Progress Report and Request for Continuation of the ALFALFA Survey for the Year 01Jul2007 – 30Jun2008

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Overview of progress to date: ALFALFA, the Arecibo Legacy Fast ALFA Survey, is a two-pass drift scan spectral line survey intended to cover 7000 deg^2 of high galactic latitude sky visible from Arecibo, with ∼eight times the sensitivity, four times the angular resolution, three times the spectral resolution, and 1.6 times the total bandwidth of HIPASS. The survey area is intended to map, with complete 2-pass coverage, the region from 0° to +36° in declination and from 22^h <R.A.< 3^h (the "fall sky") and 7^h30^m <R.A.< 16^h30^m (the "spring sky"). The fixed azimith, "minimum intrusion" observing technique that ALFALFA employs delivers high data quality and extremely high observing efficiency. Because of its wide areal coverage and photometric accuracy, ALFALFA will provide a legacy dataset for the astronomical community at large, serving as the basis for numerous studies of the local extragalactic Universe. The survey was initiated in February 2005 and has proceeded steadily since then. As of Jan. 15, 2007, one-third of the survey area has been fully mapped, allowing the production of Level II spectral data products (3-D cubes). With the completion of the Spring 2006 season last summer, we were able to begin in earnest the production and extraction of sources from grids in the region of the Virgo cluster. A first catalog extracted from the Level II data, containing 716 high quality detections in 2% of the final sky area, is in press (Giovanelli *et al.* 2006). Another paper, describing the signal extraction algorithm and its implementation (Saintonge 2006), is also in press. Two papers based on our precursor observations were published in 2005 (Giovanelli *et al.* 2005ab). Precursor ALFA data and archival pointed observations for 9000 galaxies are available as a node of the Virtual Observatory at the Cornell Theory Center (CTC); this is already the largest collection of digital HI galaxy spectra in existence in the world. Team members have web access to preliminary, searchable source catalogs for the planning and execution of multiwavelength followup observations; these SQL searchable databases and plotting tools will be made public when their associated presentation papers are accepted for publication (as per VO requirement). The data reduction, signal extraction and ancillary software has been exported to 15 sites where it is in regular use by team members. Well-developed documentation and hands-on training in observation and reduction techniques are provided to new members by ALFALFA experts. The ALFALFA dataset has already served as the basis of five undergraduate senior thesis projects; two more are in progress. Seven graduate students (6 at U.S. institutions) are fully engaged in ALFALFA thesis research; two others, more junior, have participated and are formulating thesis plans. A number of members of the team have spent time at Cornell to receive intensive training in the observing, data reduction and data analysis process. Attracted by the initial ALFALFA results, the ALFALFA consortium continues to grow with the addition of new members who seek to be engaged in the team observations at Arecibo, in complementary observations performed or planned using a number of other telescope facilities and in performing relevant numerical simulations. It might be noted that ALFALFA survey efficiency is extremely high: with the exception of hardware failures, science data are acquired during ∼ 97% of each assigned observing block. Furthermore, the TOGS program has run commensally with ALFALFA since August 2005, with the observing burden for TOGS borne by the ALFALFA team. In all respects, we believe ALFALFA is living up to its promise, and moreover, developing as a legacy survey as we intended.

For the sake of brevity, we provide the URLs of the following documents/websites previously submitted to NAIC or containing information of direct relevance.

- ALFALFA Survey proposal, 15Oct2004, with the complete science justification
  http://egg.astro.cornell.edu/alfalfa/docs/alfalfaprop.pdf
- ALFALFA Year 1: Midterm Report, 15Aug2005
  http://egg.astro.cornell.edu/alfalfa/docs/midterm_report_2005.pdf
- ALFALFA A2010 Spring (Jan-Jun) 2006 Additional Time Request, 18Aug2005
  http://egg.astro.cornell.edu/alfalfa/docs/req_spring2006.pdf
- ALFALFA A2010 Request/plan for the year starting 01 Jul 2006, 26Jan2006
  http://egg.astro.cornell.edu/alfalfa/docs/req_feb06.pdf

- ALFALFA survey public website
  http://egg.astro.cornell.edu/alfalfa/
- ALFALFA observing team website
  http://www.naic.edu/∼a2010/galaxy_a2010.html
- Cornell HI digital archive website
  http://arecibo.tc.cornell.edu/hiarchive

In this document, we provide additional/updated information which specifically outlines progress in the last year and proposes a plan and request for continuation of ALFALFA for the year commencing 01Jul07.

