

# Ayudando desde Uniandes a construir el mapa más grande del Universo

Jaime E. Forero-Romero (Uniandes)

Febrero 2021



El conocimiento  
es de todos

Colciencias



European  
Commission

Horizon 2020  
European Union funding  
for Research & Innovation



RA,Dec = 216.2432, 34.9465, zoom 12

+  
-  
-

5 arcmin

Contrast: 1

Brightness: 1

Jump to object: NGC 5614

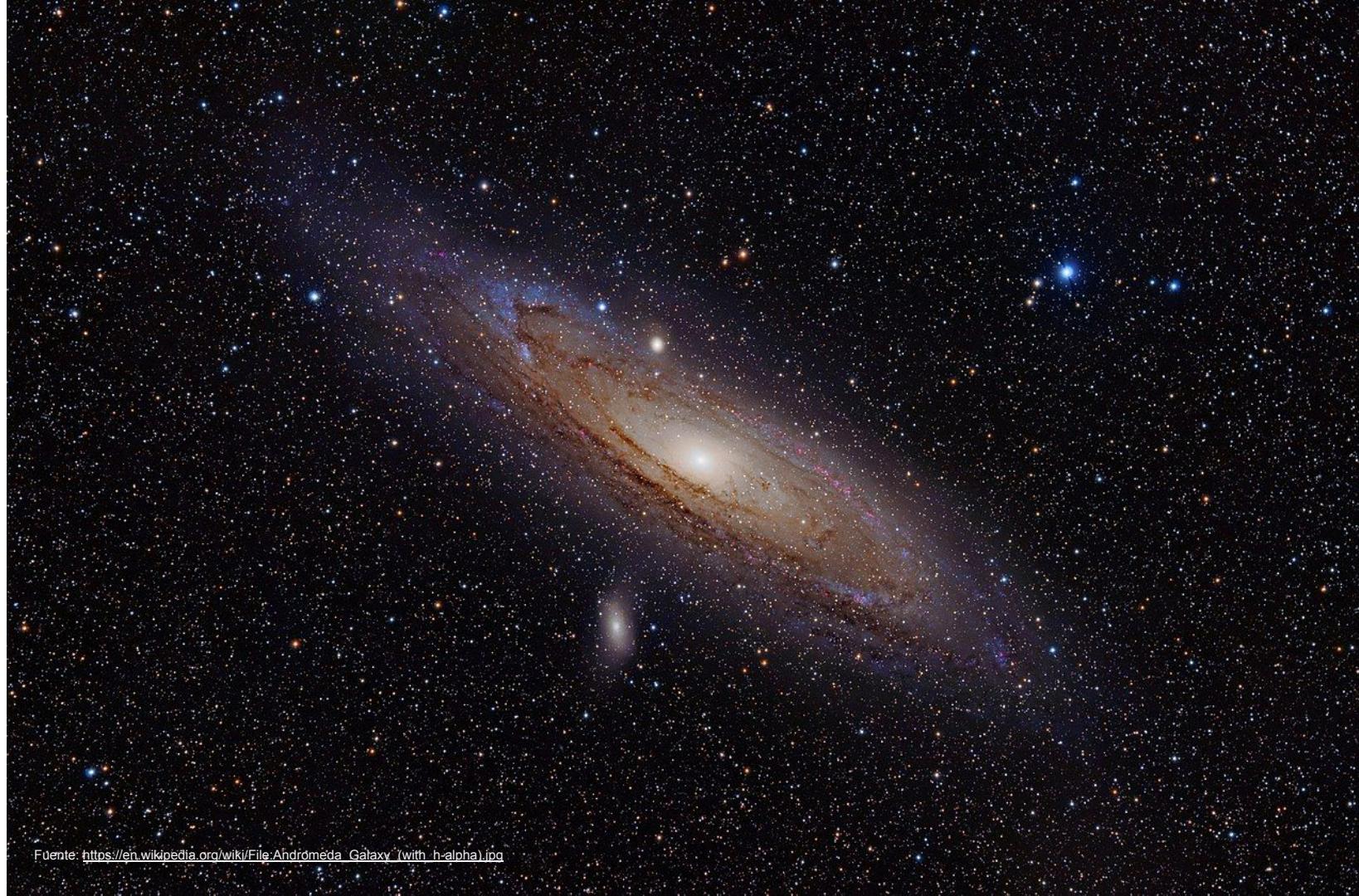
Custom catalog upload (FITS table; RA,Dec,[name]):

No file chosen

- Legacy Surveys DR9-SV images
- Legacy Surveys DR9-SV models
- Legacy Surveys DR9-SV residuals
- +  Legacy Surveys DR9-SV-north images
- +  Legacy Surveys DR9-SV-south images
- Legacy Surveys DR8 images
- Legacy Surveys DR8 models
- Legacy Surveys DR8 residuals
- +  Legacy Surveys DR8-north images
- +  Legacy Surveys DR8-south images
- Legacy Surveys DR6+DR7 images
- +  DECaLS DR7 images
- +  MzLS+BASS DR6 images
- DECaLS DR5 images
- +  DECaPS images
- +  unWISE W1/W2 NEOs
- unWISE Catalog Model
- More surveys
  - SDSS images
  - DES DR1
  - HSC DR2 images
  - VLASS 1.2 images
  - GALEX
  - WISE 12-micron dust map
  - SFD dust map
  - Halpha map
- Legacy Surveys Bricks
- +  Legacy Surveys DR9-SV CCDs
- +  Legacy Surveys DR8 CCDs
- +  DECaLS DR7 CCDs
- SDSS none



Fuente: [https://commons.wikimedia.org/wiki/File:Panoramic\\_Large\\_and\\_Small\\_Magellanic\\_Clouds.jpg](https://commons.wikimedia.org/wiki/File:Panoramic_Large_and_Small_Magellanic_Clouds.jpg)

