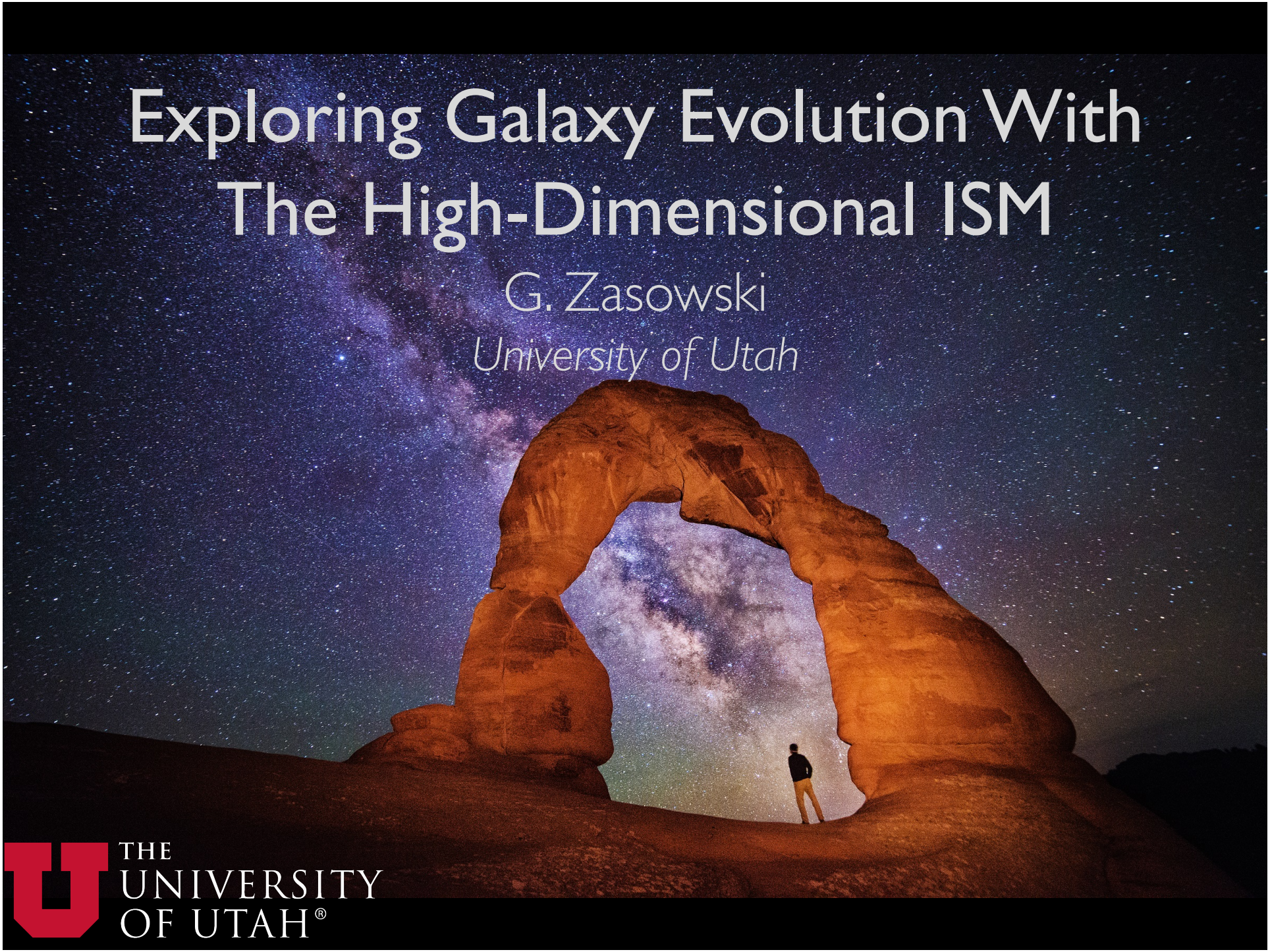
Exploring Galaxy Evolution With The High-Dimensional ISM