First ALFALFA Science: A first installment of HI sources extracted from 3-D spectral data cubes was compiled using a matched filtering technique and then examined interactively to yield global HI parameters. 716 HI detections are catalogued within the solid angle $11^h44^m <$ R.A.(J2000) $< 14^h00^m$ and $+12° <$ Dec.(J2000) $< +16°$, and redshift range -1600 km s^{-1} $< cz < 18000$ km s^{-1}. In comparison, the HI Parkes All-Sky Survey (HIPASS) detected 40 HI signals in the same region. Optical counterparts are assigned via examination of digital optical imaging databases. ALFALFA HI detections are reported for three distinct classes of signals: (a) detections with S/N > 6.5; (b) high velocity clouds in the Milky Way or its periphery; and (c) signals of lower S/N (to ~ 4.5) which coincide spatially with an optical object of known similar redshift. Although this region of the sky has been heavily surveyed by previous targeted observations based on optical flux– or size– limited samples, 69% of the extracted sources are newly reported HI detections. The resultant positional accuracy of HI sources is dependent on S/N: it averages $24''$ ($20''$ median) for all sources with S/N > 6.5 and is of order $\sim 17''$ ($14''$ median) for signals S/N > 12. The median redshift of the sample is $\sim$7000 km s^{-1} and its distribution reflects the known local large scale structure including the Virgo cluster and the void behind it, the A1367-Coma supercluster at $cz \sim$7000 km s^{-1} and a third more distant overdensity at $cz \sim$13000 km s^{-1}. Distance uncertainties in and around the Virgo cluster perturb the derived HI mass distribution. Specifically, an apparent deficiency of the lowest HI mass objects can be attributed, at least in part, to the incorrect assignment of some foreground objects to the cluster distance. Several extended HI features are found in the vicinity of the Virgo cluster. A small percentage (6%) of HI detections have no identifiable optical counterpart, 2/3 of which are high velocity clouds in the Milky Way vicinity; the remainder 17 objects do not appear connected to or associated with any known galaxy. Based on these initial results, ALFALFA is expected to fulfill, and even exceed, its predicted performance objectives in terms of the the number and quality of HI detections. A paper presenting these results is in press with the *Astronomical Journal*.

A number of other papers including a second Virgo region catalog release, further study of the Virgo cluster and several enigmatic HI clouds discovered within it, and the first anti-Virgo region catalog are in progress with submission planned for the first half of 2007.

ALFALFA Refereed Papers to Date:

Giovanelli, R., Haynes, M.P., Kent, B.R., Perillat, P., Saintonge, A., Brosch, N., Catinella, B., Hoffman, G.L., Stierwalt, S., Spekkens, K., Lerner, M., Masters, K.L., Momjian, E., Rosenberg, J., Springob, C.M. plus 25 others 2005, A.J., 130, 2598 (Paper I)

Giovanelli, R., Haynes, M.P., Kent, B.R., Perillat, P., Catinella, B., Hoffman, G.L., Momjian, E., Rosenberg, J., Saintonge, A., Spekkens, K., Brosch, N., Masters, K.L., Springob, C.M., Karachentsev, I.D., Karachentseva, V.E., Koopmann, R.A., Muller, E., van Driel, W. & van Zee, L., 2005, A.J., 130, 2613

Giovanelli, R., Haynes, M.P., Kent, B.R., Saintonge, A., Stierwalt, S., Altaf, A., Balonek, T., Brosch, N., Brown, S., Catinella, B., Furniss, A., Goldstein, J., Hoffman, G.L., Koopmann, R.A., Kornreich, D.A., Mahmood, B., Martin, A.M., Mitschang, A., Momjian, E., Nair, P.H., Rosenberg, J.L. & Walsh, B. 2007, A.J., press

Saintonge, A. 2007, A.J., in press

ALFALFA Highlights since February 2006:

- As of 15Jan2007, Project A2010 has conducted observations during 322 separate observing blocks, to-

talling about 1760 hours of telescope time. In terms of efficiency, ALFALFA records data continuously, with an "open shutter" rate of 99%. About 5% of the allocated time is used for setup and telescope slew time; during another 5% of the time, the LST range is outside of the survey map area but can be used for single drift, 2-D signal detection. Time is often allocated in blocks shorter than optimal for our mapping strategy but of more convenience to the AO scheduler trying to accommodate multiple observing programs; for A2010, this practice leads to some loss of optimal efficiency and coverage. Graphical illustrations of the actual map coverage are shown in Figure 1 for the "fall" sky, 22^h <R.A.< 3^h and Figure 2 for the "spring" sky: 7^h30^m <R.A.< 16^h30^m (right), separately. Completed observations of each area in the two passes are illustrated separately, with green highlighting the first pass, and cyan, the second. Scheduled observations are denoted in yellow (first pass) and gold (second pass). Bad data are highlighted in brown and are generally replaced by a second set of observations. Pink shaded areas denote those intended to be mapped in the current scheduling year. Note that full resolution, updated images can be found at *http://egg.astro.cornell.edu/alfalfa/scheds/index.php* along with more detail summary information of completed and planned observations.

As evident in Figures 1 and 2, the time allocation to date, has allowed us sufficient coverage in both passes to construct fully sample grids of the following regions: from 12° to +16° and from +24° to +32° in the fall sky and +4° to +16° in the spring sky; this amounts to only six of the nine +4°-wide bands of tiles we had hoped to have covered by the second anniversary of the survey's start. For reference with previous requests for telescope time allocation, we have completed the tiles at +14°, +26° and +30° (fall) and +6°, +10°, and +14° (spring), but have not completed the ones included in last year's plan at +6° (fall) and +26° and +32° (spring). We hope to make significant progress on the latter two zones in the current spring 2007 season. Further progress on the spring zones this year is subject to the uncertainties associated with the platform painting project, as discussed below.

