

**ALFALFA A2010 Spring (Jan-Jun) 2006 Additional Time Request:  
66 sessions extending from  $7^h10^m < \text{LST} < 16^h40^m$**

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18 August 2005

As per communication from R. Brown on 17 August in response to our mid-term report submitted to NAIC on 15 July 2005, we will submit a formal renewal proposal for continuation of the ALFALFA survey (project A2010) for review on 1 February 2006. Here we discuss our request for telescope time during the January-June 2006 period, under the “continuing allocation” basis proposed in the mid-term report and now approved.

As discussed in the mid-term report, the nature of ALFALFA science requires survey completion of contiguous areas. The timely release of data into the public domain demands similarly. As discussed in the full survey proposal, ALFALFA aims to “tile” the sky; a strip of tiles covers four degrees in Declination. For reference, Figure 1 illustrates the proposed ALFALFA survey coverage of the “spring sky” for the entire survey highlighting the plan for 2005-6. Because of pressure from other proposals in the queue, the time allocated to A2010 in spring 2005 was not sufficient to allow us to complete our planned coverage (see Figure 1 of the mid-term report for a graphical summary of final ALFALFA coverage in Spring 2005). We understand that further allocations in Dec 2005/Jan 2006 will allow us to two-pass complete coverage of the region from  $7^h30^m < \text{R.A.} < 16^h30^m$  between  $+08^\circ < \text{Dec.} < +16^\circ$  (the blue shaded region in Figure 1).

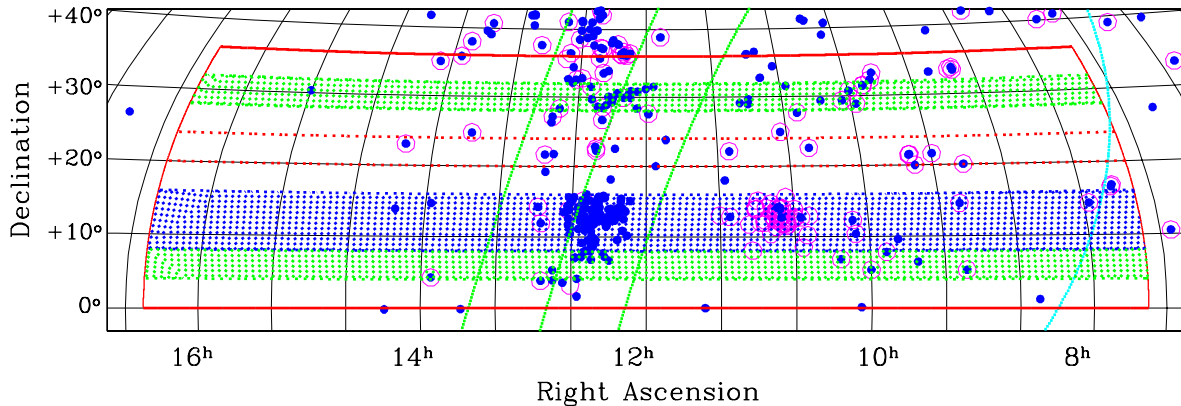


Figure 1: Proposed 2005-6 A2010 sky coverage for “spring” sky region. The solid red lines outline the proposed survey area for the full ALFALFA survey. The dotted red lines make the designated ALFALFA tile boundaries. The cyan line traces  $b = +20^\circ$ , while the green lines trace  $\text{SGL} = -10^\circ, 0^\circ$  and  $+10^\circ$ . Blue filled circles mark galaxies with observed heliocentric recessional velocities  $cz < 700 \text{ km s}^{-1}$  while open magenta circles denote objects believed to lie with 10 Mpc, based largely on primary distances (Karachentsev *et al.* 2004). The 2005 ALFALFA program planned to cover homogeneously the region extending from  $7^h30^m < \text{R.A.} < 16^h30^m, +8^\circ < \text{Dec.} < +16^\circ$ ; further allocations in Dec 2005/Jan 2006 will aim to complete this region (shaded blue). The allocation requested here for Jan-June 2006 targets the four degree wide tiles at  $\text{Dec.} = +06^\circ$  and  $+30^\circ$  (green shaded areas).

