Current status of Sloan Digital Sky Survey III & IV

Hyunmi Song (KASI)

6th SSGW at Ullengdo

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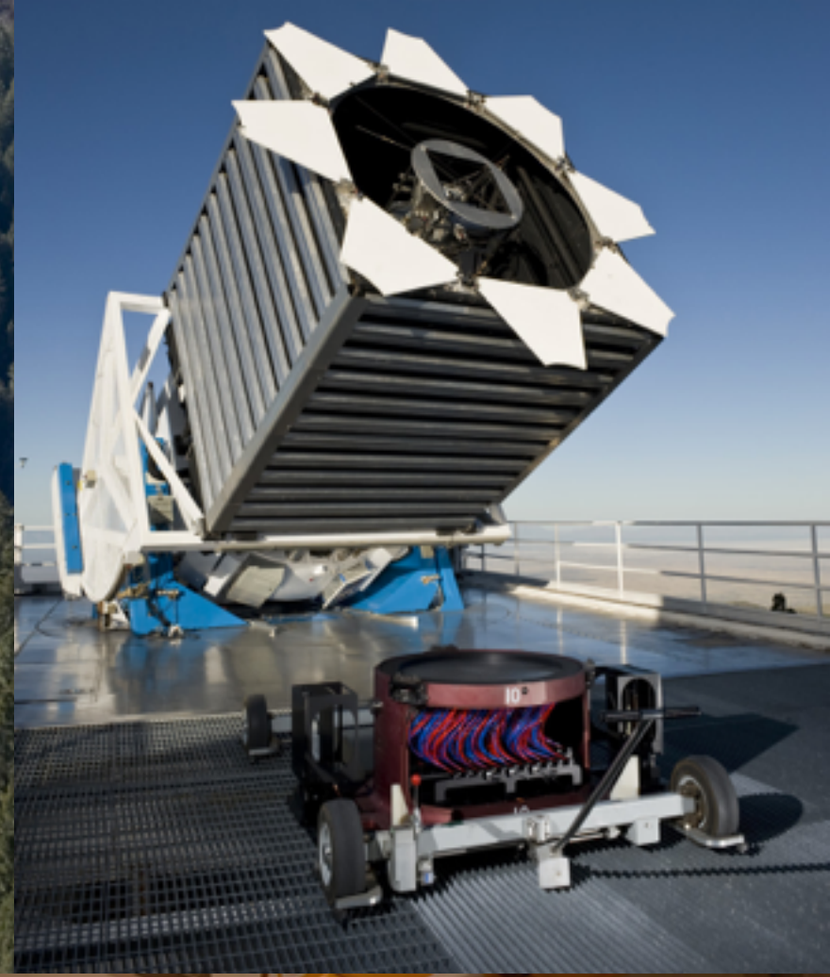
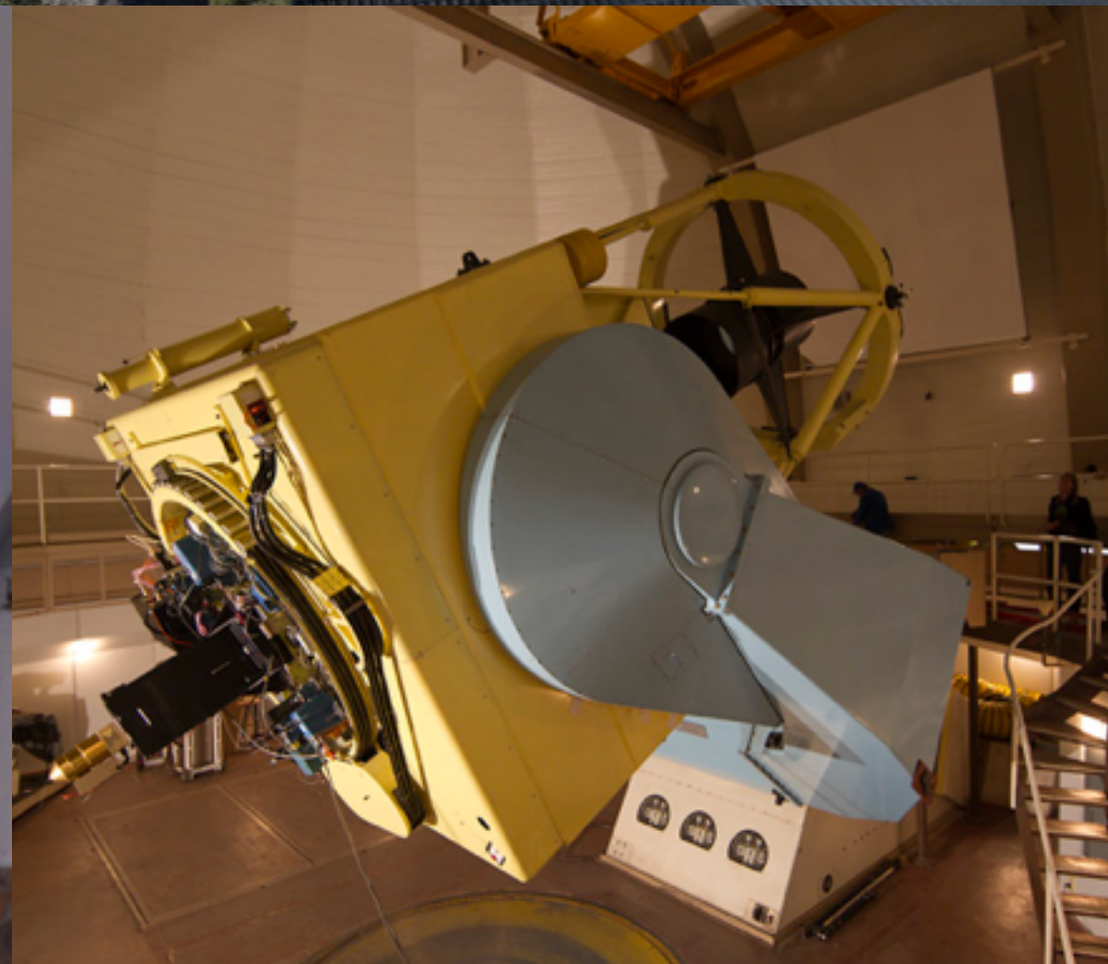
Sloan Digital Sky Survey