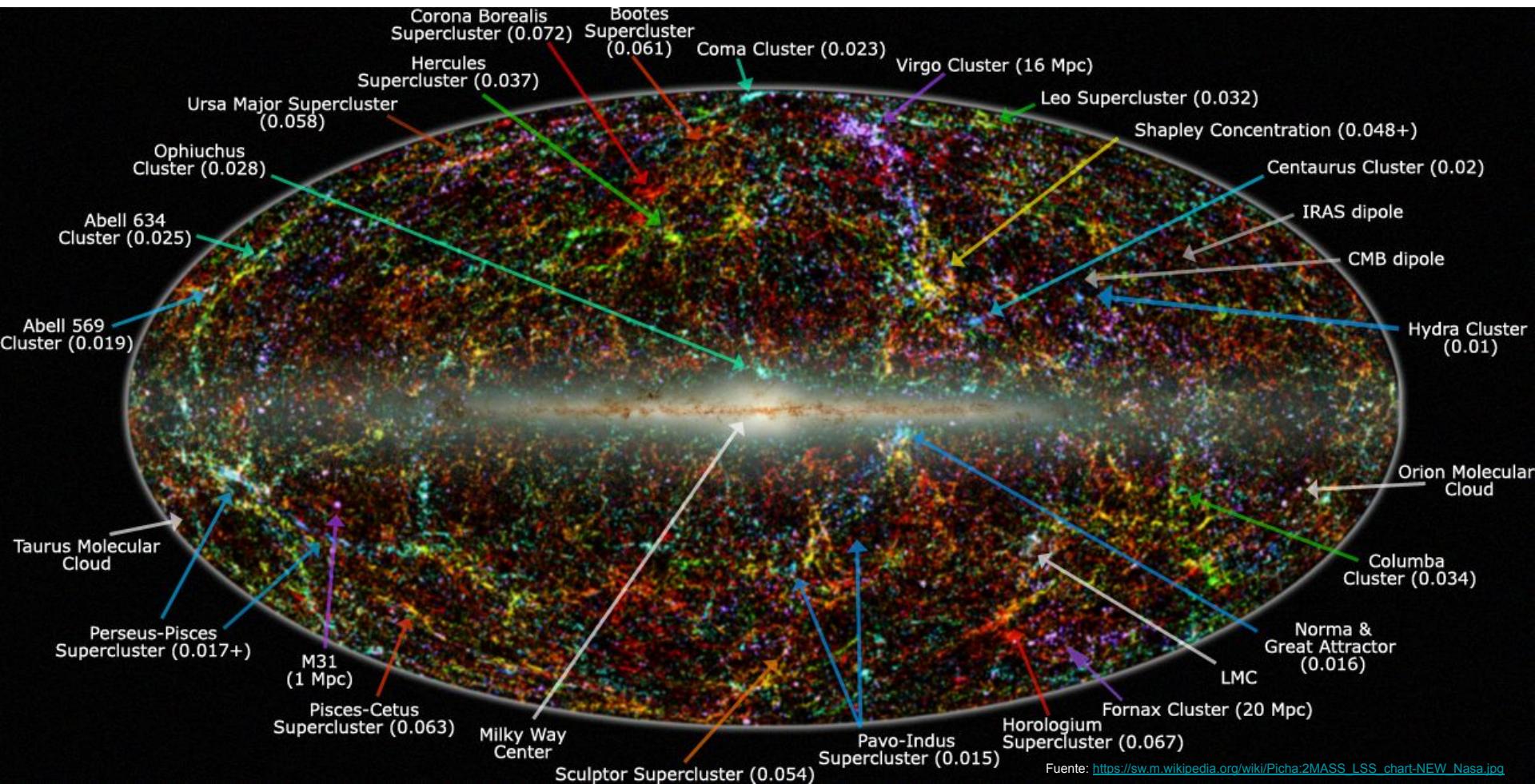


Fuente: [https://en.wikipedia.org/wiki/File:Andromeda\\_Galaxy\\_\(with\\_h-alpha\).jpg](https://en.wikipedia.org/wiki/File:Andromeda_Galaxy_(with_h-alpha).jpg)

