The North America ALMA Science Center (NAASC)

John Hibbard

NA ARC Manager

(NRAO/NAASC)

Associated Universities, Inc.

NSF

NRAO

National Research Council Canada

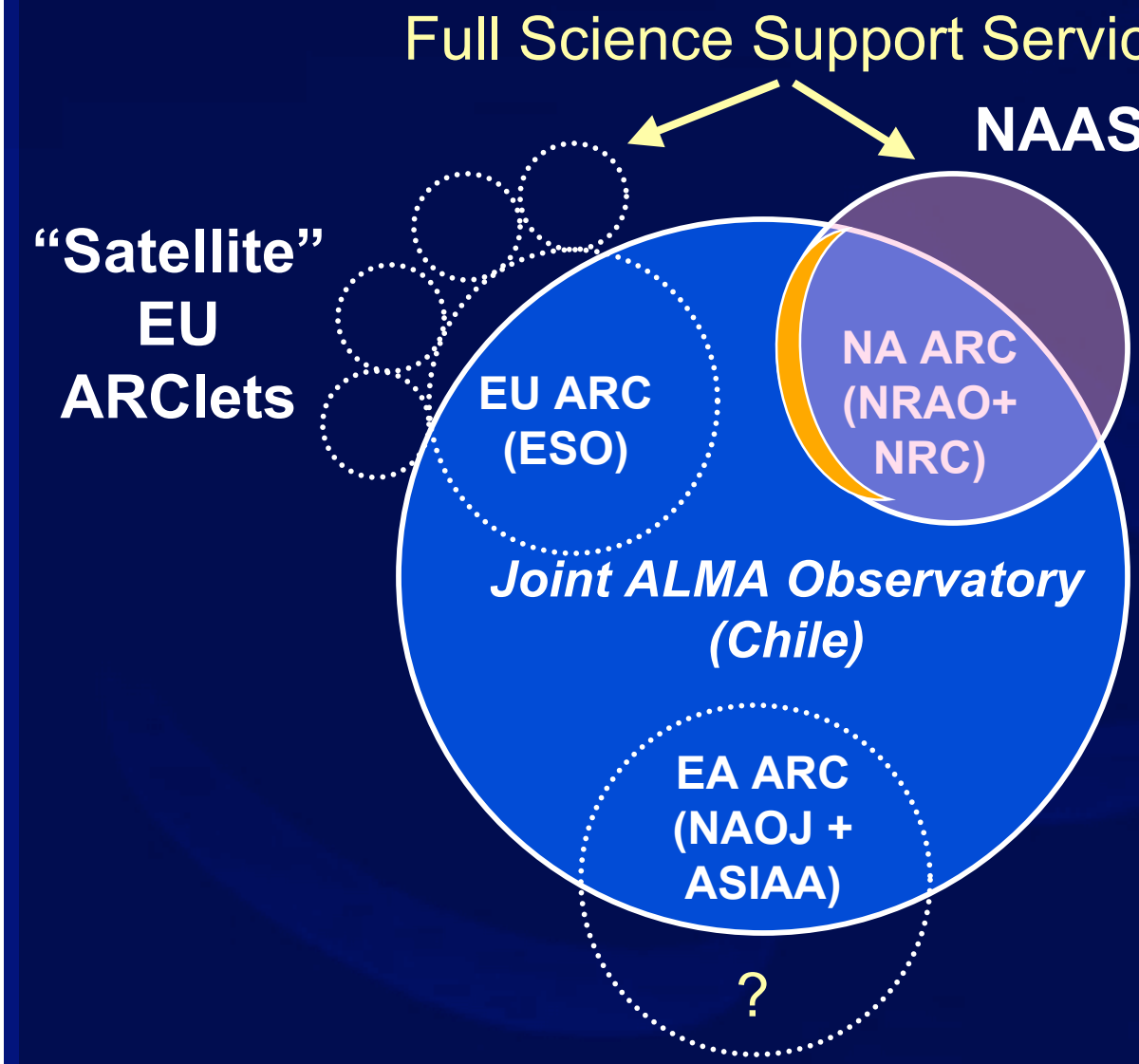
ESO ALMA Community Meeting, Garching, Sept 3-4 2007

ALMA: A Facility for All Astronomers

- The key premise of ALMA is that the best science will emerge from competitive use by the widest possible user community
  - ALMA should not be restricted to experts in mm/submm astronomy or even radio astronomy
- This goal requires comprehensive user support including:
  - Test, improve, distribute, and support use of user software
  - Help users push the envelope of ALMA capabilities
  - Contribute to (and learn from) Chilean ALMA operations
  - Foster development of new capabilities

To achieve this goal we have created the North American ALMA Science Center (NAASC)

ALMA Operations: Three ALMA Regional Centers – ARCs



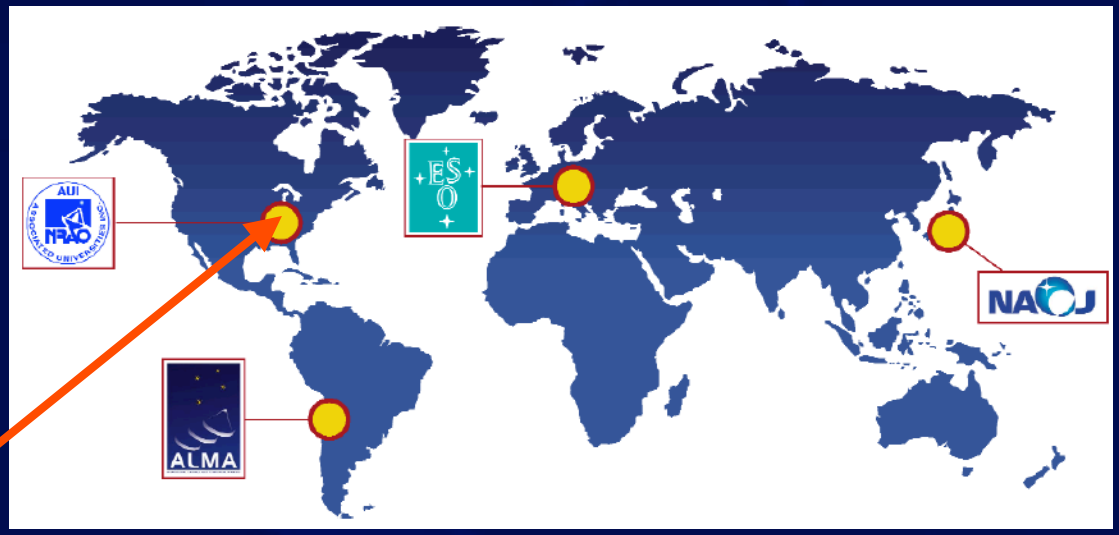
ARCs provide basic user interface, as well as basic archive, software, and hardware maintenance and development