- Photometric (~3000-11000A; ugriz bands) + spectroscopic (optical 3800-9200A+infrared) survey over ~π steradians of the sky since 2000 (until 2020).
- Telescopes
  - The Sloan Foundation 2.5m telescope at Apache Point Observatory in New Mexico; 3 deg FoV
  - (New in SDSS-IV) The Irenee du Pont 100in. (2.54m) telescope at Las Campanas Observatory in Chile; 1.45 deg FoV

Apache Point Observatory



Las Campanas Observatory



SDSS phases

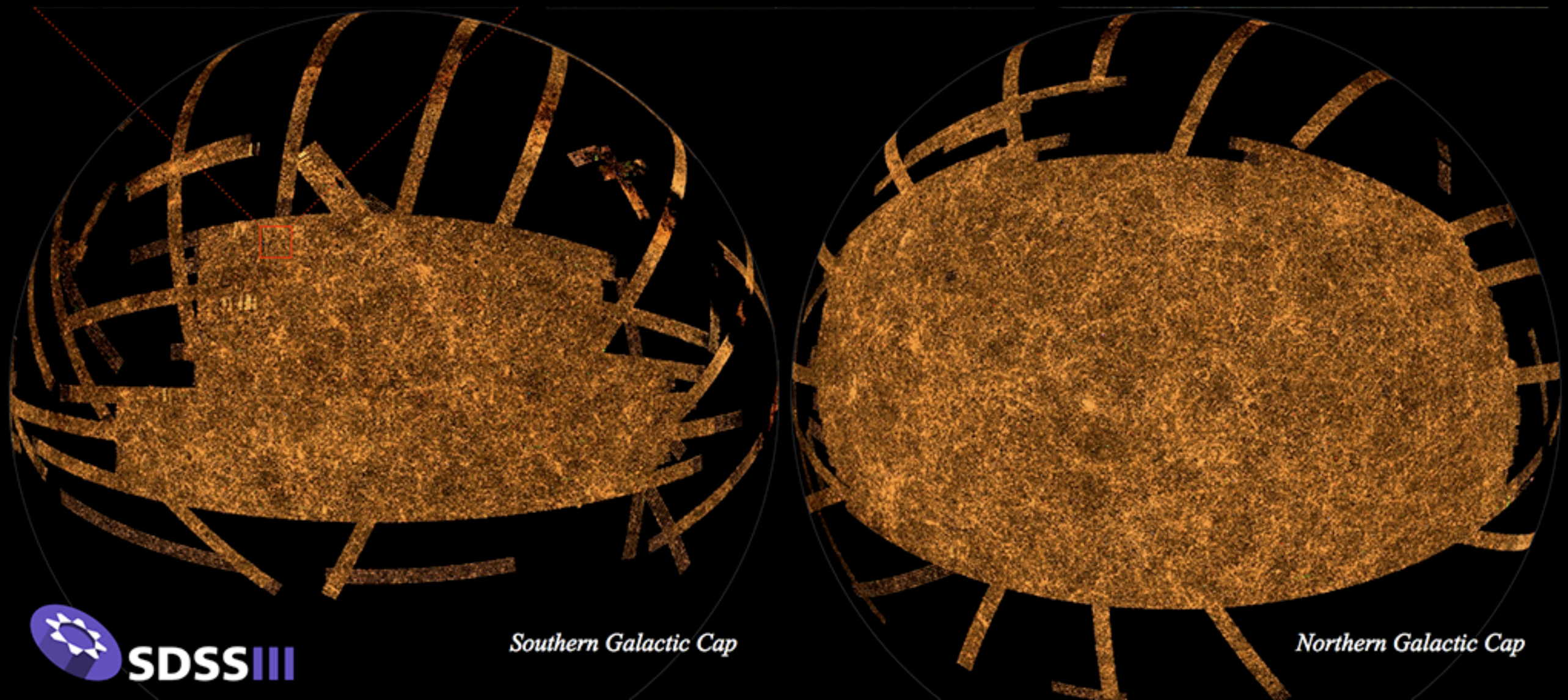
- SDSS-I/II : 2000-2008, Data Release (DR) 1-7
- SDSS-III : 2008-2014, DR8-12
- SDSS-IV : 2014-2020(?), DR13-