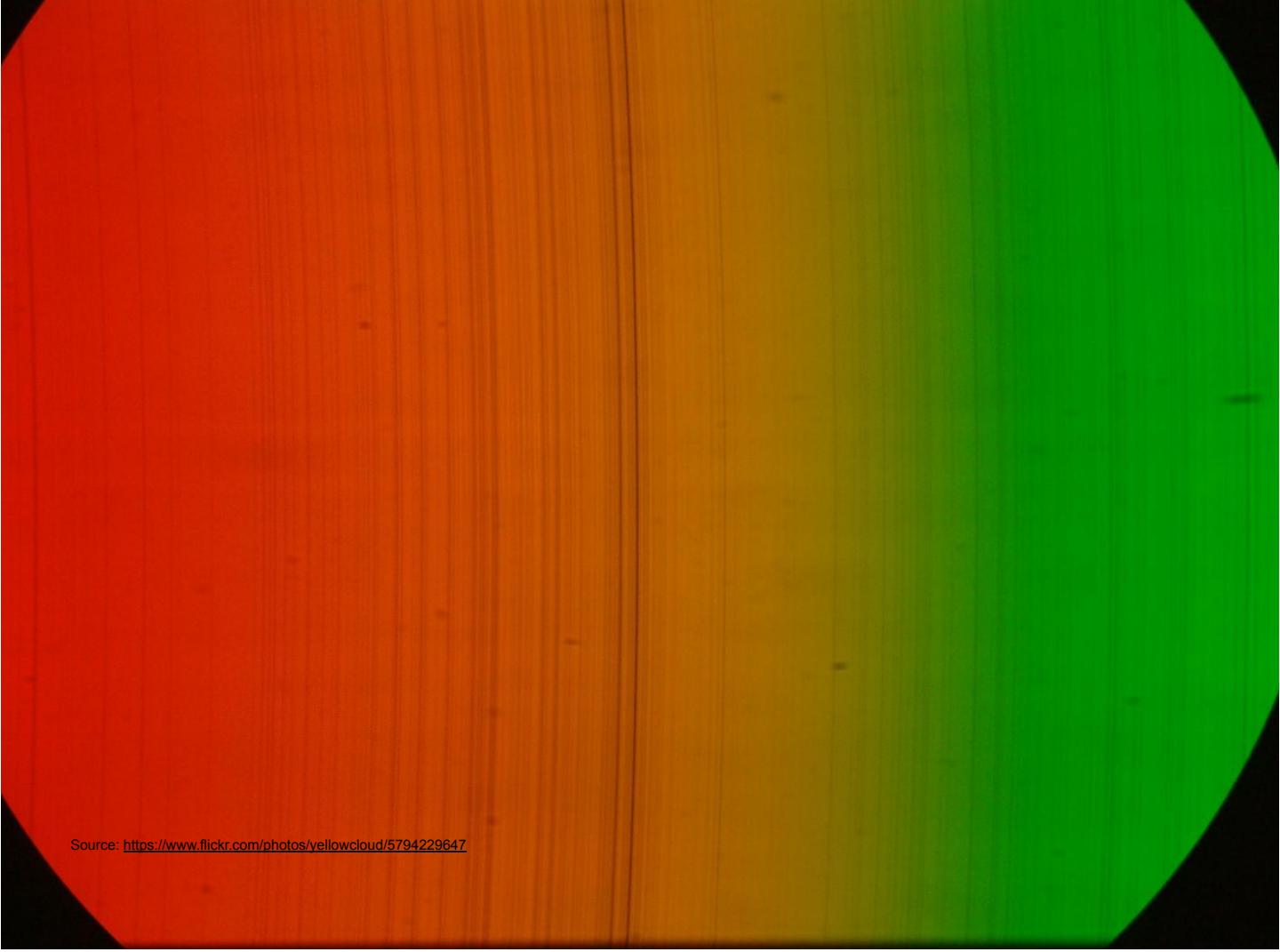


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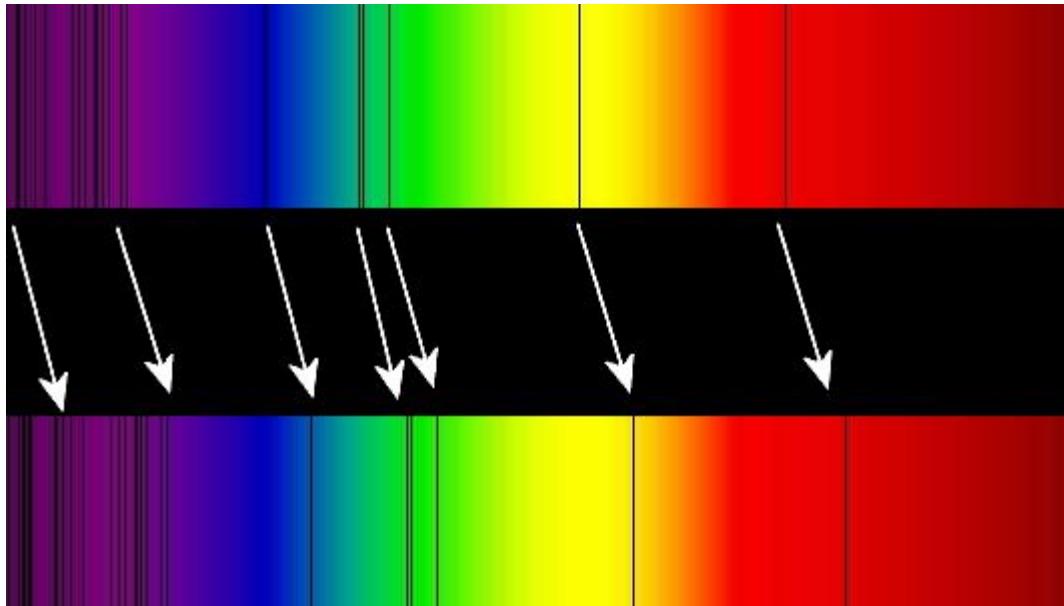
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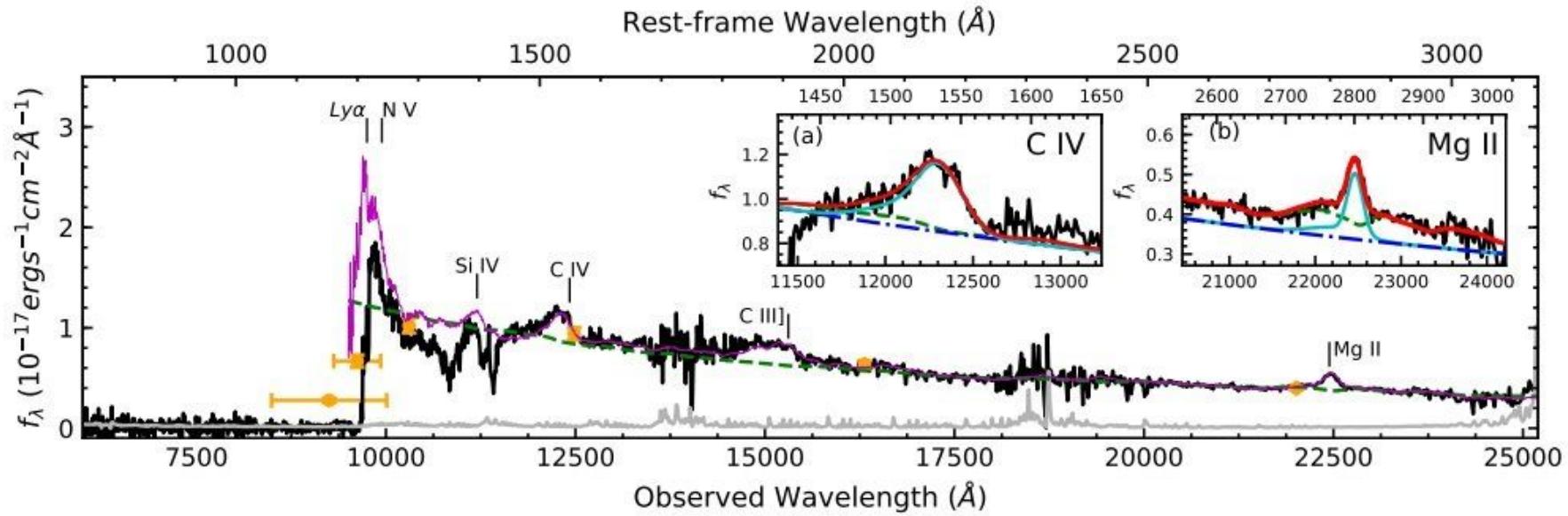
Fuente: [https://sw.m.wikipedia.org/wiki/Picha:2MASS\\_LSS\\_chart-NEW\\_Nasa.jpg](https://sw.m.wikipedia.org/wiki/Picha:2MASS_LSS_chart-NEW_Nasa.jpg)



Source: <https://www.flickr.com/photos/yellowcloud/5794229647>



Fuente: [https://commons.wikimedia.org/wiki/File:Redshift\\_horizontal.png](https://commons.wikimedia.org/wiki/File:Redshift_horizontal.png)



The final calibrated spectrum of DELS J003836.10-152723.6. Credit: Wang et al., 2018.



Fuente: [https://commons.wikimedia.org/wiki/File:SDSS\\_spectrograph\\_cartridge.JPG](https://commons.wikimedia.org/wiki/File:SDSS_spectrograph_cartridge.JPG)



Fuente: <https://pages.astronomy.ua.edu/keel/telescopes/apo.html>



# The Dark Energy Spectroscopic Instrument (DESI)

The Dark Energy Spectroscopic Instrument (DESI) will measure the effect of dark energy on the expansion of the universe. It will obtain optical spectra for tens of millions of galaxies and quasars, constructing a 3D map spanning the nearby universe to 11 billion light years.

