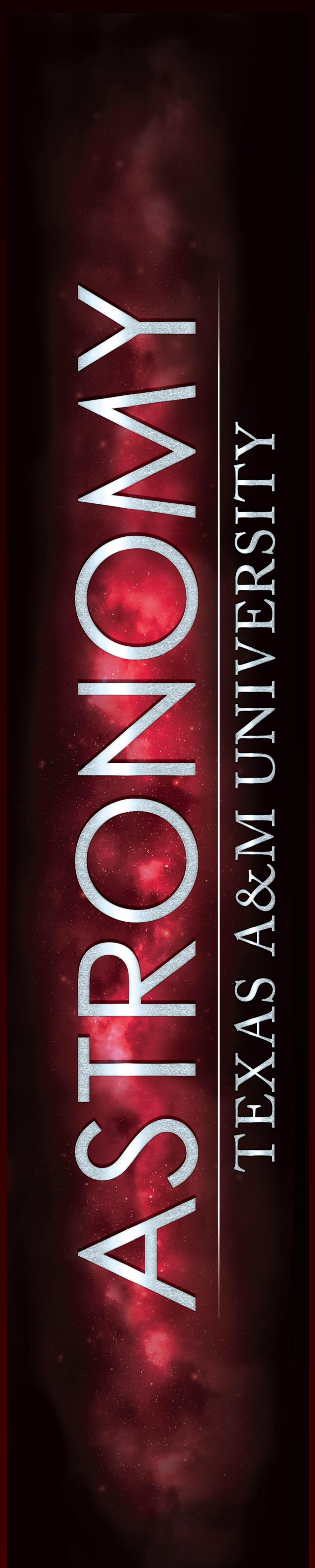
# THE LOCAL VOLUME DATABASE

Liam L. Plybon[a], John F. Maner[a], Andrew B. Pace[a]

[a]Department of Physics and Astronomy, Texas A&M University, 4242 TAMU, College Station, TX, 77843-4242 USA




## ABSTRACT

The Local Volume Database (LVDB) is an SQL database of measurements of hundreds of satellite galaxies and globular clusters within the Local Group (D < 3Mpc) from > 250 publications. The LVDB allows users to access a current snapshot of the structural, dynamical, and chemical properties of Local Group satellites through user created SQL queries, Python, or precompiled .FITS tables.

## INTRODUCTION

The large scale survey efforts of SDSS, DES, GAIA and others has seen the number of discovered ultra faint dwarf galaxies and star clusters rapidly increase. The most recent compilation of Local Group objects (McConnachie et al. 2012) has not received updates in over 3 years and does not include many recently discovered objects. The LVDB not only includes newly discovered objects but also provides updated measurements of previously discovered objects. A total of 6 tables currently exist, containing basic information, distances, kinematics, structural properties, proper motions, and metallicities for most of the ~150 satellite galaxies and clusters.

## TABLES

| NAME | PARAMETERS |
|---|---|
| Master | Object name(s), discovery year, object type, parent |
| Structure | Position, effective size, ellipticity, position angle, absolute magnitude |
| Kinematics | Average velocity, velocity dispersion, number of member stars |
| Distance | Distance modulus, distance [kpc], methodology |
| Proper Motion | RA, Dec proper motion components, methodology & measurement baseline |
| Chemistry | Mean metallicity, metallicity dispersion |

## DATA

All appropriate data from a given publication was collected and intermediate calculations were performed to ensure dimensional homogeneity and data completeness. Such calculations include coordinate conversions and precession to J2000, distance modulus to kiloparsecs, structural model scale radius to half-light radius, and distance modulus and absolute magnitude to apparent magnitude. In many cases, a single publication presents several analyses of a single object, particularly structural analyses, and thus several entries for any object exist. Users may have the option of selecting data from individual tables and accessing all entries for any object(s) in the future, or selecting from a precompiled table which contains one entry per object.

## TAG STRUCTURE

Due to the fact that many publications present several sets of values for a given object, it is not sufficient to identify objects within the database by only object name and bibcode. Therefore each entry is assigned a unique integer ID that is generated by an SQL SEQUENCE. The ID of the most desirable set of values for each object is stored in a "glossary" table that is populated with a Python function when uploaded. The glossary table allowed the creation of preformatted tables via an SQL VIEW, which is essentially a stored query that functions as a table. VIEW's are updated automatically and thus once created require no user interaction. Duplicate column names were aliased in order to avoid confusion and permit .FITS and Python compatibility.

## LVDB INTERACTION

Currently, preformatted .FITS tables are the most convenient and portable means of interacting the LVDB. All data is formatted to be Python 2.7 and 3.x compatible. In the future users may have the option to interact directly with the database and select multiple sets of values for a single object.

```
CREATE VIEW lvdb_v1 AS
SELECT m.name, g.key, g.type, g.host, d.method AS distance_method, d.distance_modulus,
d.distance_modulus_em, d.distance_modulus_ep, d.distance_kpc, d.distance_kpc_em,
d.distance_kpc_ep, k.average_velocity, k.average_velocity_em, k.average_velocity_ep,
k.velocity_dispersion, k.velocity_dispersion_em, k.velocity_dispersion_ep, k.n,
k.rotation, s.model AS structure_model, s.ra, s.ra_em, s.ra_ep, s.dec,
s.dec_em, s.dec_ep, s.ellipticity, s.ellipticity_em, s.ellipticity_ep,
s.position_angle, s.position_angle_em, s.position_angle_ep, s.rscale,
s.rscale_em, s.rscale_ep, s.rparam_2, s.rparam_2_em, s.rparam_2_ep,
s.rhalf, s.rhalf_em, s.rhalf_ep, s.m_v, s.m_v_em, s.m_v_ep, s.apparent_magnitude,
s.apparent_magnitude_em, s.apparent_magnitude_ep, c.average_metallicity,
c.average_metallicity_em, c.average_metallicity_ep, c.metallicity_dispersion,
c.metallicity_dispersion_em, c.metallicity_dispersion_ep, s.ref AS structure_ref,
k.ref AS kinematics_ref, d.ref AS distance_ref, c.ref AS chemistry_ref,
d.notes AS distance_notes, c.notes AS chemistry_notes, k.notes AS kinematics_notes,
s.notes AS structure_notes FROM glossarytest AS g
LEFT JOIN distance_v1 AS d ON g.distance_v1=d.id
LEFT JOIN structure_v1 AS s ON g.structure_v1=s.id
LEFT JOIN chemistry_v1 AS c ON g.chemistry_v1=c.id
LEFT JOIN kinematics_v1 AS k ON g.kinematics_v1=k.id
LEFT JOIN master_table_v3 AS m on g.key=m.key
WHERE g.distance_v1=d.id OR g.structure_v1 = s.id
OR g.chemistry_v1 = s.id OR g.kinematics_v1 = k.id;
GRANT SELECT ON lvdb_v1 TO PUBLIC;
```