Full Science Support is needed to provide advanced user support, algorithm development, student programs, EPO, grants

The Tri-Partner ALMA Project - Service community through ALMA Regional Centers (ARC)

The North American ARC is a partnership between the US and Canada (7.25%)

The NAASC is a combination of the NA ARC and US funded Full Science Support



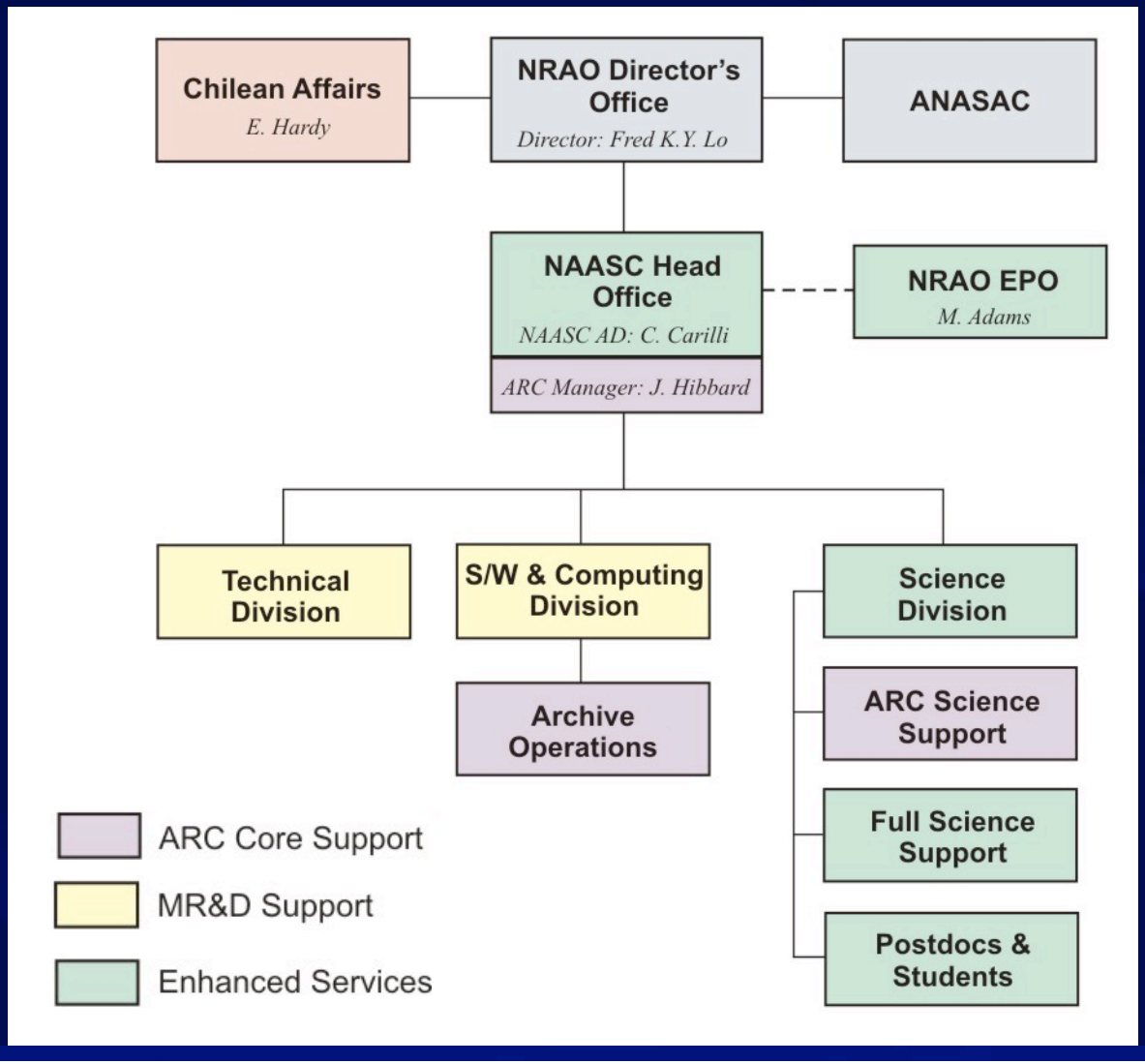
One-stop shopping for NA astronomers

- Proposals
- Observing scripts
- Data archive and reduction

NAASC: North America ALMA Science Center, Charlottesville, VA

The NAASC Has Three Major Components:

The North American ARC Core Support
ALMA Offsite Technical and Software Support
Full Science Support