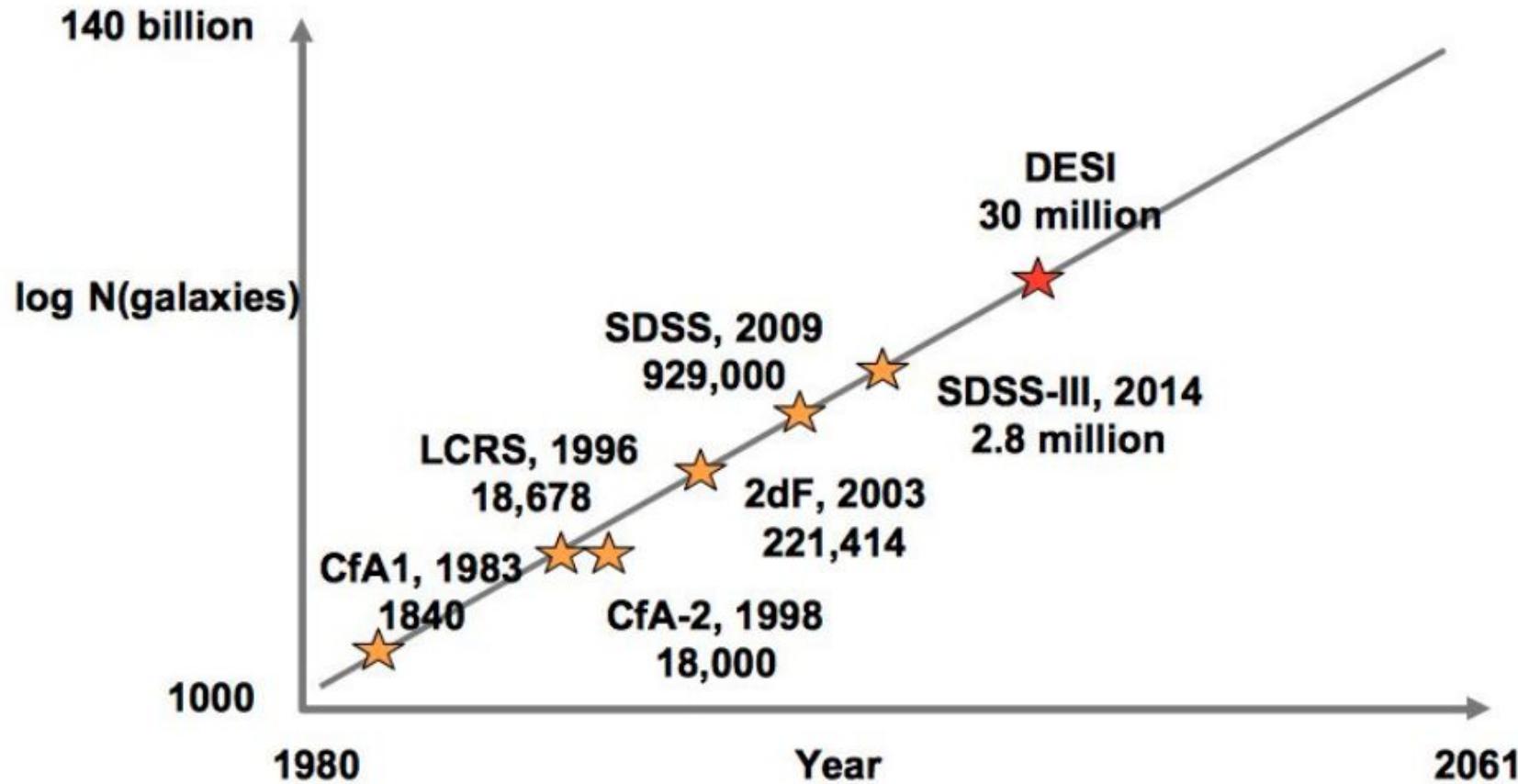
The DESI Survey will be conducted on the Mayall 4-meter telescope at Kitt Peak National Observatory starting in 2019. DESI is supported by the Department of Energy Office of Science to perform this Stage IV dark energy measurement using baryon acoustic oscillations and other