During January-June 2006, we propose to cover two more sets of tiles, one centered at  $\text{Dec} = +06^\circ$ , and a second at  $\text{Dec} = +30^\circ$  (green shaded areas in Figure 1). Such a plan will require allocation of 66 sessions extending from  $7^h10^m < \text{LST} < 16^h40^m$ . It should be noted that ALFALFA survey efficiency is extremely high: with the exception of hardware failures, science data are acquired during  $\sim 97\%$  of each assigned observing block. Furthermore, the TOGS program will run commensally with ALFALFA in 2006 (it did not in 2005). The priority for coverage of these strips is principally motivated by the desire to achieve specific science objectives, summarized below:

**Dec = +06° strip of tiles:**

- is already included in the area covered by the current public data release (DR4) of the Sloan Digital Sky Survey (SDSS), allowing immediate identification of optical counterparts and comparison with the stellar component, of ALFALFA detections – or the lack thereof.
- adds to the survey of the Virgo cluster and its environs, further to the south, including the W and W' clouds and the northern portion of the SE extension (Bingeli *et al.* 1993).
- includes the very extended HI distributions already known around the Virgo galaxies NGC 4532/DDO 137 (Hoffman *et al.* 1992; 1999) and UGC 5288 (van Zee 2005), and the tidal features seen in loose groups

such as NGC 2777 (Hogg *et al.* 1998). Wider surveys of these regions may help elucidate the origin of these giant HI envelopes and the history of tidal events. The blind survey nature of ALFALFA also promises the discovery of as-yet-unknown objects in these categories.

- crosses the nearby group of galaxies around NGC 5364, including the single-pass drift conducted by the 2005 Undergraduate ALFALFA team at the Union College workshop (project A2140). Further study of this group would be undertaken by these same undergraduates who could reduce and analyze the data during summer 2006.
- includes the area covered by the on-going optical *SMUDGES* survey (van Zee, P.I.). Specifically designed as an unbiased survey for dwarf galaxies to quantify the fraction of dwarfs that go through a starburst phase and to identify the mechanisms that trigger star formation in them, SMUDGES is covering 134 square degrees of imaging in B, V and I, plus optical spectroscopy of about 13,000 galaxies and H $\alpha$  imaging for thousands of galaxies. Comparison with ALFALFA in the same region adds an important component to this work and will involve Indiana University graduate student Prasanth Nair.
- includes the regions occupied by the more distant rich clusters Abell 2040 ( $z= 0.0456$ ) and Abell 2052 ( $z= 0.0348$ ). ALFALFA will detect the most massive HI disks in these clusters and their surrounding superclusters; as more clusters are included in the survey, a comparison of their HI mass functions will become possible.

#### Dec = +30° strip of tiles:

- is largely included in the current SDSS public data release. (N.B.: The only alternative north of Arecibo zenith is the strip at +34° which we give lower priority because of its high zenith angle/lower sensitivity. Unfortunately, the current SDSS largely excludes the Arecibo declination zones in the Virgo direction.)
- covers several nearby groups and clouds including Coma I, the Leo Spur, and the Can Ven Spur.
- cuts across the supergalactic plane nearly parallel to the previously completed ALFALFA strips but offset by more than 15° in SGL.
- will map the Local Group dwarf irregular Leo A and its surroundings.
- crosses the core of the Coma cluster (Abell 1656;  $z= 0.0232$ ) and its supercluster environment, allowing a complete mapping of HI deficiency in and around Coma. Gavazzi, Scodreggio and collaborators have a large collection of existing HI and optical imaging data in their *GOLDMINE* database.
- includes the regions occupied by the more distant rich clusters Abell 671 ( $z= 0.0502$ ), Abell 1185 ( $z= 0.0304$ ), Abell 1213 ( $z= 0.0468$ ) and Abell 2162 ( $z= 0.0320$ ).

The combination of these strips of tiles will provide a solid dataset for the initial statistical studies included in the ALFALFA scientific program as contained in the full proposal. Furthermore, this plan will provide the first significant TOGS coverage of the high galactic latitude sky.

**Summary of Request:** Completion of a single strip of ALFALFA 4° tiles in 2-pass mode requires 33 observing sessions with the second half occurring 3-9 months after the first. Therefore, **in addition to the time required to complete the strips of tiles begun in spring 2005**, which we understand will be scheduled in Dec 2005 - Jan 2006, completion of two additional strips of tiles in 2006 requires **66 sessions of LST from 7<sup>h</sup>10<sup>m</sup> to 16<sup>h</sup>40<sup>m</sup>** allocated during **Jan - Jun 2006**. TOGS will run commensally with ALFALFA.

#### References

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