- TOGS runs commensally with A2010. In practice, the real-time burden for running the TOGS calibration is borne by the A2010 observer since it is he/she who executes the TOGS command files both before and after the A2010 observations. We also provide the TOGS team with access to our observer reports and log files.
- Two workshops for ALFALFA team members were held in early summer, one at the Arcetri Observatory (1 Jun 2006) and the other at Cornell (23-24 Jun 2006). Presentations from the latter meeting can be found at *http://egg.astro.cornell.edu/alfalfa/news/mtgs/ithaca06.php*.
- The second undergraduate ALFALFA workshop was held at Union College July 13-14, 2007. See: *http://www.union.edu/PUBLIC/PHYDEPT/koopmanr/ualfaagenda06.php*. In attendance were 16 faculty and 12 students. New participants included faculty and students from Skidmore College and Rutgers University. Again, a highlight of this event was a 90 minute remote observing session conducted by the students during the workshop, and as last year, the students were required to submit a plan for the observations in advance. This activity was supported by an NSF grant to Becky Koopmann and a grant from the Brinson Foundation to Martha Haynes.
- In consultation with NSF staff, Becky Koopmann (Union Coll.), Sarah Higdon (Georgia Southern) and Tom Balonek (Colgate U.) are preparing a proposal to NSF-AST for formal support for the undergraduate ALFALFA consortium, involving faculty and students from 14 colleges and universities throughout the US who are committed to participating (Colgate U., Cornell U., George Mason U., Georgia Southern U., Humboldt State U., Lafayette Coll., St. Lawrence U., Sienna Coll., Skidmore Coll., Union Coll., U. Puerto Rico, U. Wisconsin-Stevens Point, Wesleyan U., West Texas A&M). A major activity will be an annual undergraduate ALFALFA workshop to be held at Arecibo during the academic year.
- In keeping with the adopted ALFALFA guidelines for the science collaboration, a number of specific science projects, most notably seven led by students, have been proposed and approved by the ALFALFA Oversight Committee; more are expected in the coming months. Active project summaries can be found at *http://egg.astro.cornell.edu/alfalfa/projects/projects.php*.
  1. Team projects:
     - *"Blended HI signals from Distant Clusters"*, (Lead: Hoffman)

- *"An H-alpha Imaging Survey for a Volume-Limited Sample of ALFALFA Sources"*, (Lead: Salzer)
- *"Synthesis Imaging of Low Mass Dwarfs discovered by ALFALFA"*, (Lead: Begum)
- *"Integrated Spectra of galaxies detected by ALFALFA"*, (Lead: Boselli)
- *"H-alpha Imaging of ALFALFA Galaxies in Selected Cluster Fields"*, (Lead: Gavazzi)
- *"ALFALFA survey of the region around ZwCL1400+0949"*, (Lead: Balonek)
- *"ALFALFA detection of dE/dS0's in Virgo"*, (Lead: Koopmann)
- *"ALFALFA detections in the region around M33"*, (Leads: Corbelli and Giovanardi)
- *"ALFALFA as a blind HI absorption line survey"* (Leads: Darling and Momjian)
- *"GALEX observations of ALFALFA low mass galaxies"* (Lead: Haynes)
- *"UV Star Formation and HI Content within the ALFALFA volume"* (Lead: Giovanelli)
- "HI and X-ray properties of Elliptical Galaxies" (Leads: Di Serego Alighieri, Gavazzi and Trinchieri)

2. Graduate student projects:
   - *"Chemical abundances of low mass galaxies"*, (Lead: Saintonge, Cornell U.; Adviser: Giovanelli)
   - *"'The ALFALFA Virgo cluster survey"*, (Lead: Kent, Cornell; Adviser: Giovanelli)
   - *"Cross-correlation of ALFALFA HI detections with SMUDGES objects"*, (Lead: Nair, Indiana U.; Adviser: van Zee)
   - *"ALFALFA survey of the Leo region"*, (Lead: Stierwalt, Cornell U.; Adviser: Haynes)
   - *"Extremely Isolated Galaxies"*, (Lead: Spector, Tel-Aviv U.; Adviser: Brosch)
   - *"Extended HI Disks in the ALFALFA survey"*, (Lead: Dowell, Indiana U.; Adviser: van Zee)
   - *"The HI Correlation and Velocity Functions"*, (Lead: Martin, Cornell U.; Adviser: Haynes)
3. Undergraduate student (senior) projects:
   - *"Low-mass CDM halos in group-free environments"*, (Lead: Altaf, Lafayette Coll.; Adviser: Hoffman); submitted May 2006; Altaf is currently enrolled in the graduate program at Purdue.
   - *"Rich groups in the ALFALFA survey: Zw1400.4+0949"*, (Lead: Walsh, Colgate U.; Adviser: Balonek); completed May 2006; Walsh is currently enrolled in the graduate program in astronomy at Boston Univ.
   - *"The Extended Disk of NGC 5701"*, (Lead: Furniss and Mitschang, Humboldt State U.; Adviser: Kornreich)
   - *"The Undergraduate ALFALFA minisurvey"*, (Lead: Ayala, U. of Puerto Rico; Adviser: C. Pantoja)
   - *"Distant Clusters in the ALFALFA Volume"*, (Lead: Goldstein, Lafayette; Adviser: Hoffman)
   - *"The Environments of Galaxy Groups"*, (Lead: Lomax, St. Lawrence U.; Adviser: O'Donoghue)

- Two papers based on ALFALFA data were submitted for publication in Dec. 2006 and are in press:
  - *"The Arecibo Legacy Fast ALFA Survey: III. The Northern Virgo Cluster Region"*, Giovanelli *et al.*, 2007, Astron. J.
  - *"The Arecibo Legacy Fast ALFA Survey: IV. Strategies for Signal Identification and Survey Catalog Reliability"*, Saintonge, 2007, Astron. J.