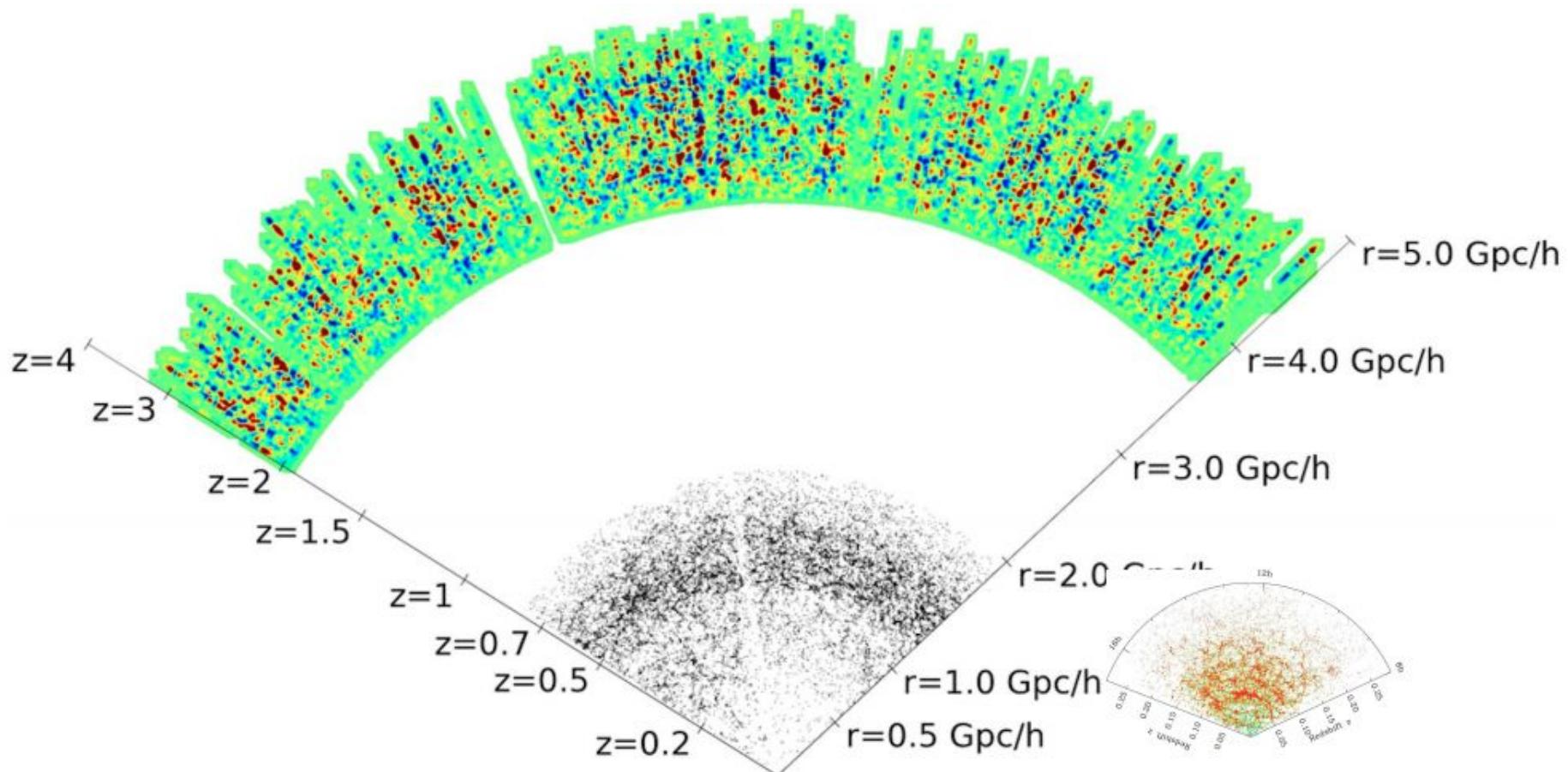


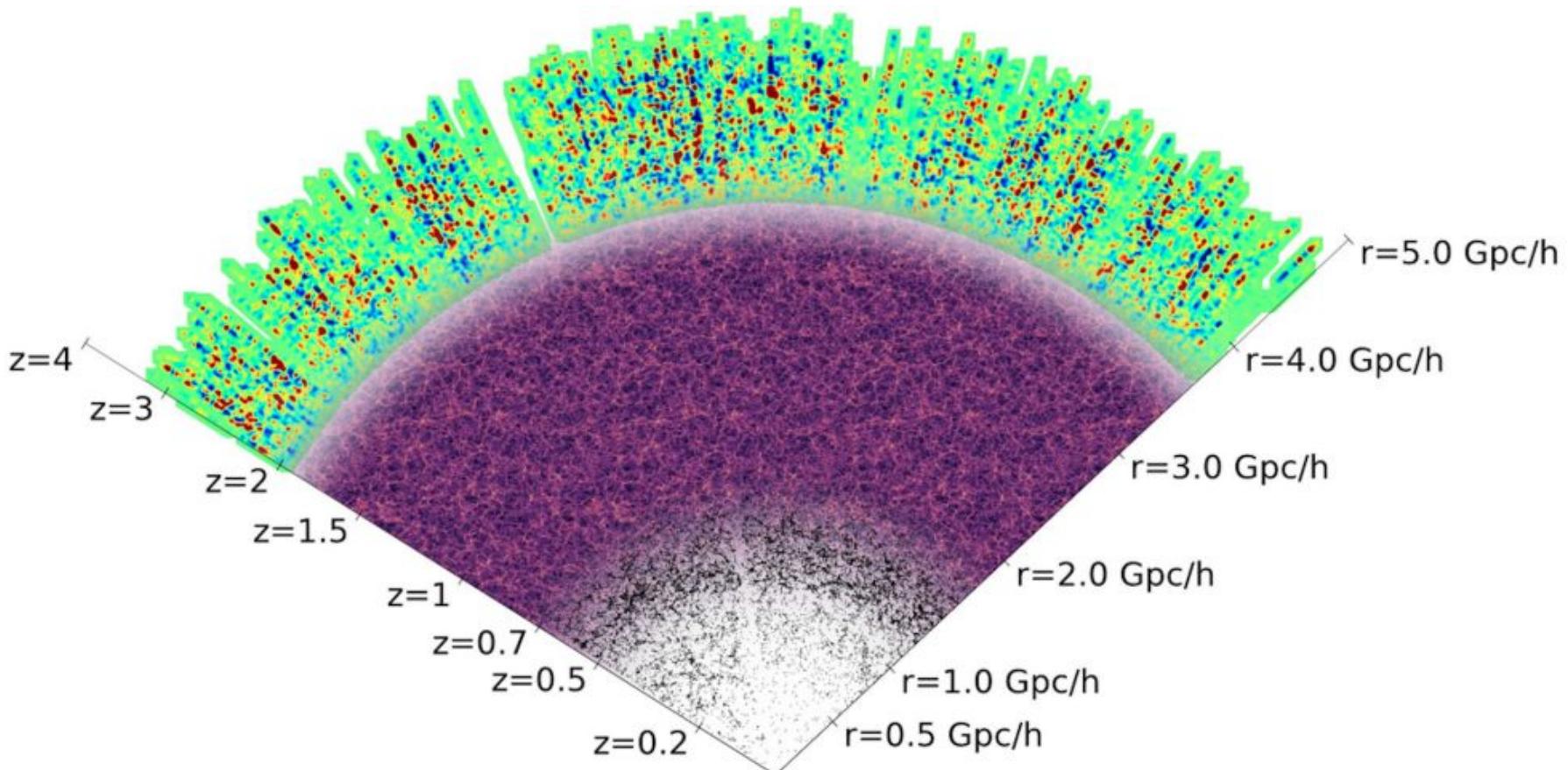
Fuente: [https://commons.wikimedia.org/wiki/File:Kitt\\_Peak\\_National\\_Observatory\\_\(1\)\\_-\\_Flickr\\_-\\_Joe\\_Parks.jpg](https://commons.wikimedia.org/wiki/File:Kitt_Peak_National_Observatory_(1)_-_Flickr_-_Joe_Parks.jpg)



