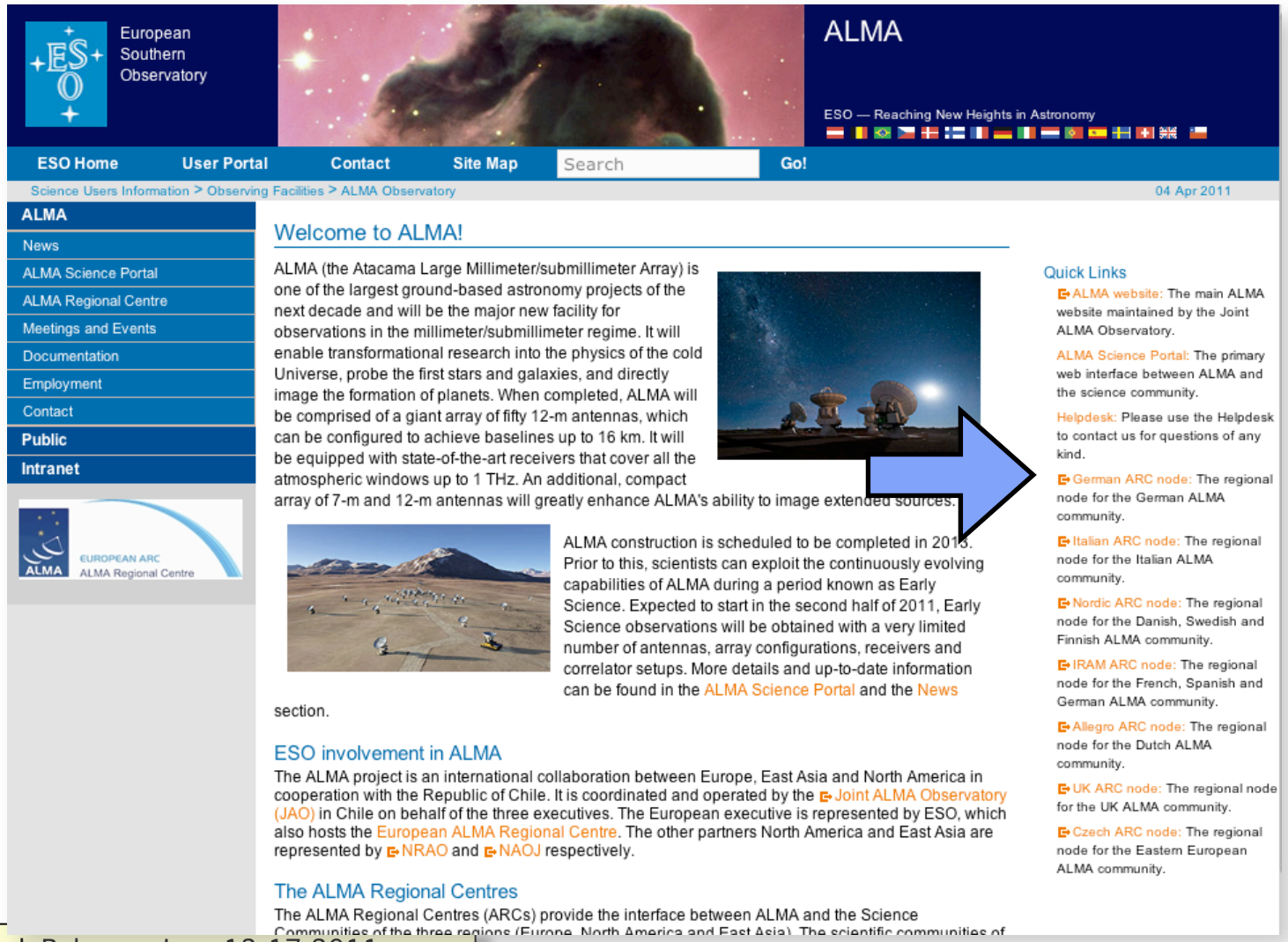
The ARC nodes' webpages



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Early Science Operations: key dates

- *31 March 2011:* Release of the Call for Proposals for ALMA Early Science Cycle 0 and release of offline Observing Tool.
- *29 April 2011:* Deadline for submission of Notice of Intent.
- *15 May 2011:* Release of Cycle 0 Technical Handbook and intended schedule of compact and extended configuration availability.
- *1 June 2011:* Opening of archive for proposal submission and release of the online version of the Observing Tool.
- *30 June 2011:* Proposal submission deadline.
- *September 2011:* Feedback to proposers on the results from the proposal review process.
- *Autumn 2011:* Start of ALMA Cycle 0 observing.
- *February 2012:* One month engineering shutdown during the 2012 Altiplanic winter.
- *30 June 2012:* End of ALMA Cycle 0

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Early Science Operations

- Purpose of ALMA Early Science Cycle 0:
  - deliver scientifically useful results to the astronomy community
  - facilitate the ongoing characterization of ALMA systems and instrumentation as the capability of the array continues to grow.
- Early Science through Cycle 1 (until construction and commissioning complete)
- Priority is given to completion of the array: the time is shared with Commissioning activity.
- Projects not carried over from Cycle 0 to later cycles
- 12-month proprietary rights applicable to all ALMA data but Cycle 0 projects will not block later observations of the same targets with enhanced capabilities.
- Scheduling of SBs done by the dynamic scheduler, used in manual mode

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Best Efforts
(PIs need to be aware of)

- PIs will need to contribute to data processing and to Quality Assurance
- The proprietary time for each dataset starts as soon as that dataset is delivered. Proprietary time lasts 12 months
- No guarantee that the project will be completed
- No carry over of projects from Cycle 0 to later cycles

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Optimal projects for Cycle 0

- Well matched to Cycle 0 capability
- Scientifically worthwhile & publishable outcomes from Cycle 0 observations
- Produce images/spectra from observations of a few hours or less
- Exploit ALMA's unique capabilities

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Questions?

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Thanks for your attention!
For any questions, please contact the ALMA Helpdesk at www.almascience.eso.org

Atacama Large Millimeter/submillimeter Array
Observer Support