- Papers introducing ALFALFA (Haynes) and reporting first results (Giovanelli) were presented at the December 2006 workshop on *Cosmic Voids* held at the Royal Netherlands Academy of Sciences. See *http://www.astro.rug.nl/∼ weygaert/knawvoid.program.php.*
- Two papers were presented at the January 2007 AAS meeting: *"The Arecibo Legacy Fast ALFA Survey: HI Sources in the Northern Virgo Cluster Region"* by Becky Koopmann and *"The Arecibo Legacy Fast ALFA Survey: The Rich Galaxy Group Zwicky 1400+0949"* by Tom Balonek.
- The first ALFALFA Ph.D. thesis is scheduled for completion in the summer of 2007 by Amélie Saintonge of Cornell University. In August 2007, Amélie is scheduled to begin a postdoctoral position at the University of Zurich.
- The working group on complementary and followup observations engaged in a number of activities leading to the planning and acquisition of new observations. These include:

  - Complementary broadband and narrow-band Hα images were obtained of newly discovered nearby dwarf galaxies with the WIYN 0.9m telescope (Salzer), San Pedro Martir (Gavazzi), the SAO 6-m telescope (Karachentsev) and the Wise Observatory 1-m telescope (Brosch). Following detection of Hα, long-slit spectra were obtained of selected HII regions with the Palomar 5m telescope for the purpose of determining their metallicities (Lead: Saintonge). These will continue in 2007.
  - VLA-C observations were conducted of several newly discovered HI clouds in the Virgo cluster (Lead: Kent) and two objects with extended HI disks was approved (Lead: Stierwalt)
  - A proposal to conduct new GALEX observations of low mass ALFALFA detections was approved for GALEX Cycle 3 (Lead: Haynes)
  - A proposal to conduct a correlative study of ALFALFA and the GALEX archive was approved for GALEX Cycle 3 (Lead: Giovanelli)
  - A proposal to conduct synthesis imaging of several newly discovered nearby dwarfs was submitted to the GMRT. (Lead: Begum)
  - Observations of low but positive velocity gas in the vicinity of the Virgo cluster were conducted with the GBT. (Lead: Kent)
  - Several proposals for followup time with Spitzer are being prepared for the the upcoming deadline (Leads: Hunt, Higdon and Charmandaris).
  - A cross-correlative study of cold (HI) and hot (X-ray, Chandra) properties of Elliptical galaxies is underway (Leads: Di Serego Alighieri, Trinchieri and Gavazzi).
  - A new collaboration with the GALEX MIS/DIS and SDSS legacy project team has been formed; further coordinated observations are being planned (Leads: Schiminovich, Kauffmann, and Catinella)
- The ALFALFA-IDL package was further developed and extended. The signal extraction algorithm was enhanced to include the fitting of Gauss-Hermite templates. Installation was streamlined for both Linux and Mac-OS users. The software has been successfully deployed at the following institutions: Cornell U., Arecibo, Colgate U., Georgia Southern U., Harvard-SAO/Center for Astrophysics, Humboldt State, INAF-Milano, Indiana U., Lafayette Coll., St. Lawrence U., Union Coll., U. Colorado, U. Minnesota, U. Wisconsin, Wesleyan U.
- The Cornell EGG digital HI archive dataset was installed on a SQL database server at the Cornell Theory Center (CTC); see *http://arecibo.tc.cornell.edu/hiarchive*. The archive is SQL and cone searchable and spectra can be downloaded in VOTable, FITS and ASCII format. A JAVA-script based plotting tool was developed to complement the VO-Plot tool for users who do not have access to the required plug-in. The preliminary ALFALFA catalogs have been made available internally within the collaboration for the purpose of planning followup observations; this interface will be moved to the CTC server when the associated paper is accepted for publication. Access to our datasets has been coordinated with the NASA Extragalactic Database; integration of our public archive fully into NED awaits further developments by IPAC staff.
- We are actively involved in a Cornell collaboration involving the CTC and other large dataset holders, including the PALFA consortium, for development of hardware and software tools for the permanent storage of and access to the ALFALFA data archive. We intend to participate in a proposal submission for support for research and education in data-driven science to the NSF Cyberinfrastructure Initiative. The AGES collaboration has asked to take advantage of our developments in this area.
- Several ALFALFA team members have paid extended visits to Cornell to work closely with the Cornell group. Becky Koopmann (Union Coll.) and Tom Balonek (Colgate U.) are spending the AY06-07 in residence at Cornell, partially supported by NAIC. Noah Brosch (Wise Obs/U. Tel-Aviv) spent two months at Cornell and one at Arecibo; he was joined for one month by his graduate student Oded Spector. NAIC-Arecibo staff member Emmanual Momjian visited the Cornell team members for a month in the summer of 2006 to develop IDL routines to look for HI absorbers.
- A number of team members have visited Cornell for short periods of time to receive intensive training in the ALFALFA data reduction software and process. Visiting Cornell were graduate students Shea Brown (U. Minnesota), Kelley Hess (U. Wisconsin), and Prasanth Nair and Jayce Dowell (Indiana U.). Team members who spent time at Cornell for the purpose of training include Marco Scodeggio (INAF-Milano) and John Salzer and John Cannon (Wesleyan Univ.).

- Cornell ALFALFA "experts" provided on-site instruction and training to team members at Arecibo, including several students and first-time Arecibo visitors. In February 2006, David Kornreich (Humboldt State University), his two undergraduate students Amy Furniss and Arik Mitschang, and graduate student Shea Brown (U. Minnesota) spent a week at Arecibo accompanied by Martha Haynes. In November 2006, Tom Balonek (Colgate) conducted observations at Arecibo with Aileen O'Donoghue and Jeff Miller (St. Lawrence U.) and their senior undergraduate Jamie Lomax. In January 2007, Sarah Higdon (Georgia Southern U.) and her undergraduates Josh Davidson and Daniel Richey traveled to Arecibo with Martha Haynes. We anticipate that the practice of training new ALFALFA users on site at Arecibo will continue in future years.