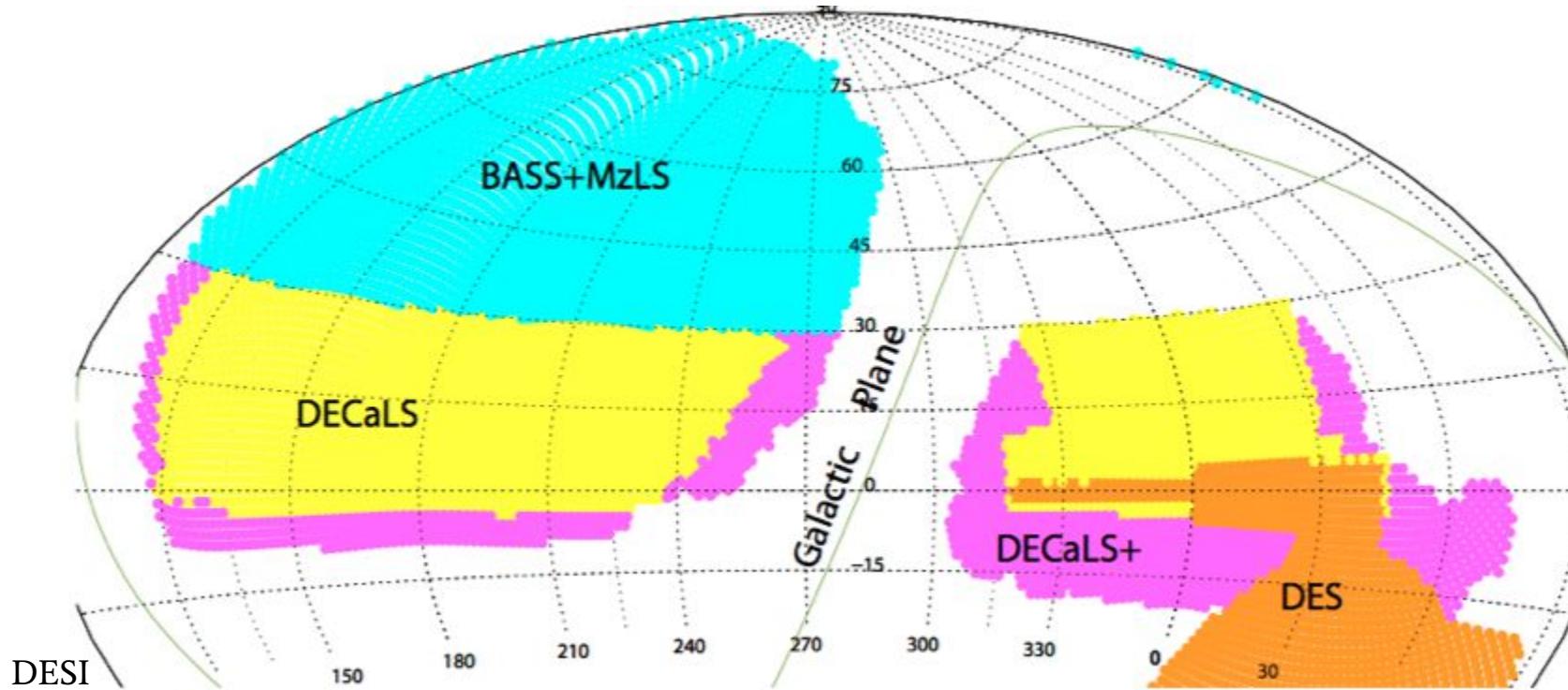
Fuente: <https://phys.org/news/2018-08-universe-d.html>. Credit: Marilyn Chung/Lawrence Berkeley National Laboratory.







# DESI observará un tercio de la esfera celeste



# The DESI Experiment Part I: Science, Targeting, and Survey Design

DESI Collaboration: Amir Aghamousa<sup>73</sup>, Jessica Aguilar<sup>76</sup>, Steve Ahlen<sup>85</sup>, Shadab Alam<sup>41,59</sup>, Lori E. Allen<sup>81</sup>, Carlos Allende Prieto<sup>64</sup>, James Annis<sup>52</sup>, Stephen Bailey<sup>76</sup>, Christophe Balland<sup>88</sup>, Otger Ballester<sup>57</sup>, Charles Baltay<sup>84</sup>, Lucas Beaufort<sup>45</sup>, Chris Bebek<sup>76</sup>, Timothy C. Beers<sup>39</sup>, Eric F. Bell<sup>28</sup>, Jos Luis Bernal<sup>66</sup>, Robert Besuner<sup>89</sup>, Florian Beutler<sup>62</sup>, Chris Blake<sup>15</sup>, Hannes Bleuler<sup>50</sup>, Michael Blomqvist<sup>2</sup>, Robert Blum<sup>81</sup>, Adam S. Bolton<sup>35,81</sup>, Cesar Briceno<sup>18</sup>, David Brooks<sup>33</sup>, Joel R. Brownstein<sup>35</sup>, Elizabeth Buckley-Geer<sup>52</sup>, Angela Burden<sup>9</sup>, Etienne Burtin<sup>12</sup>, Nicolas G. Busca<sup>7</sup>, Robert N. Cahn<sup>76</sup>, Yan-Chuan Cai<sup>59</sup>, Laia Cardiel-Sas<sup>57</sup>, Raymond G. Carlberg<sup>23</sup>, Pierre-Henri Carton<sup>12</sup>, Ricard Casas<sup>56</sup>, Francisco J. Castander<sup>56</sup>, Jorge L. Cervantes-Cota<sup>11</sup>, Todd M. Claybaugh<sup>76</sup>, Madeline Close<sup>14</sup>, Carl T. Coker<sup>26</sup>, Shaun Cole<sup>60</sup>, Johan Comparat<sup>67</sup>, Andrew P. Cooper<sup>60</sup>, M.-C. Cousinou<sup>4</sup>, Martin Crocce<sup>56</sup>, Jean-Gabriel Cuby<sup>2</sup>, Daniel P. Cunningham<sup>1</sup>, Tamara M. Davis<sup>86</sup>, Kyle S. Dawson<sup>35</sup>, Axel de la Macorra<sup>68</sup>, Juan De Vicente<sup>19</sup>, Timothée Delubac<sup>74</sup>, Mark Derwent<sup>26</sup>, Arjun Dey<sup>81</sup>, Govinda Dhungana<sup>44</sup>, Zhejie Ding<sup>31</sup>, Peter Doel<sup>33</sup>, Yutong T. Duan<sup>85</sup>, Anne Ealet<sup>4</sup>, Jerry Edelstein<sup>89</sup>, Sarah Eftekharzadeh<sup>32</sup>, Daniel J. Eisenstein<sup>53</sup>, Ann Elliott<sup>45</sup>, Christopher Fassnacht<sup>4</sup>, Matthew Fratt<sup>81</sup>, Douglas Frenk<sup>76</sup>,