SDSS programs

- Stellar science : MARVELS, APOGEE-2
- Galactic science : SEGUE-1, SEGUE-2, APOGEE, APOGEE-2, MaNGA
- Extragalactic science : Legacy, Supernova, BOSS, (SEQUELS), eBOSS, (TDSS, SPIDERS)

SDSS-I, II, III, IV

Credit: SDSS



Previous Data

- 12 DRs from SDSS-I/II/III, getting more complete in area and in volume (redshift) as goes to later versions.
- DRs are accumulative and inclusive of previous DRs.
- *Photometry* data
  - Survey coverage completed in DR8 (14 555 sqdeg); updates with corrections/improvements in DR 9/13
  - 95% completeness at r~22.2 (in comparison with COMBO-17 survey)
  - 208 478 448 galaxies; 260 562 744 stars; 12 682 unknowns (in total 460 053 874; 31 608 objects/sqdeg)

Previous Data

- *Spectroscopy* data
  - *Optical*
    - DR12 : 343 160+862 735 galaxies;
      220 377+158 917 quasars; 247 216 stars
  - *Infrared* (APOGEE)
    - 156 593 stars in MW bulge, halo, disk, etc

Previous Data

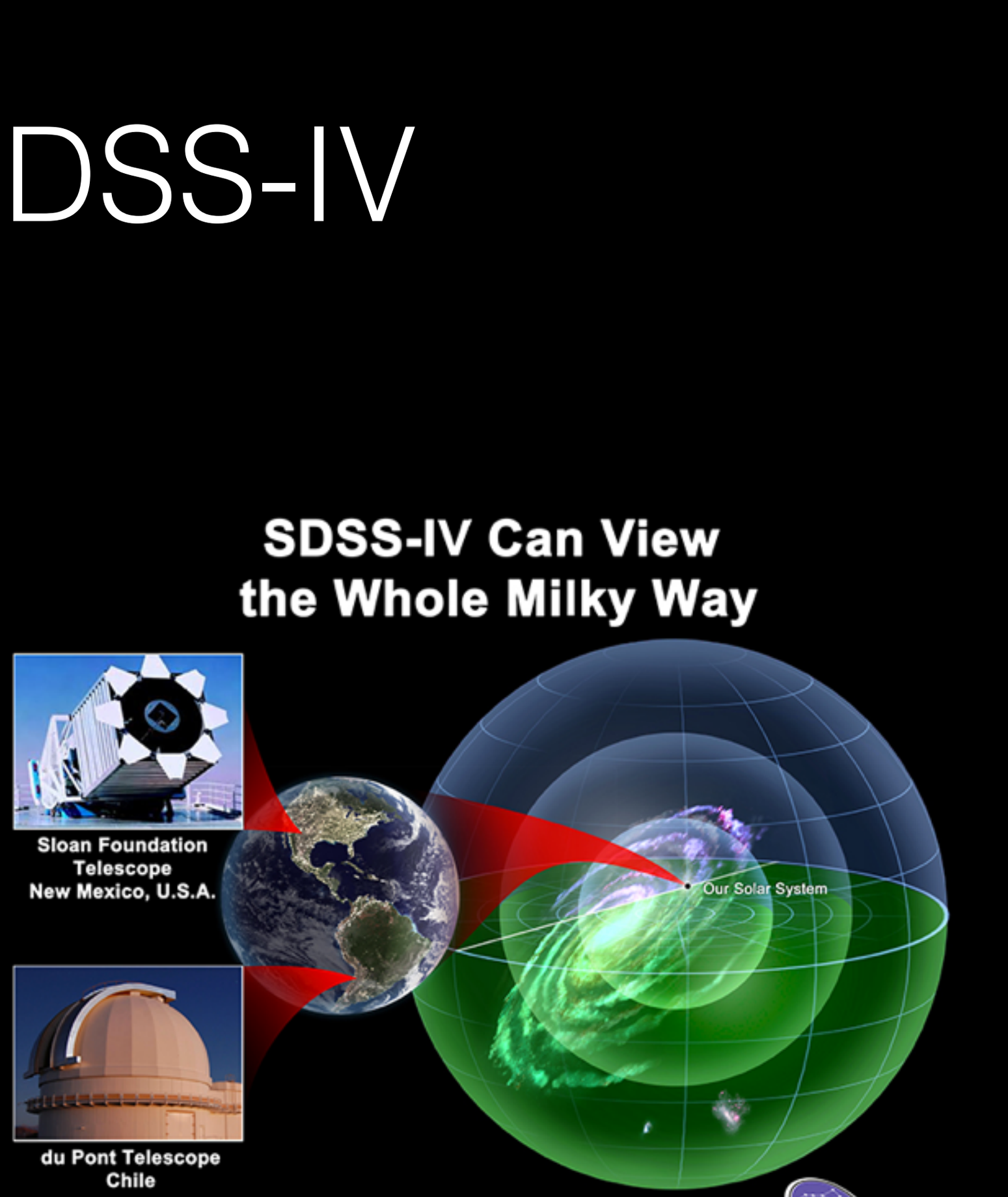
- *Spectroscopy* data (conti.)
  - Optical data completeness
    - Main galaxy sample : ~90% at r*~17.77
    - BOSS galaxy sample : <80% at $\log_{10}(M_{stellar}/M_{sun})$~11.6
    - DR7 low-z (<2.2) quasar sample : 90% at i*~19.1
    - DR7 high-z (>3) quasar sample : 90% at i*~20.2