Issues of Uncertainty for the Next Year: A major structural painting project is scheduled to take place at Arecibo for a 12-week period in the first half of 2007. Its impact on telescope operations is not entirely understood. It is anticipated that because of its fixed-azimuth drift scan technique, ALFALFA may fit well into the limitations imposed by the painting project. On the other hand, it is possible that azimuth limitations may be required. If it is not possible to position the azimuth arm on the meridian, we will have to modify our specific observing plans. One option will be to perform the mapping of the $+18^\circ$ set of tiles; to avoid the zenith "zone of avoidance" (the dome cannot come within about $+2^\circ$ Zenith), the ALFALFA strategy for this region includes positioning the arm more in the E-W direction. As of this date, the schedule for the painting project has slipped; we understand that the telescope will be scheduled for normal operations until March 19, 2007. Here, we assume that we will receive a significant allocation of telescope time in the spring season of 2007 with no restrictions.

Recently, the first set of boards for the new E-ALFA spectrometer has been delivered to Arecibo and already HI emission from several galaxies has been detected with the new device. The ALFALFA technical requirements of spectral resolution and bandwidth are met adequately by the WAPPs, so one option for us is simply to continue to use them. However, recurrent WAPP failures continue to occur periodically and have been the major source of telescope time loss in the past two years. We are submitting a separate proposal for telescope time to test the new E-ALFA spectrometer in our standard observing mode in summer 2007. We will plan to stick to the WAPPs through the current season, and will make a decision as to whether to switch to the new spectrometer beginning in Fall 2007 after performing system tests.

Plan for the Next Year: Figure 3 illustrates the current and proposed ALFALFA sky coverage, particularly in the context of local large scale structure. Completed regions, general containing bands of 4°-wide "tiles", are shown in blue. Areas proposed to be covered during the current year but not yet complete are shaded in magenta, while new regions which we propose to survey next are shaded green. Our original request planned to complete two sets of 4° tiles per year. As is evident from the figures here, the allocation of telescope time has not been adequate to match that pace, so that our request for the next year assumes that we will spend much of the time completing regions already initiated and that only two new bands of tiles will be started. For the year beginning 01Jul07, we propose to complete the $+06^\circ$ set of tiles in the "fall" and $+26^\circ$ and $+30^\circ$ in the "spring", and to initiate the $+10^\circ$ one (fall) and $+02^\circ$ one (spring). The priority for coverage of these strips is motivated by the desire to achieve the principal ALFALFA science objectives, with special attention to the timely acquisition of datasets required for PhD theses. Particular reasons for the choice of these particular sets of tiles is highlighted briefly below.

- Completion of the Dec = $+06^\circ$ fall strip will provide full overlap with the optical SMUDGES strip being surveyed at BVI wavelengths (van Zee). As part of his Ph.D. thesis research, graduate student Prasanth Nair (Indiana) will perform a cross-correlation of ALFALFA with the SMUDGES dataset.
- The $+26^\circ$ and $+30^\circ$ spring strips will map both the Coma cluster (Abell 1656; z= 0.0232) itself and its supercluster environment, extending southward towards Abell 1367. Gavazzi, Scodeggio and collaborators have a large collection of multiwavelength data covering this region in their *GOLDMINE* database. Additionally, these strips cut across the supergalactic plane nearly parallel to the more southerly ALFALFA strips but offset by more than 15° in SGL, providing an excellent sampling of the central regions of the Local Supercluster.
- The fall Dec = $+10^\circ$ strip will fill in the gap between the $+06^\circ$ and the $+14^\circ$ bands and will provide adequate sampling of the anti-Virgo region to allow comparison of the HI mass function in the Virgo

and anti-Virgo environments within the same sampling volume.

- The spring Dec = +02° band of tiles includes of the southeast extension of the Virgo cluster.

Dataset and product status: Processing of the data is proceeding according to schedule. Raw data in FITS format are converted to IDL and transferred to Cornell daily. Processing to Level I usually occurs within days to weeks using a standard pipeline in ALFALFA-IDL. A laborious part of Level I processing is the flagging of RFI, a necessary (unfortunately) and extremely beneficial exercise. Construction of final data products in some areas is limited by the incomplete coverage of datasets due to the spottiness of time allocation, but we are now engaged in systematic reduction of selected, fully sampled areas. A few points are worthy of note:

- ALFALFA acquires data at a rate of about 1 GB/hour. Raw data is archived at Arecibo by NAIC. About 3 TB of Level I datasets (2-D) are currently housed at Cornell for quick access; about 1 TB of Level II datasets (3-D) are also housed at Cornell. Reduction status is available on the team-only website. If the skeptical review panel needs access to this site, it can be provided upon request. Nearly all data acquired prior to June 2006 have been processed to Level I, and about half of the data obtained since then is at a similar state. Priority in processing is given to completing Level I processing of datasets needed to yield full coverage of contiguous areas for gridding purposes and regular checks to insure data quality.
- Both Level I and Level II datasets are produced by numerous team members following a very strict protocol and after several extensive training sessions by a reduction "expert". Each Level I and Level II dataset is later checked for quality by a senior member (RG or MH) of the team before being delivered into the archive. Cataloguing and archiving is also carried out by a senior individual, providing a second check.
- The construction of 3-D grids is currently underway. Each grid represents a square of $2.4° \times 2.4°$ of sky, with contiguous grid centers separated from each other by 2°. As of jan 30, 2007, 235 grids have been generated and sources extracted from them, corresponding to 13.5% of the total ALFALFA plans. Signal extraction and measurement is a laborious phase of the processing, currently being carried out at several sites with close supervision from senior members of the team at Cornell. The first batch of source catalogs has been submitted for publication; several others will be submittedd in the first half of 2007.
- Signal extraction within the 3-D datasets is performed using a Fourier domain technique developed by graduate student Amélie Saintonge and makes use of confirmation in both polarizations, both passes and adjacent beams. Because of the extreme value of these multiple "confirmation" checks, it is necessary to have all data in hand to produce final catalogs of reliable detections.
- As part of the initial examination, we perform a preliminary "eyeball" inspection of the 2-D drifts for possible HI detections and an immediate cross correlation with other public datasets (NED, NVSS, DSS2 and, where available, SDSS). Although the data are not, at this stage, at full sensitivity nor of highest quality, this quick inspection has allowed us to identify immediately the most exciting targets for complementary and followup observations.
- A "followup observations" website is available to team members. This site serves as a testbed for public catalog releases before they are made public.