# ¿Cómo entró Uniandes en DESI?



DESI

<https://gruber.yale.edu/gallery/2011-gruber-cosmology-prize-photo-gallery>

« PREV NEXT » 35 of 44

Jaime Forero-Romero

CLOSE

# Ya hay imágenes disponibles al público

RA,Dec = 125.0498, 18.8368, zoom 11

+ -

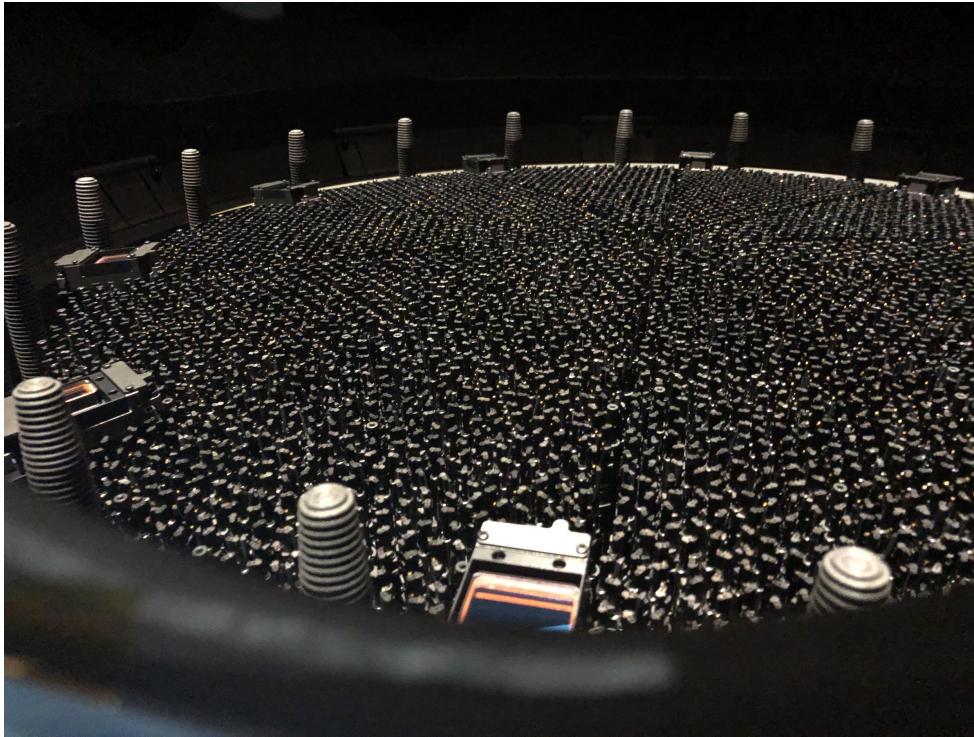
10 arcmin

Jump to object: NGC 5614

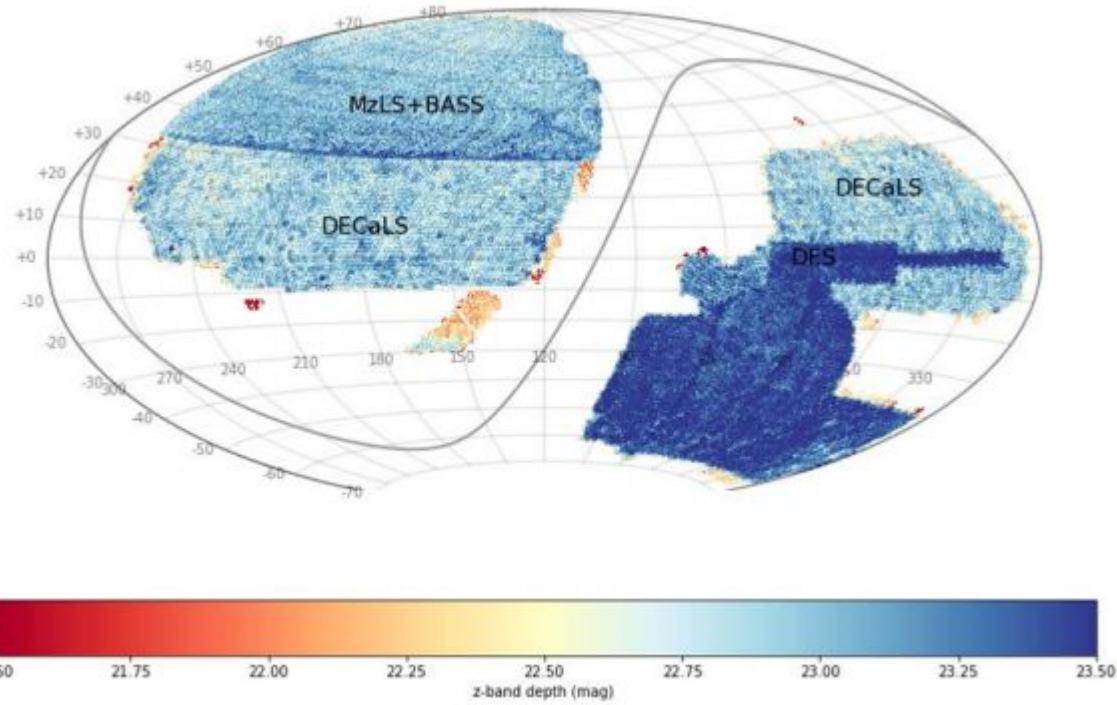
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Choose File No file chosen Upload

- +  LegacySurvey DR6+DR7 images
- DECaLS DR7 images
- DECaLS DR7 models
- DECaLS DR7 residuals
- MzLS+BASS DR6 images
- MzLS+BASS DR6 models
- MzLS+BASS DR6 residuals
- DECaLS DR5 images
- MzLS+BASS DR4 images
- +  DECaPS images
- +  unWISE W1/W2 NEO4
- unWISE Catalog Model
- More surveys
- SDSS images
- DES DR1
- HSC images
- VLASS images
- GALEX
- WISE 12-micron dust map
- SFD dust map
- Halpha map
- DECaLS Bricks
- +  DECaLS DR7 CCDs
- SDSS CCDs
- unWISE tiles
- +  DECaLS DR7 Exposures
- +  DECaLS DR7 catalog
- Gaia DR2 catalog
- + Other catalogs
- + Spectroscopy
- + DESI targets
- DESI Footprint