Data Access

- Science Archive Server (SAS) : interactive spectra and image mosaics
- Catalog Archive Server (CAS) : catalogs with basic properties measured through pipelines
- Value-Added Catalog (VAC)
  - SEGUE : [a/Fe], globular/open cluster photometry
  - APOGEE : red-clump stars
  - BOSS : LSS, galaxy properties (stellar mass/kinematics, emission line fluxes), XDQSO, photo-z, QSO

SDSS-IV

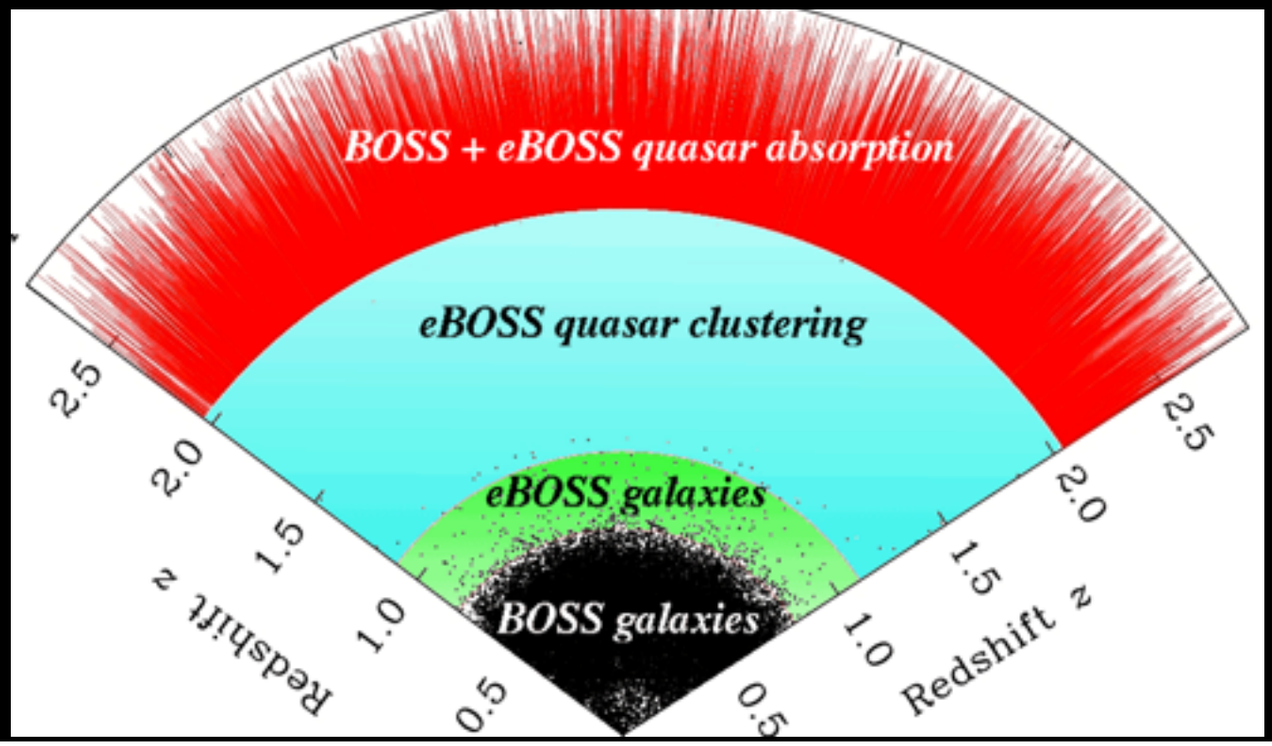
- What's continued from -III?
  - APOGEE-1 => APOGEE-2 with new telescope in the Southern hemisphere to see the entire MW