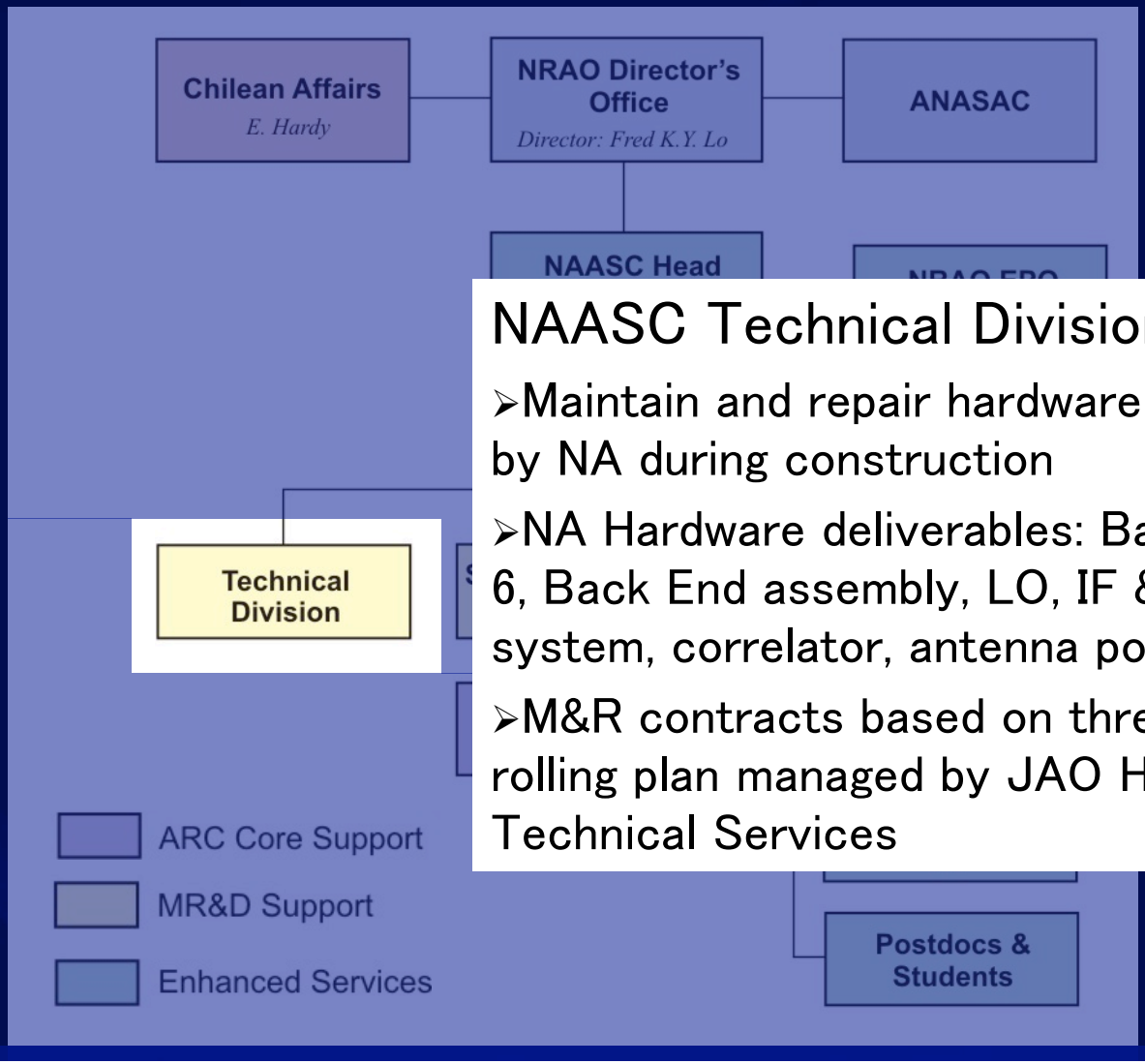


C. Brogan

TBA

+2 positions advertised

Chilean Offsite Technical Support: Hardware Maintenance & Repair



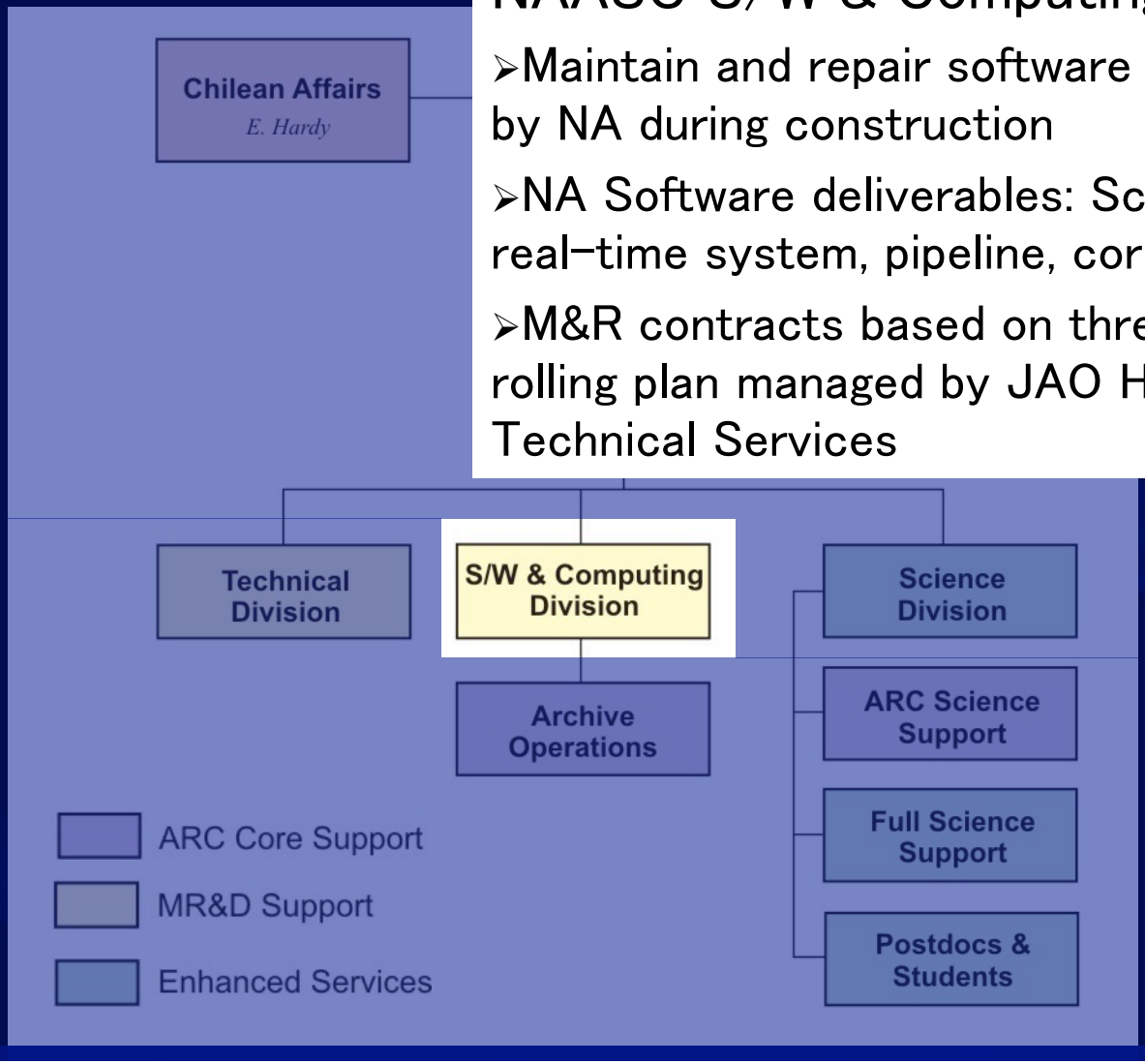
NAASC Technical Division

- Maintain and repair hardware developed by NA during construction