Figure 1. SQL command to create a preformatted VIEW table.

## RESULTS

Preformatted .FITS tables allow users to visualize parameters of the Local Group in seconds. Below we present five sample plots, half-light radius vs absolute magnitude, absolute magnitude vs mean metallicity, metallicity vs metallicity dispersion, absolute magnitude vs mass/luminosity, and positional plot of 142 objects.

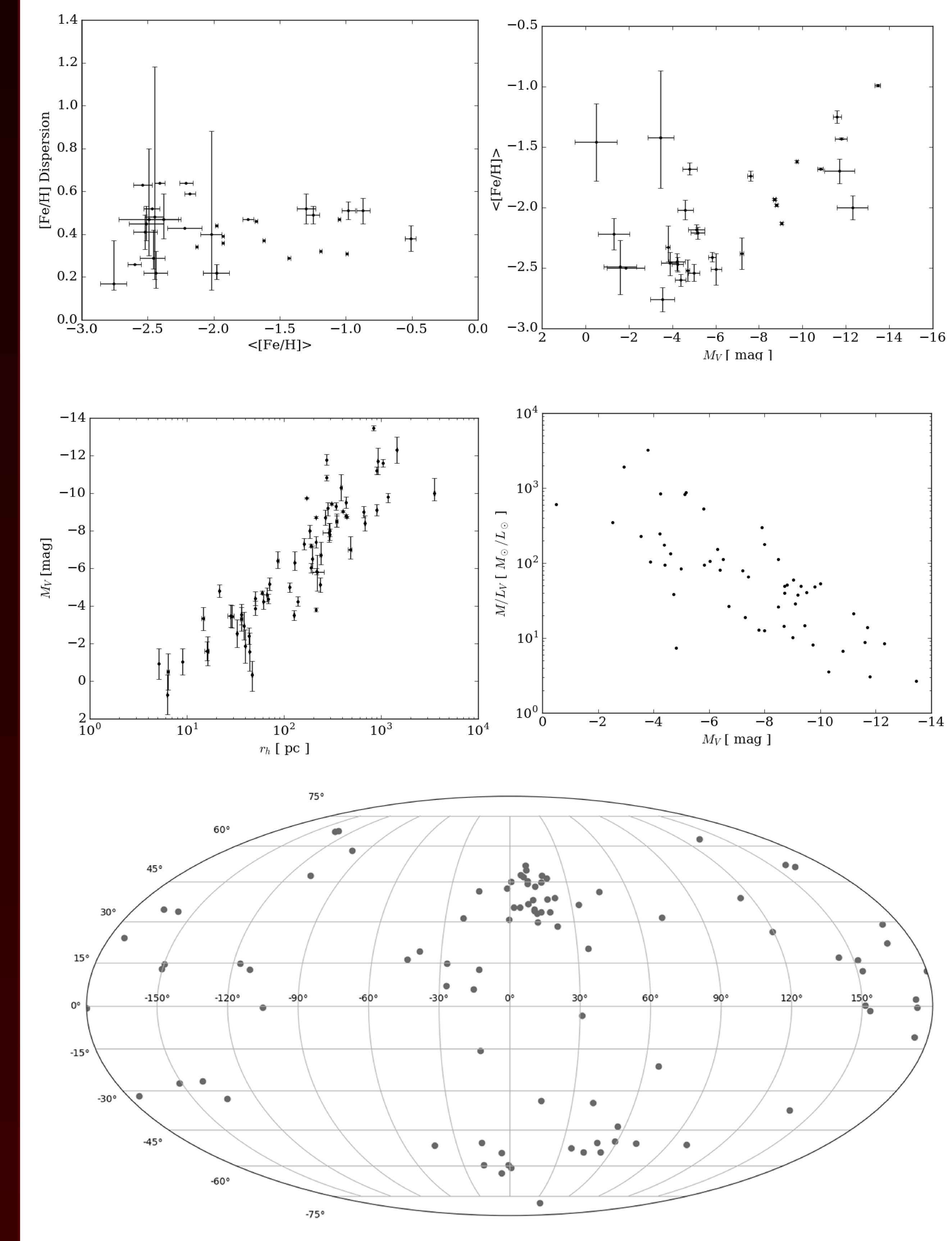


Figure 2. Sample plots created with preformatted .FITS tables.

## CONCLUSION

The Local Volume Database presents an up to date snapshot of the Local Group to the astronomy community. Regular updates are planned as new discoveries and follow-up studies are published. Robust documentation and sample queries will be created to increase ease of access.

Follow our progress:
http://instrumentation.tamu.edu

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