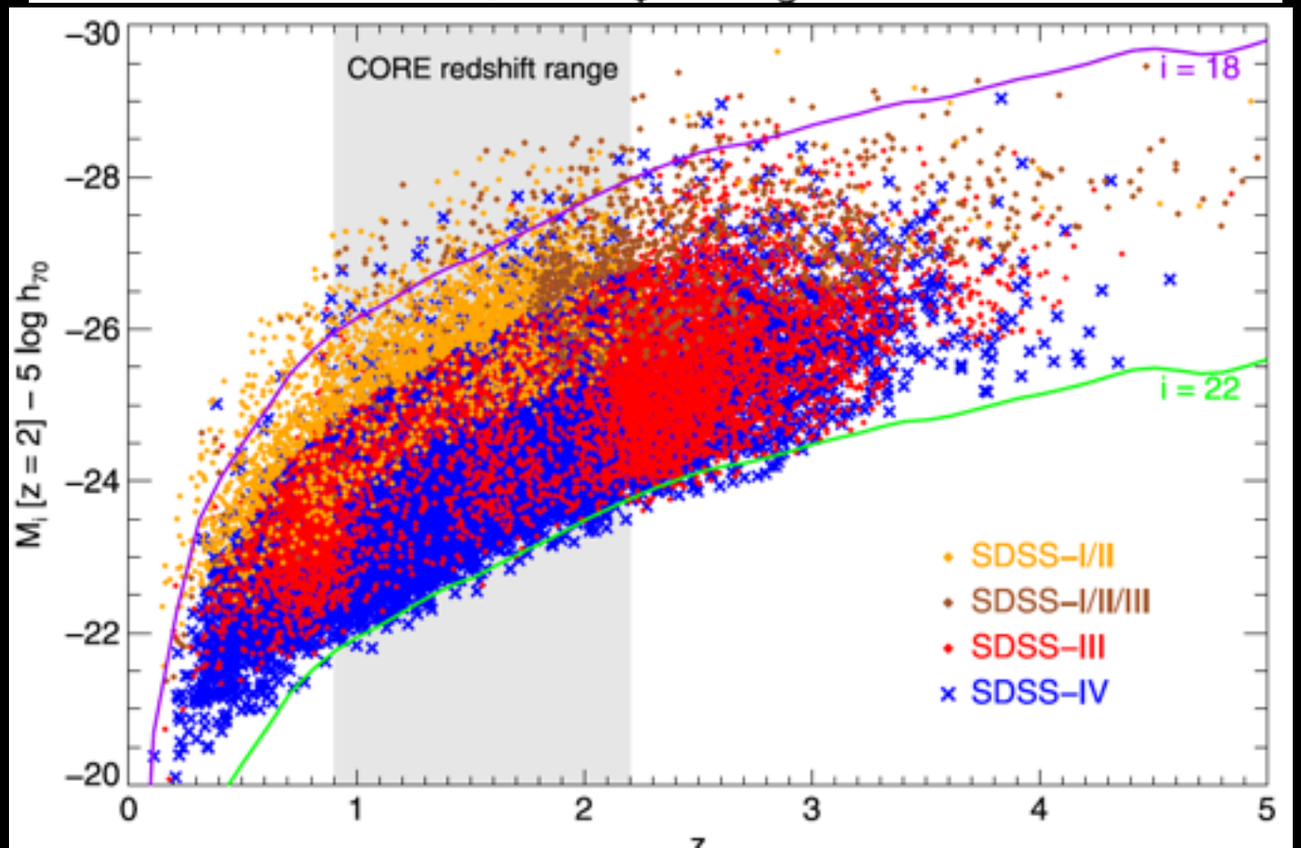


SDSS-IV

Credit: SDSS

- What's continued from -III? (conti.)
  - BOSS => eBOSS with new photometry, target selection to explore farther universe more completely