- NA Hardware deliverables: Band 3, Band 6, Back End assembly, LO, IF & DTS system, correlator, antenna power supply
- M&R contracts based on three-year rolling plan managed by JAO Head of Technical Services

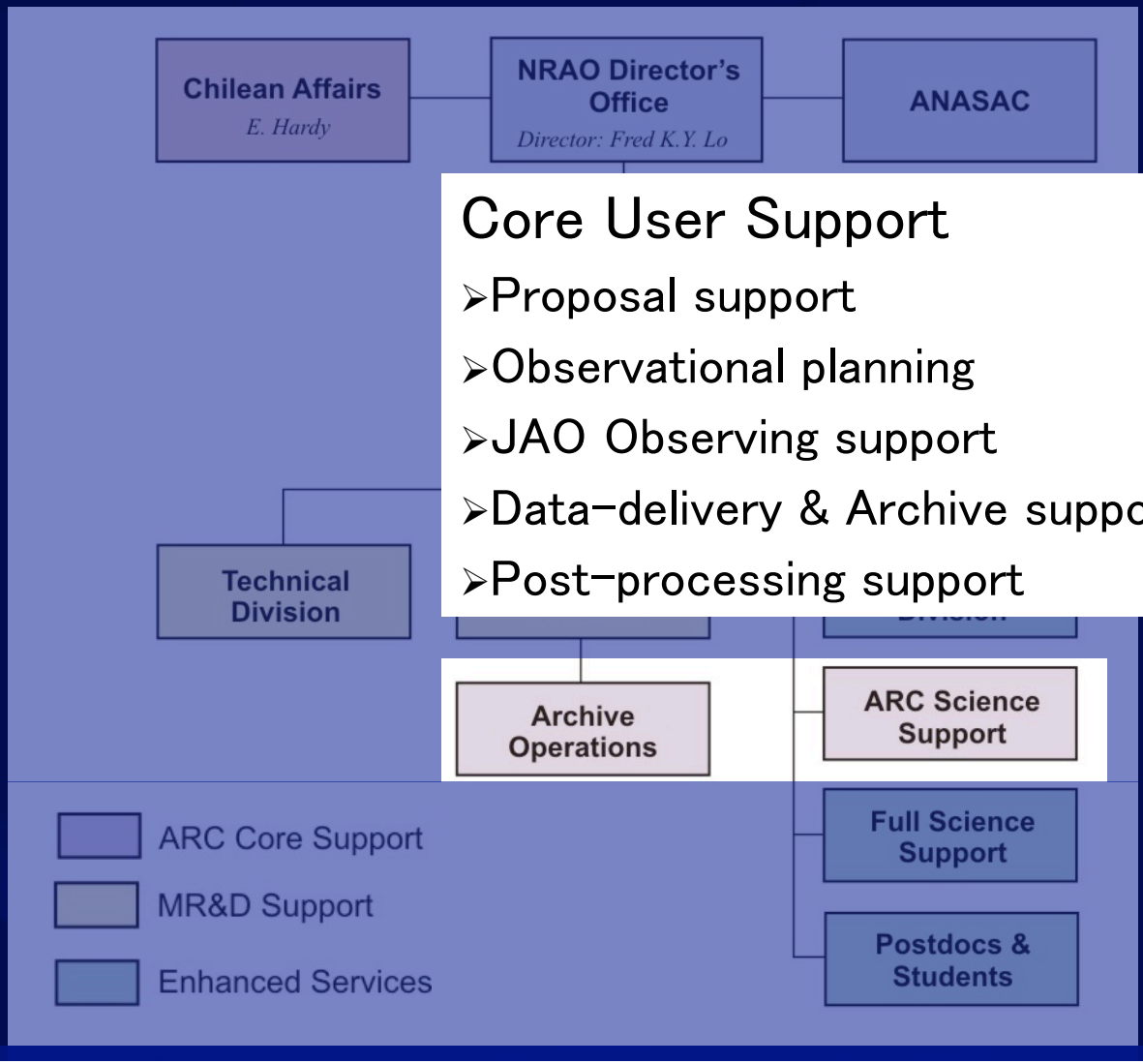
Chilean Offsite Technical Support: Software Maintenance & Repair