Additional activities already planned during 2007:

- A significant ALFALFA team presence will occur at IAU Symposium No. 244 to be held in Cardiff, UK in June.
- ALFALFA results will be presented in several invited talks at other meetings including the conference on *HI Survival through Cosmic Time* in May (Giovanelli), the NRAO 50th Anniversary Symposium in June (Haynes), and the meeting entitled *A Century of Cosmology* in August (Giovanelli).
- Arcetri Obs. postdoc Marco Grossi will visit Cornell for 3 weeks in spring 2007 to be thoroughly trained in the data reduction and analysis procedures.

- We will continue to provide training sessions for less experienced ALFALFA team members on site in Arecibo.
- We will continue to participate in the development of the Cornell cyberinfrastructure initiative in collaboration with the CTC.
- Pending NSF funding, organized activities of the undergraduate ALFALFA consortium will initiate in Fall 2007.

Summary of Request: Completion of a single strip of ALFALFA 4° tiles in 2-pass mode requires 33 observing sessions with the second half occuring 3-9 months after the first. We understand that it is more convenient for the AO scheduler to schedule A2010 in more, but shorter blocks, which we can then stitch together to provide complete coverage of the ALFALFA survey region. Such a scheme, while somewhat less efficient and more burdensome in terms of bookkeeping, is acceptable to us. We therefore request for the period 01Jul06-30Jun07 that A2010 be scheduled for **the equivalent of 66 sessions from LST 21^h40^m to 03^h10^m during the period Aug07-Jan08** and **the equivalent of 66 sessions from LST 07^h10^m to 16^h40^m during the period Dec07-Jun08**. The tiles we propose to complete in this period are +6° (fall) and +26° and +30° (spring). We will also initiate observations of the +10° fall strip and the +2° spring one. The proposed coverage is subject to change if telescope restrictions during the platform painting project restrict the azimuth placement to an azimuth other than along the meridian; if it is more E-W, we will focus on observations of the +18° tiles. As always, TOGS will run commensally with ALFALFA.