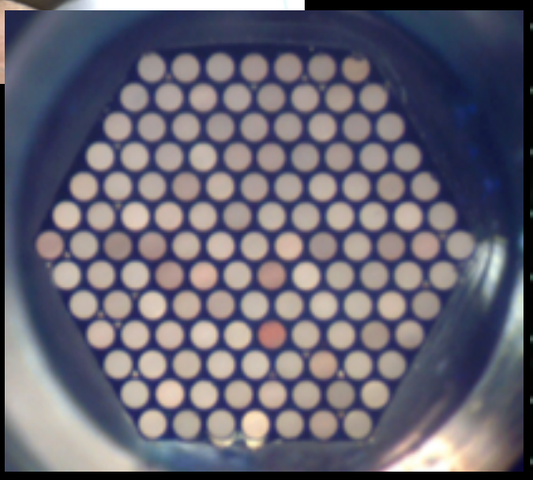


A. Myers et al. (2015)

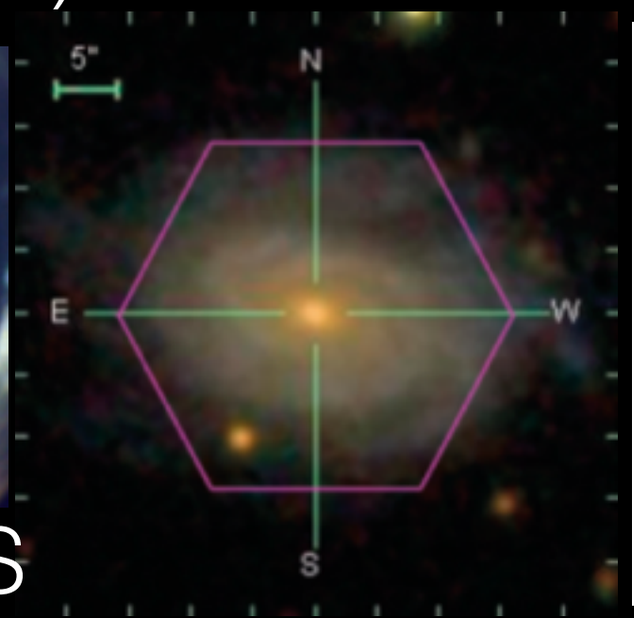
SDSS-IV

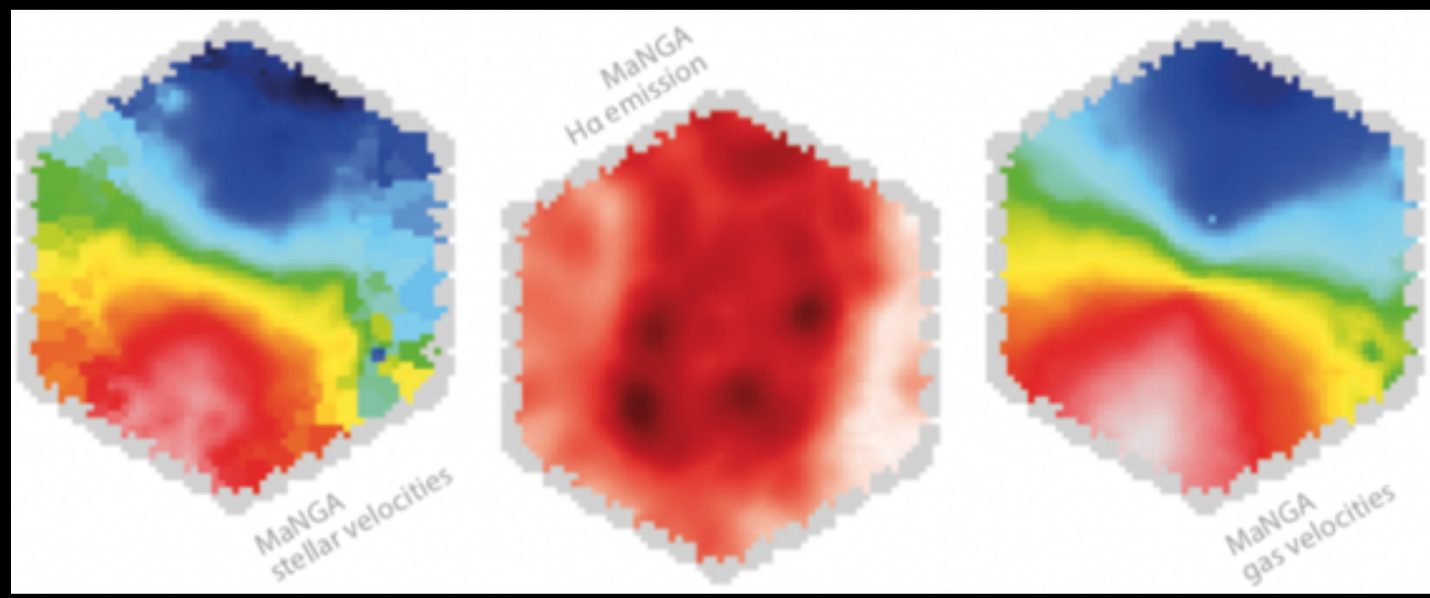
- What's new?
  - Photometry : calibration, resolution, extinction coefficients have been changed. Mainly for eBOSS project.