NAASC S/W & Computing Division

- Maintain and repair software developed by NA during construction
- NA Software deliverables: Scheduling, real-time system, pipeline, correlator, offline
- M&R contracts based on three-year rolling plan managed by JAO Head of Technical Services



ARC “Core” Functions



Core User Support

- Proposal support
- Observational planning
- JAO Observing support
- Data-delivery & Archive support
- Post-processing support

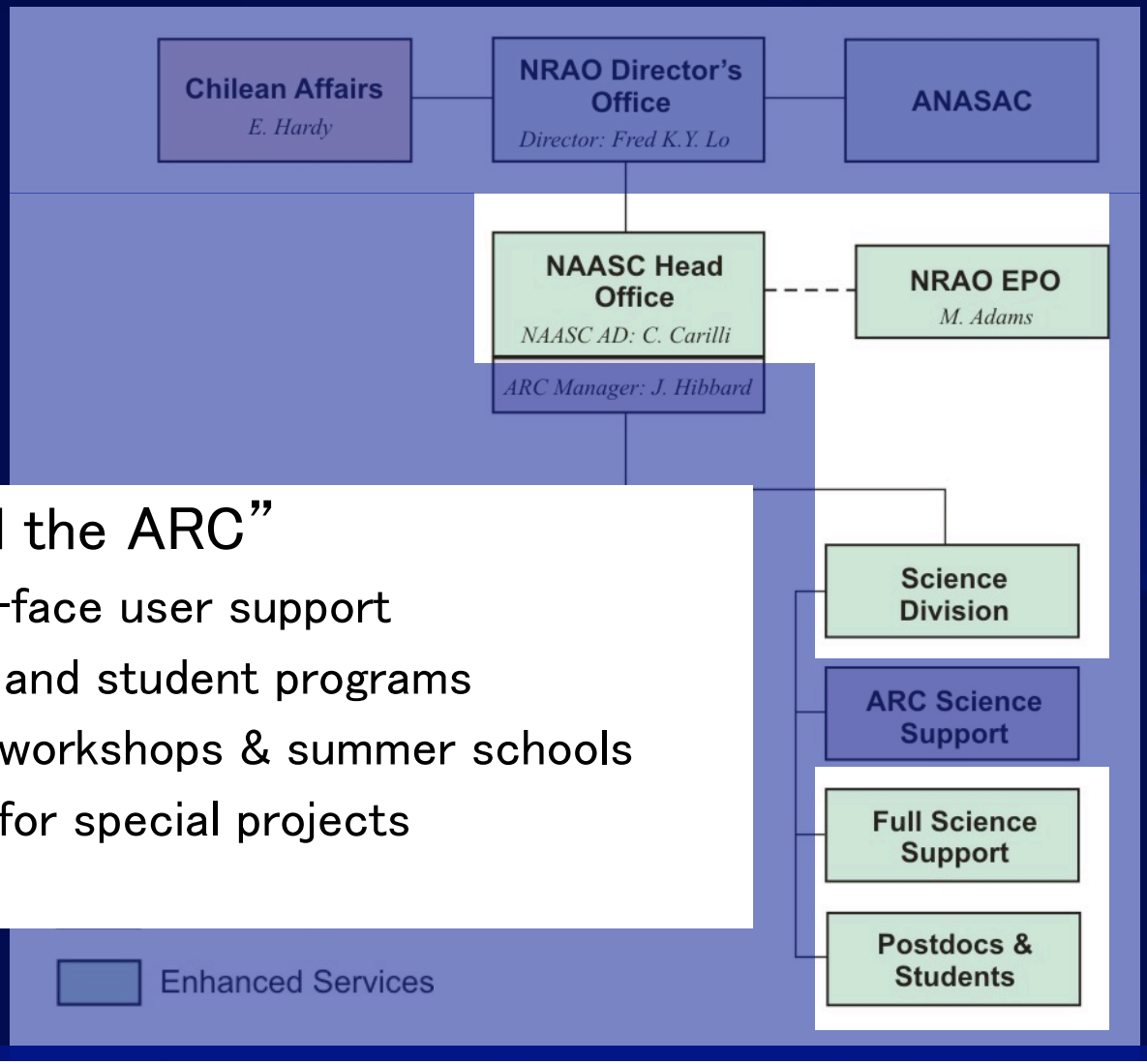
ARC Core support

- Proposal and Scheduling Functions:
  - Review and evaluate the Observing Tool
  - Issue call for proposals and assist proposers
  - Support JAO with international PRC
  - Provide assistance to users in generating observe files
  - Verify and correct schedule blocks
  - Provide user-friendly documentation
- User Science Support:
  - Participate in Commissioning and Science Verification
  - Review and evaluate the pipeline and off-line data reduction software, cookbooks, and web pages
  - OSF staffing: “Astronomer-on-Duty”
  - Quality assurance and user feedback to OSF
  - Post-observation user support via helpdesk
- Archive support:
  - Operate NA ALMA Archive (>100 Tbytes per year)
  - Distribute full uv data sets to user
  - Operate regional pipeline
  - Provide interface to the VO

Is This Enough?