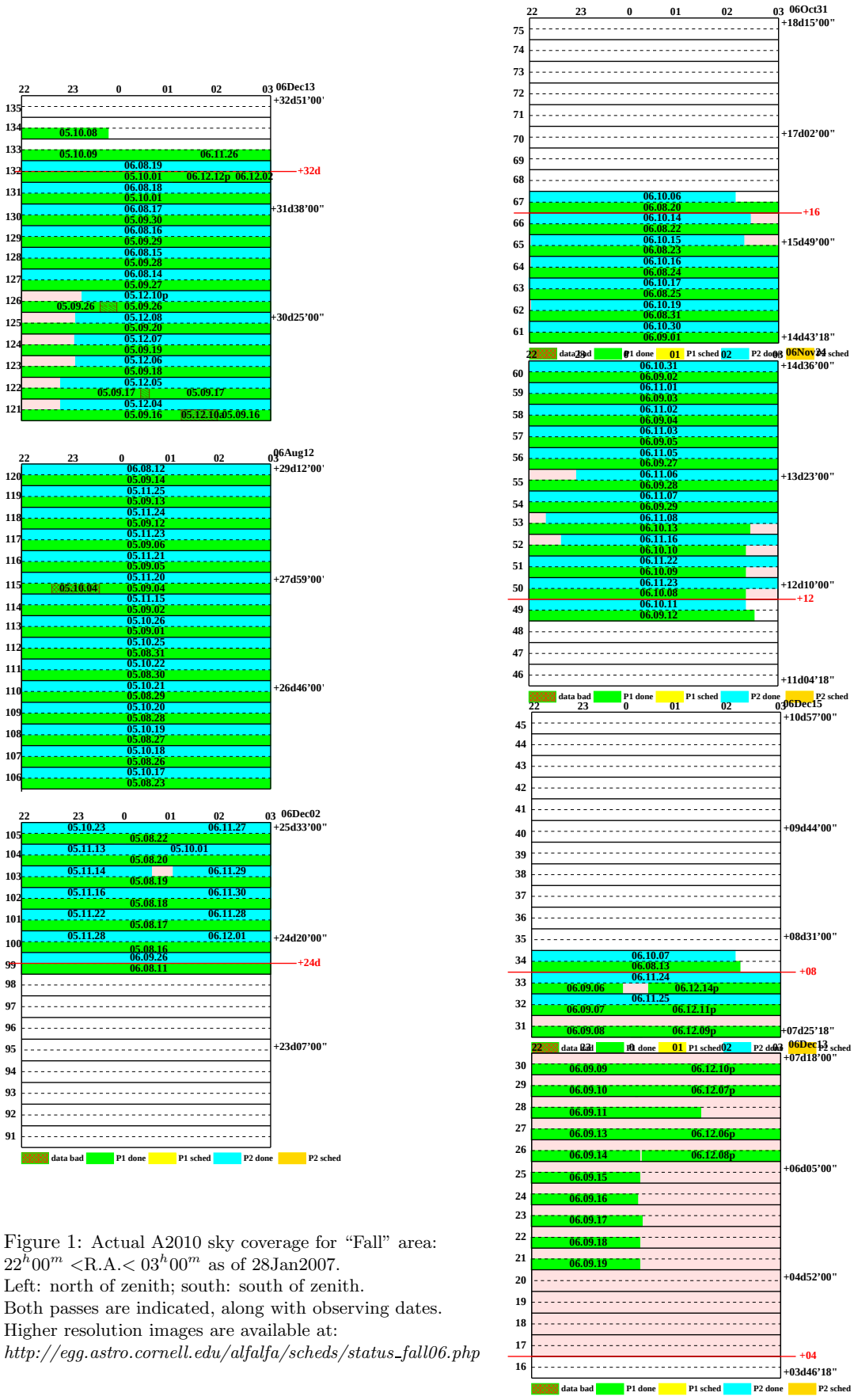

Figure 1: Actual A2010 sky coverage for "Fall" area: 22^h00^m <R.A.< 03^h00^m as of 28Jan2007.
Left: north of zenith; south: south of zenith.
Both passes are indicated, along with observing dates.
Higher resolution images are available at:
http://egg.astro.cornell.edu/alfalfa/scheds/status_fall06.php

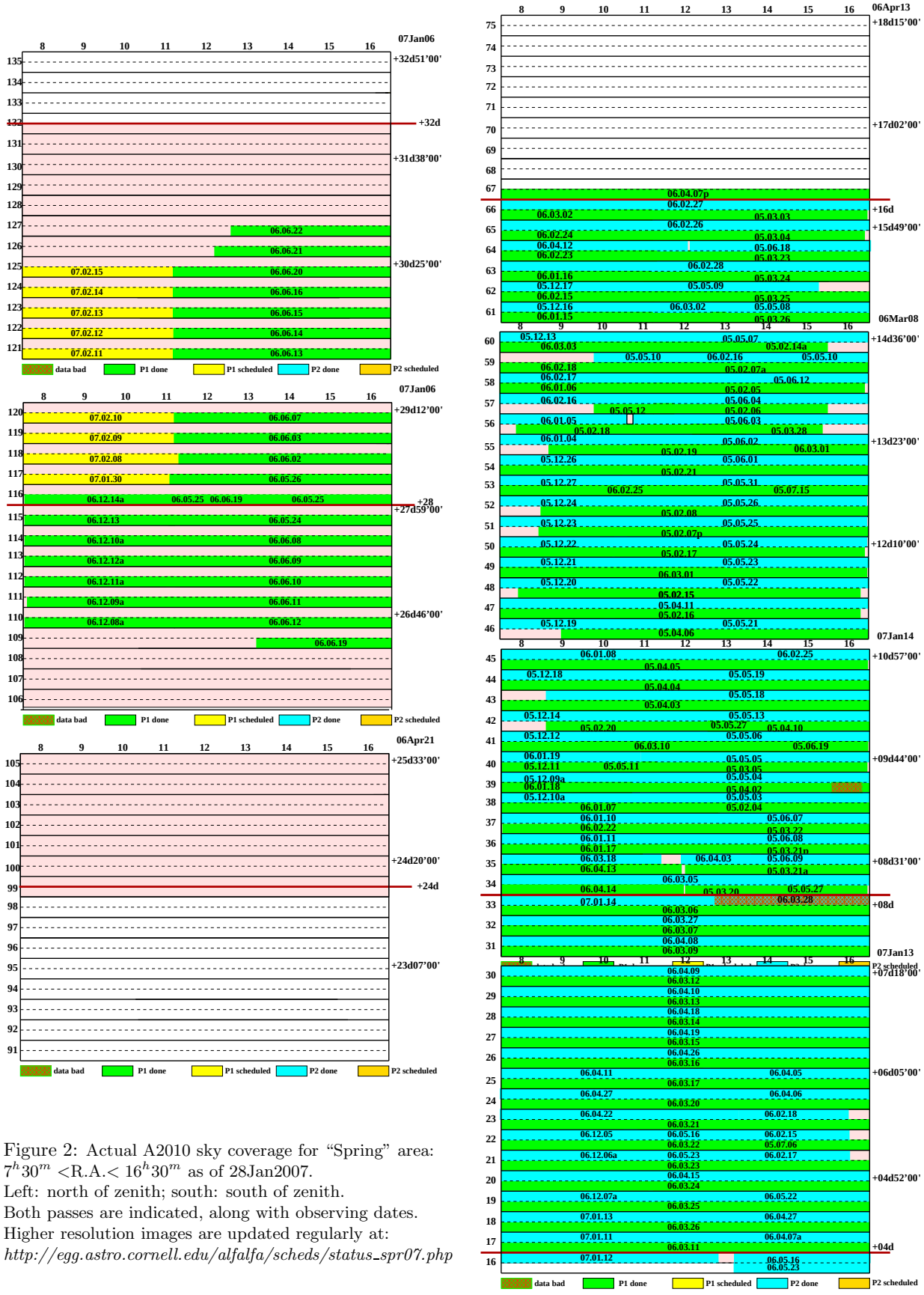

Figure 2: Actual A2010 sky coverage for "Spring" area: 7^h30^m <R.A.< 16^h30^m as of 28Jan2007.
Left: north of zenith; south: south of zenith.
Both passes are indicated, along with observing dates.
Higher resolution images are updated regularly at:
http://egg.astro.cornell.edu/alfalfa/scheds/status_spr07.php