- MaNGA : spatially resolves individual galaxies with Sloan spectrographs (integral field units; IFUs)



Credit: SDSS



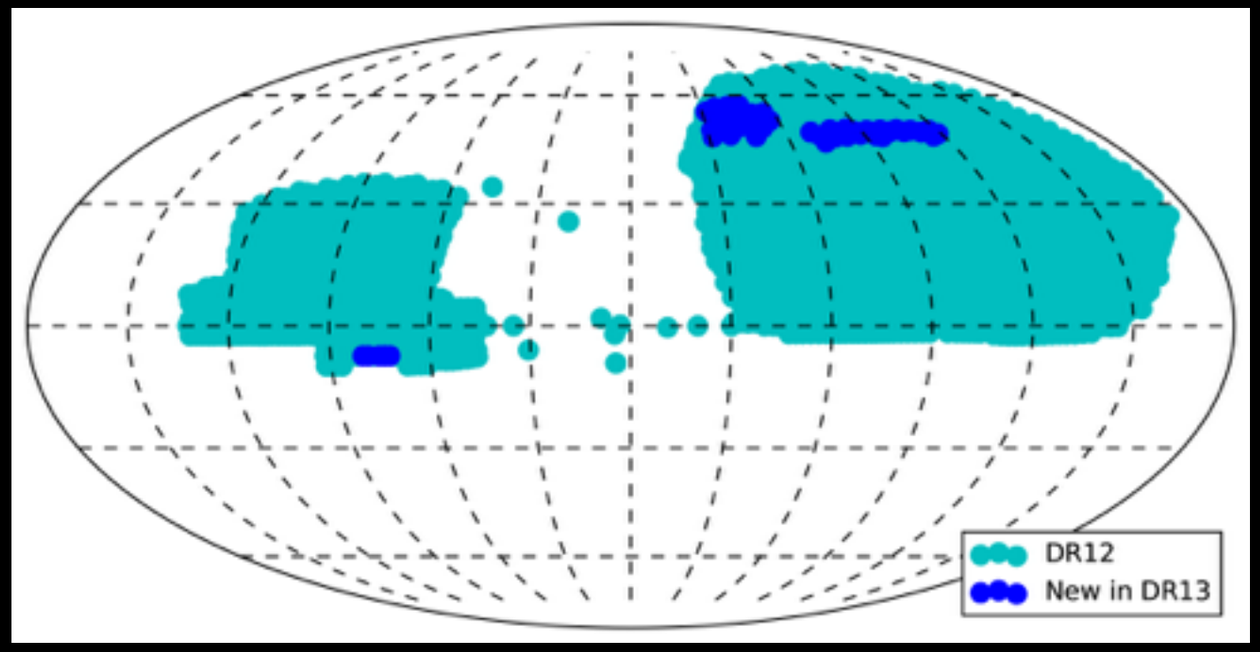


SDSS-IV

- What's new? (conti.)
  - eBOSS subprograms
    - TDSS : Time Domain Spectroscopic Survey as the first large-scale, systematic spectroscopic survey of variable sources
    - SPIDERS : SPectroscopic IDentification of ERO SITA Sources that will provide an unique census of SMBH