- ALMA will provide calibrated data and images for basic observing modes
  - ➢ This service will not be available until the start of full operations in late 2012
- Only basic post-processing user support in the form of an electronic helpdesk is provided for in the ALMA Operations Plan
  - ➢ The needs of the most technically and scientifically challenging observing programs will not be met by the pipeline processing
  - ➢ ALMA will appeal to a much broader range of astronomers than traditional radio observatories, these investigators will require additional help

NAASC Full Science Support



"Beyond the ARC"

- Face-to-face user support
- Postdoc and student programs
- Science workshops & summer schools
- Support for special projects
- EPO

Full Science Support

- F-2-F expert assistance with observation preparation and post-processing
- Research/develop new approaches/algorithms for calibration, imaging, and scientific analysis tools
- Organizing observing and data reduction tutorials
- Advanced simulation capabilities to help users better plan their observations
- Support special observing projects: Legacy type projects or other large programs

2 Scientific Staff

+

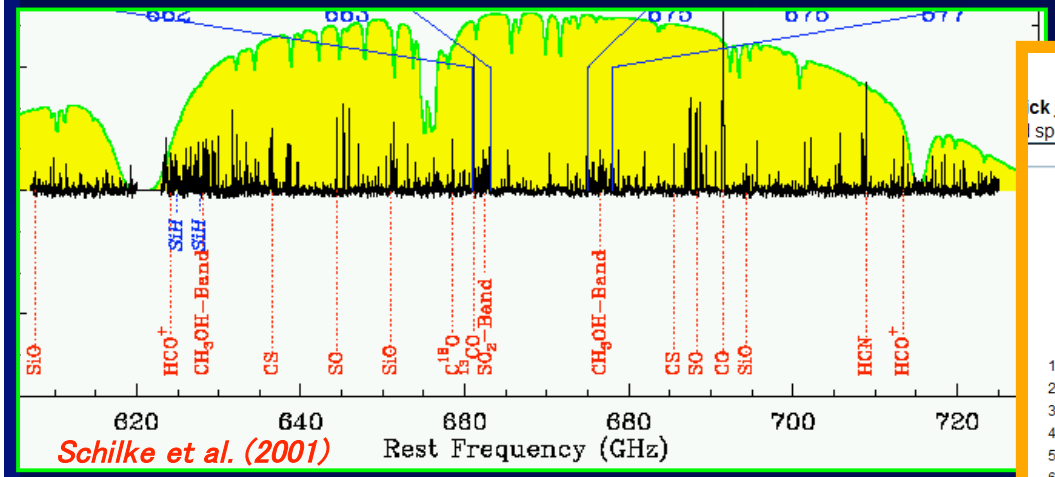
2 Scientific Programmers

- Maintain spectral line database and develop more sophisticated spectral line analysis and visualization routines

1 Scientific Staff

- Technical research for THz receiver technology through UVa Microfabrication Laboratory & NRAO Technology Center

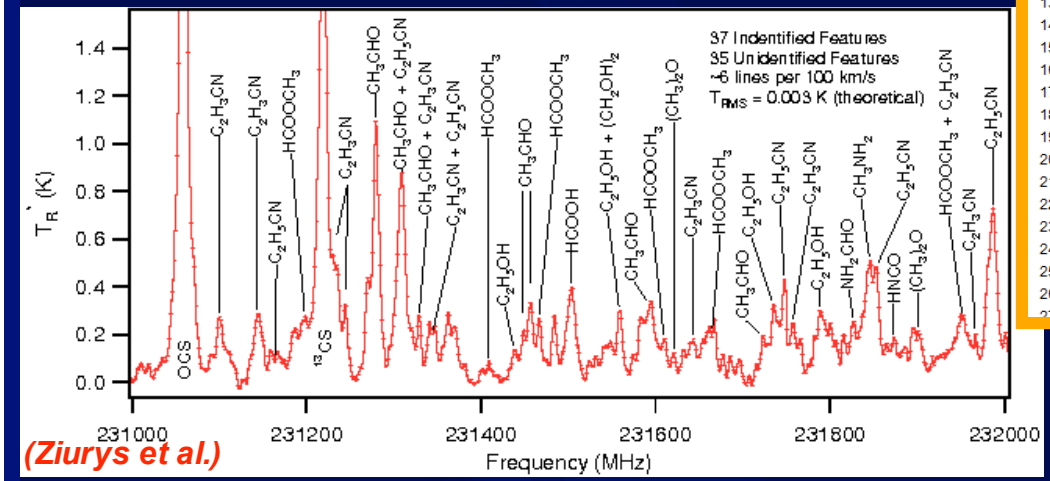
Spectral Line catalogs and tools needed to deal with tremendous spectral complexity



Schilke et al. (2001)

Lines visible in Band 9 (CSO)

1 GHz



(Ziurys et al.)

SgrB2(N) spectrum using Band 6 mixer at the SMT

ck jump
l species

splatalogue
database for astronomical spectroscopy

Currently a transition-resolved compilation of the JPL, CDMS and Lovas/NIST lists
Searching 3688088 lines in 656 chemical species

Found 95 DNC lines, showing 1 - 95

	Frequency (MHz)	Uncertainty (MHz)	LineList	E_L (cm^{-1})	Transition	
1	76305.71700		Lovas/NIST		J=1-0	ALMA BAND 2
2	76305.72700	0.009	JPL	0	J=1-0	ALMA BAND 2
3	76305.72700	0.03	CDMS	0	J=1-0	ALMA BAND 2
4	152609.77000		Lovas/NIST		J=2-1	ALMA BAND 4
5	152609.77400	0.009	JPL	2.5453	J=2-1	ALMA BAND 4
6	152609.77400	0.03	CDMS	2.5453	J=2-1	ALMA BAND 4
7	228910.48900	0.009	JPL	7.6358	J=3-2	ALMA BAND 6
8	228910.48900	0.03	CDMS	7.6358	J=3-2	ALMA BAND 6
9	228910.49200		Lovas/NIST		J=3-2	ALMA BAND 6
10	305206.21900	0.009	JPL	15.2714	J=4-3	ALMA BAND 7
11	305206.21900	0.03	CDMS	15.2714	J=4-3	ALMA BAND 7
12	381495.27390	0.0237	JPL	25.452	J=5-4	
13	381495.39040	0.0111	CDMS	25.452	J=5-4	
14	457775.99960	0.0499	JPL	38.1773	J=6-5	ALMA BAND 8
15	457776.26640	0.0115	CDMS	38.1773	J=6-5	ALMA BAND 8
16	534046.72750	0.0885	JPL	53.4471	J=7-6	
17	534047.21660	0.0111	CDMS	53.4471	J=7-6	
18	610305.79150	0.1414	JPL	71.261	J=8-7	ALMA BAND 9
19	610306.58860	0.0099	CDMS	71.261	J=8-7	ALMA BAND 9
20	686551.52520	0.2105	JPL	91.6186	J=9-8	ALMA BAND 9
21	686552.72700	0.011	CDMS	91.6186	J=9-8	ALMA BAND 9
22	762782.26240	0.2978	JPL	114.5195	J=10-9	
23	762783.99400	0.02	CDMS	114.5196	J=10-9	
24	838996.33680	0.4053	JPL	139.9632	J=11-10	ALMA BAND 10
25	838998.73600	0.015	CDMS	139.9633	J=11-10	ALMA BAND 10
26	915192.08200	0.5351	JPL	167.9491	J=12-11	ALMA BAND 10