<http://legacysurvey.org/viewer>



DESI



## Default plan

2021-02-05

noon 12:00

12 deg dusk 18:58

18 deg dusk 19:27

moonrise 02:45

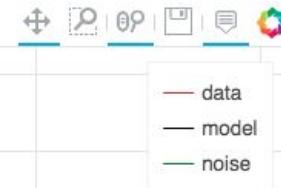
18 deg dawn 05:53

12 deg dawn 06:21

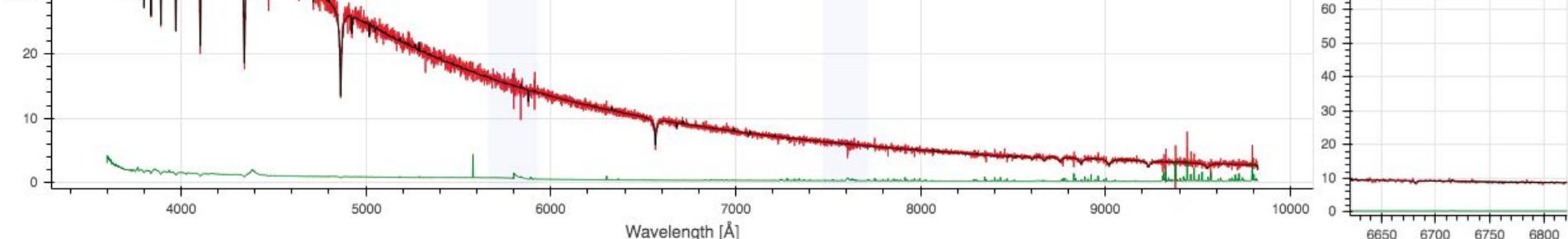
moonset 13:18

local	lst	cond	tile	ra	dec	program	fac	tot	split	d/g/b
18:58	54.5	BRIGHT	80628	28.6	5.2	svlbgsmw	1.7	910	4x227	1.0/0.0/0.0
19:26	61.4	DARK	80669	38.0	0.5	svlelgqso	1.5	1703	3x567	3.1/0.0/0.0
20:03	70.7	DARK	80673	85.5	-20.2	svlelgqso	2.5	2735	5x547	2.2/0.0/0.0
21:04	85.9	DARK	80675	98.5	44.5	svlelgqso	2.3	2502	5x500	3.1/0.1/0.0
22:00	100.1	DARK	80679	111.0	41.5	svlelgqso	1.5	1687	3x562	0.1/1.0/0.0
22:37	109.4	DARK	80683	116.0	15.5	svlelgqso	1.3	1395	3x465	2.1/0.0/0.0
23:10	117.5	DARK	80685	120.0	34.0	svlelgqso	1.3	1475	3x491	3.2/0.0/0.0
23:43	126.0	DARK	80688	130.7	22.3	svlrgqso	1.2	1357	3x452	3.1/0.0/0.0
00:15	133.9	DARK	80693	135.0	83.0	svlelgqso	2.1	2287	4x571	3.0/0.1/0.0
01:05	146.4	DARK	80651	145.0	32.4	svlbgsmw	1.1	162	2x300	1.0/0.0/0.1
01:21	150.5	DARK	80742	150.1	3.0	svlbgsmw	1.3	195	2x300	0.0/0.1/0.0
01:37	154.5	DARK	80700	159.0	32.4	svlrgqso	1.1	1202	3x400	2.3/0.0/0.0
02:06	161.7	DARK	80701	162.5	-27.0	svlelgqso	3.5	3778	7x539	0.0/2.0/0.0
03:30	182.8	GRAY	80707	192.9	27.1	svlelgqso	1.1	1748	3x582	1.1/2.0/0.0
04:08	192.4	GRAY	80709	198.0	7.0	svlelgqso	1.3	2224	4x556	0.0/0.0/0.0
04:57	204.7	GRAY	80711	213.0	51.5	svlelgqso	1.2	1909	4x477	0.1/1.0/0.0
05:41	215.7	BRIGHT	80733	199.1	18.3	svlbgsmw	1.1	568	2x284	0.0/0.0/0.0
05:57	219.5	BRIGHT	80732	198.0	0.0	svlbgsmw	1.5	802	2x401	0.0/0.0/0.0
06:16	224.4	BRIGHT	80735	250.4	37.0	svlbgsmw	1.2	640	3x213	0.0/0.0/2.0

SV0\_WD\_tile68002\_night20200315\_1



Flux



Target ID	Target class	mag_G	mag_R	mag_Z	mag_W1	mag_W2
35185935947662689	STD_GAIA STD_DITHER SV0_MW	18.00	18.43	18.98	0.00	0.00

Reset X-Y range

< 4 3 2 1 0 >

Spectrum: 0

VI optional indications :

- Bad redshift fit
- Bad spectype fit
- Bad spectrum

VI redshift :

VI spectype :

Pipeline fit :

SPECTYPE	Z	ZERR	ZWARN	DeltaChi2
STAR	0.0003	0.0000	0	33731.9

&lt; Redshift rough tuning: 0 &gt;

Redshift value:

0.0003

# Machine learning no supervisado

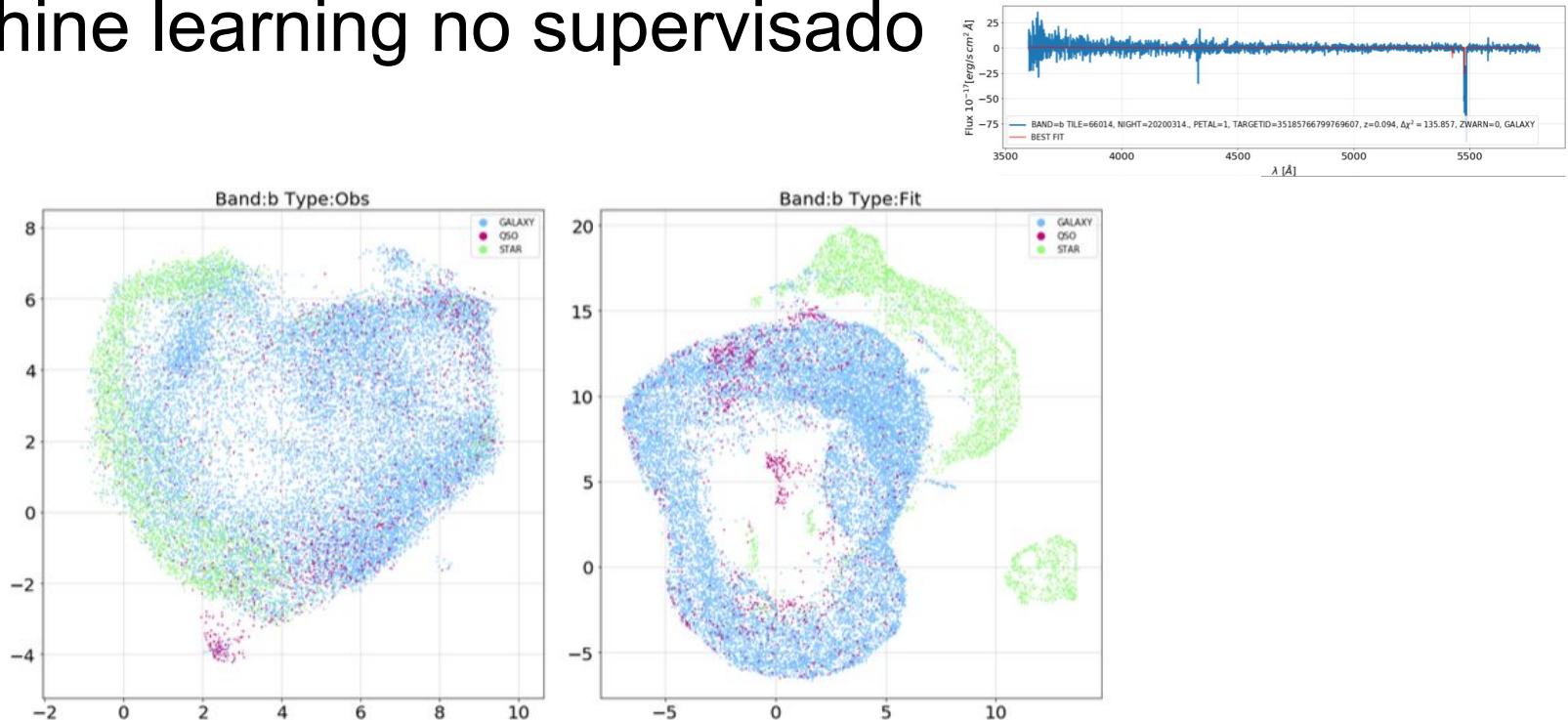


Figure 1: (Left) UMAP projection for the observational spectra and (right) for the fitted spectra in the B band.