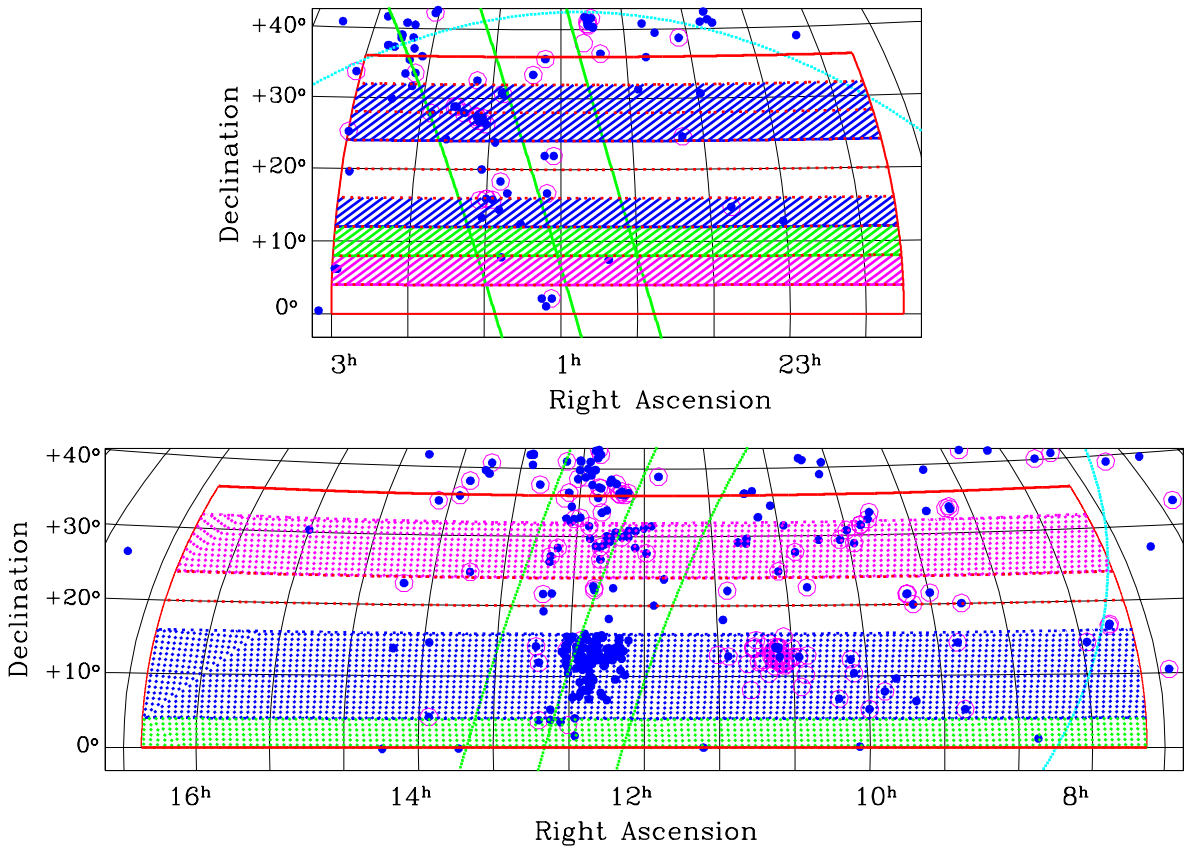

Figure 3: Proposed A2010 sky coverage for the year beginning July 2007 (if the painting project does not restrict azimuths in Spring 2007): Fall 2007 (upper) and Spring 2008 (lower). Blue shaded areas outline the (nearly)complete coverage as of 1 Jan 2007, from 7^h30^m <R.A.< 16^h30^m, $+4^\circ$ < Dec.< $+16^\circ$ and 22^h <R.A.< 3^h, $+12^\circ$ < Dec.< $+16^\circ$ and $+24^\circ$ < Dec.< $+32^\circ$. Actual coverage to date is detailed in Figures 1 and 2. Further allocations in Feb 2007 through June 2007 will aim to fill in, as much as possible, the two spring sets of tiles begun in 2006 $+24^\circ$ < Dec.< $+32^\circ$ (shaded magenta); we do not anticipate being able to complete those tiles this year, especially because of uncertainties associated with the platform painting project. The allocation requested here for the year starting 01Jul2007 aims to complete 4° wide tiles at Dec. = $+06^\circ$ (fall) and Dec. = $+26^\circ$ and $+30^\circ$ (spring) shown as the magenta shaded areas, begun in 2006. Time permitting, we will then initiate the survey of the Dec. = $+10^\circ$ (fall) and Dec. = $+02^\circ$ (spring) tiles, shaded green in each panel. The solid red lines outline the proposed survey area for the full ALFALFA survey, while dotted red lines make the designated ALFALFA tile boundaries. The cyan line traces b = $+20^\circ$, while the green lines trace SGL = -10°, 0° and $+10^\circ$. Blue filled circles mark galaxies with observed heliocentric recessional velocities cz < 700 km s^{-1} while open magenta circles denote objects believed to lie with 10 Mpc, based largely on primary distances (Karachentsev *et al.* 2004).