Unified spectral line database (to be used in observing tool)

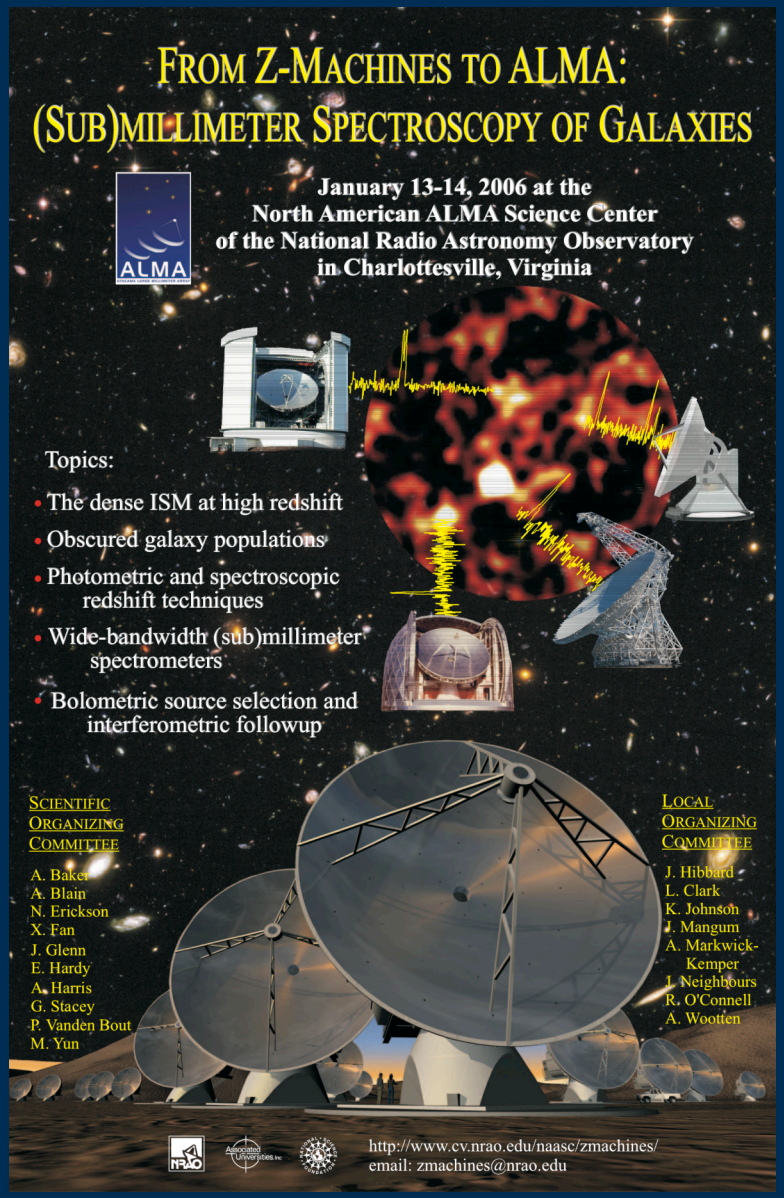
http://www.splatalogue.net/

Community Professional Development: promote health of the mm community

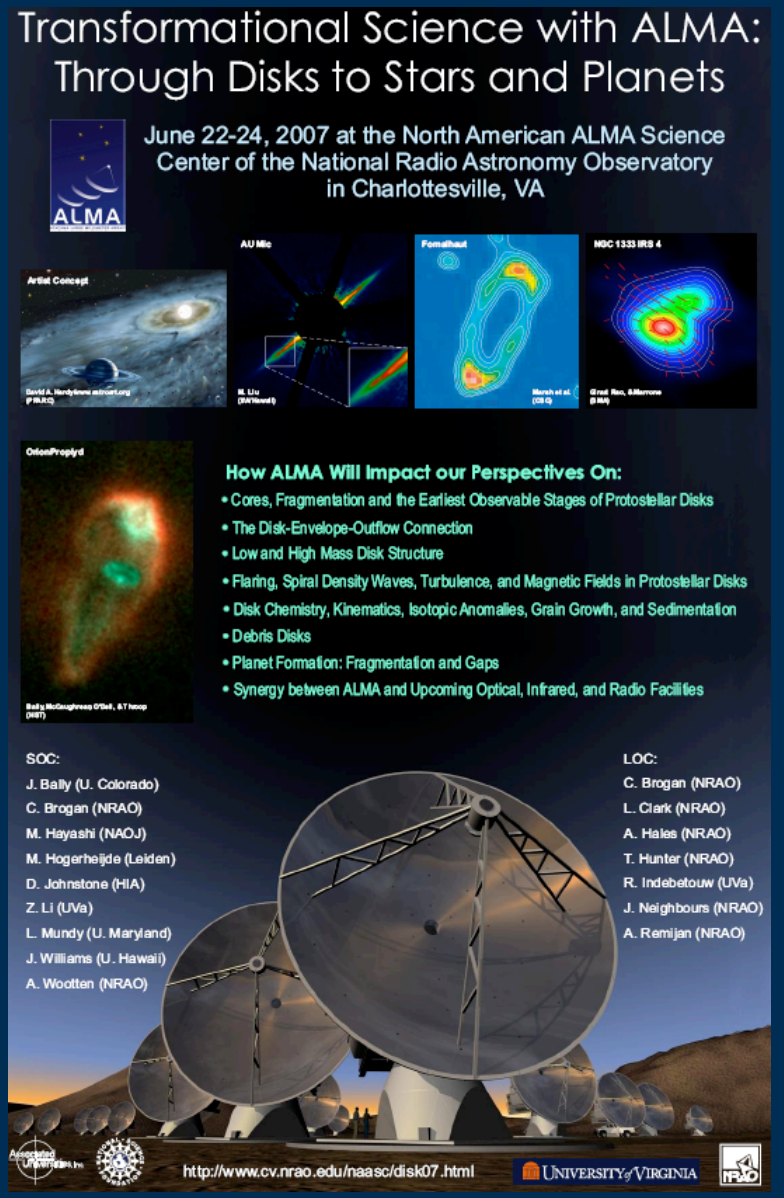
- Prize fellowships: Support Jansky Fellows program (4)
- ALMA postdocs: 25% service (3)
- ALMA students (2)
- Visiting scientist program
- Scientific Workshops – venues to explore future directions for ALMA
- Organize and run summer schools
  a. Joint sponsorship of NRAO Synth. Imaging
  b. Joint mm techniques schools with other mm observatories
  c. Intensive traveling university courses on mm astronomy

Staff: 2 astronomers, first starting in 2008

NAASC Science Workshops



Zmachines: January 2006



PPDisks: June 2007

NAASC Staffing Plan

~ 13 Engineering

~ 21 Computing/software

~ 5 Archive support

~ 17 Scientific Staff

~ 5 Post-doc/Students

~ 5 EPO

~ 5 Chilean Affairs

~ 3 Management/Administrative

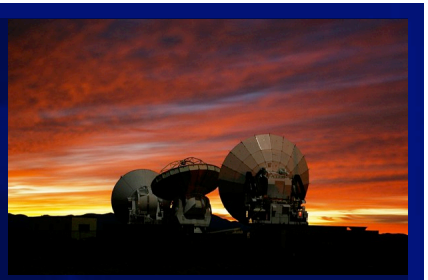
= ~74

- Begin NAASC Ramp up 2008; completed ~2012
- Includes ARC and Full Science Support
- *NAASC Director: Chris Carilli*
- *NA ARC Manager: John Hibbard*
- *C. Brogan first scientific staff*
- *Joint NRAO/UVa hire in progress*
- *Two positions advertised this Fall*

Comparison (excluding spacecraft functions)

- *Chandra* ~150
- *HST* ~350
- *Spitzer* ~120

Current Projected Timeline



2007 First antenna arrival and testing at ALMA site

Early 2009 Commissioning Begins with 3-element array

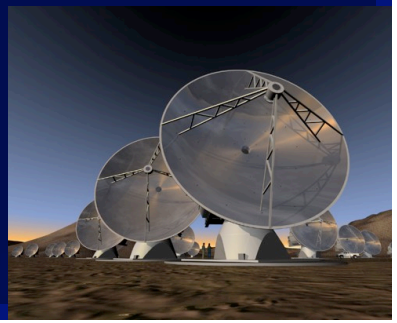
Mid 2009 Call for Science Verification projects

- 6+ antennas, 2+ bands, continuum & spectral line, 1km baselines
- Off line data reduction

Early 2010 Call for Early Science Proposals (24+ antennas)

2012 Pipeline images for standard modes