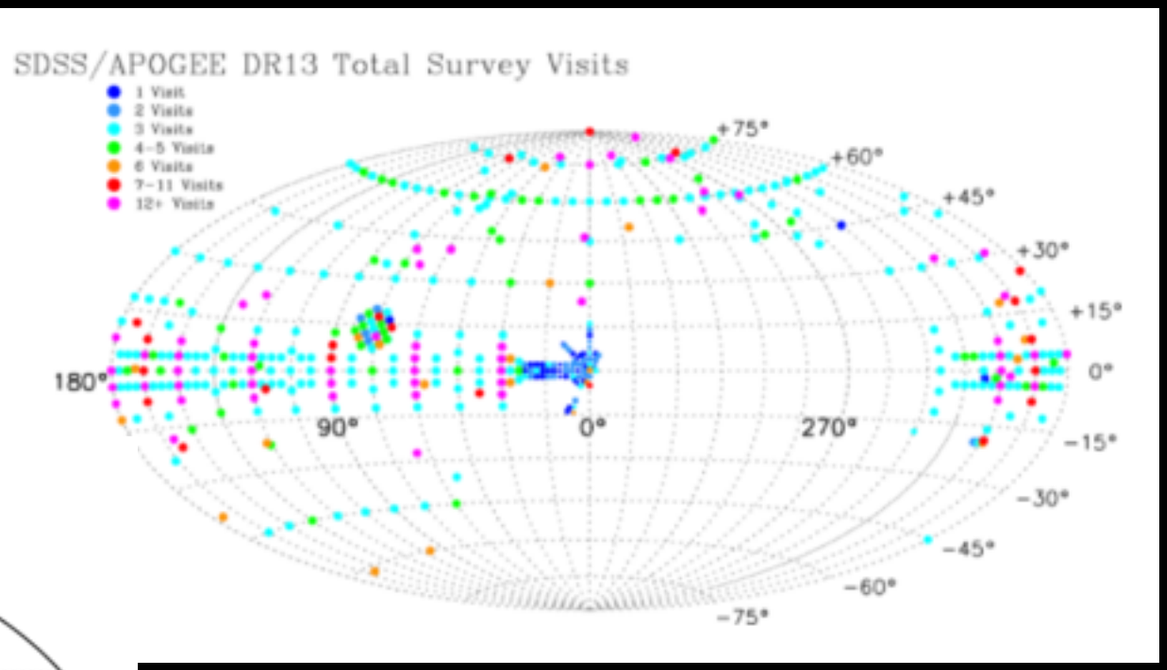
SDSS-IV

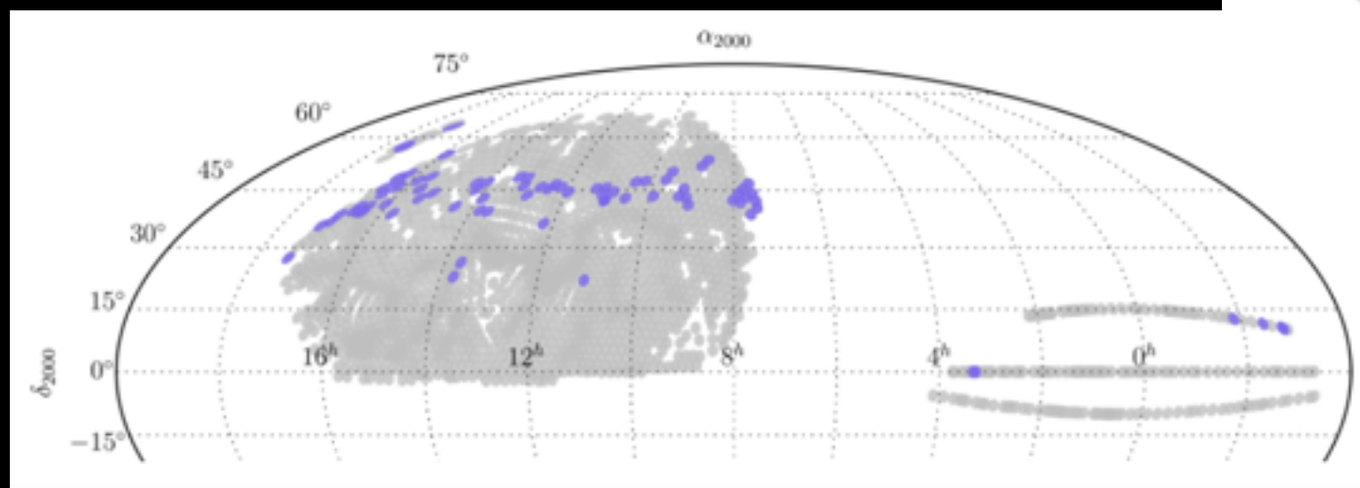
- DR13, the first DR of SDSS-IV (Aug. 2016), containing observations through July 2015 and inclusive of former DRs



eBOSS

APOGEE





MaNGA

SDSS-IV

- DR14 is coming up soon !
- DR14 makes public data taken during July 2014-2016, and re-release the latest calibration of all previous data.