2012 Baseline ALMA Construction Complete



NAASC: Work so Far

Oct 2006 to Oct 2007

- Change of AD from P. Vanden Bout to C. Carilli
- C. Brogan as first NAASC astronomer (CASA ALMA sub-system scientist)
- Successful reviews of AOP and NAASC proposal
- Offer out and verbally accepted for next NAASC astronomer (joint with UVa)
- Support 3.4 CASA programmers
- Partial support for business manager & administrative assistant
- Start training for ops at ATF
- Support of THz SIS mixer research (NTC & UVML)
- Set-up on-line spectral line catalog (A. Markwich-Kemper; A. Remijan, F. Lovas)

NAASC: Near-term tasks

Oct 2007 – Oct 2008

- Two Scientists to perform AoD/CSV duties (at ATF till June; OSF thereafter)
- Support CASA beta release
  - train other ARCs for user support
  - Bring on additional 0.5 FTE early?
- Two EPO staff (matrixed to EPO division)
- Continue work on spectral line catalog
- Finalize Canadian & UVa MOU's
- Continued participation in test of software systems
- Participate in development of pipeline heuristics
- Third science workshop
- Engage NAm community in discussion of future ALMA Development

www.alma.info

The Atacama Large Millimeter Array (ALMA) is an international astronomy facility. ALMA is a partnership between Europe, North America and Japan, in cooperation with the Republic of Chile. ALMA is funded in North America by the U.S. National Science Foundation (NSF) in cooperation with the National Research Council of Canada (NRC), in Europe by the European Southern Observatory (ESO) and Spain. ALMA construction and operations are led on behalf of North America by the National Radio Astronomy Observatory (NRAO), which is managed by Associated Universities, Inc. (AUI), on behalf of Europe by ESO, and on behalf of Japan by the National Astronomical Observatory of Japan.