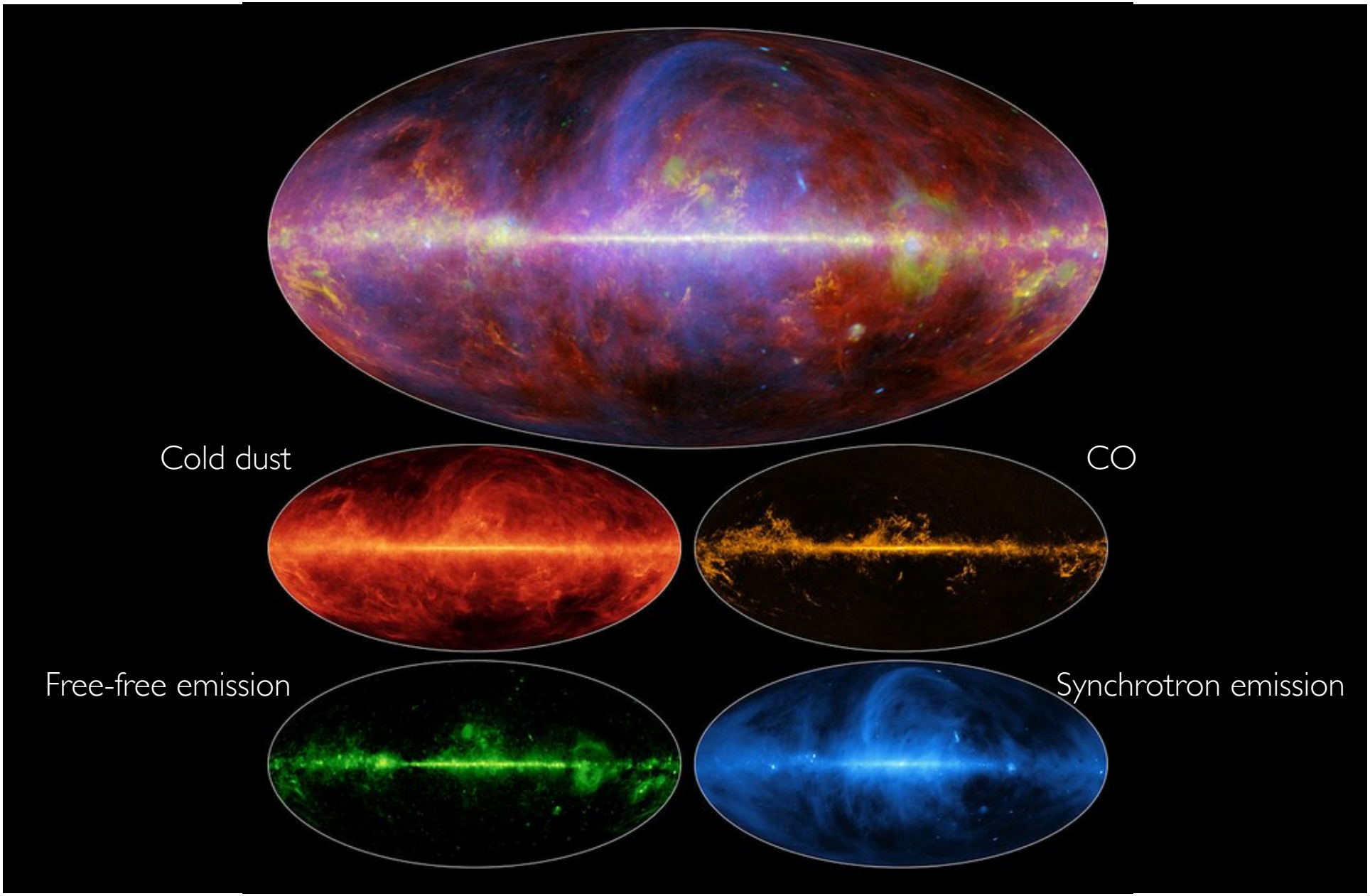
G. Zasowski

University of Utah



THE UNIVERSITY OF UTAH®

A Complex Interstellar Medium



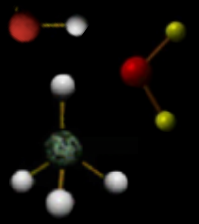
atoms

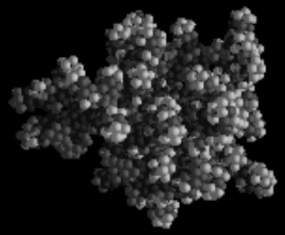
small molecules

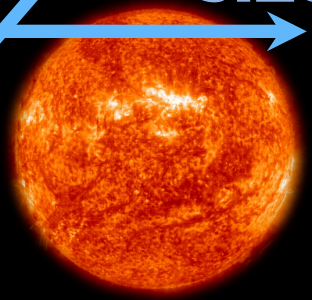
dust grains

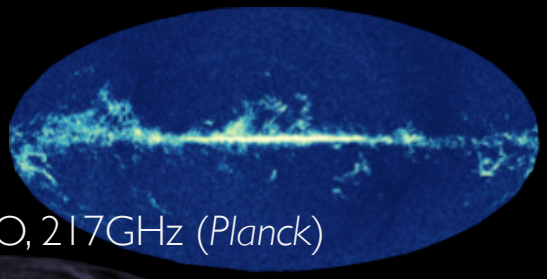
stars

size

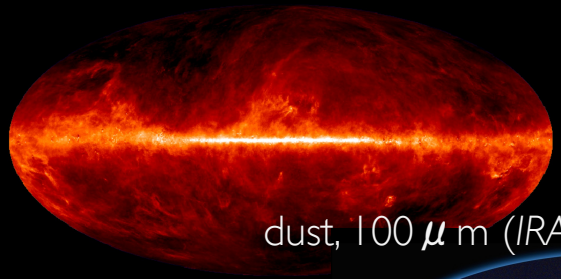




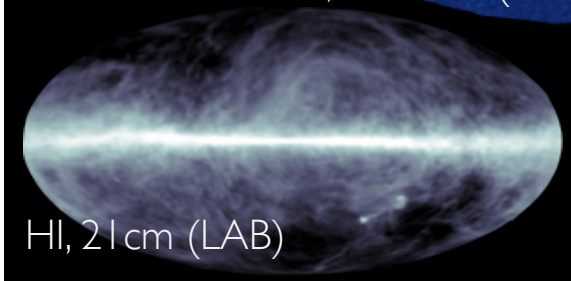




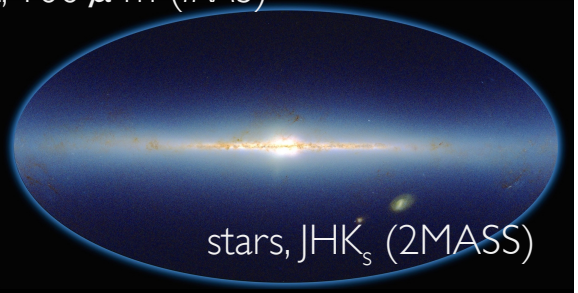
CO, 217GHz (*Planck*)



dust, 100 μm (*IRAS*)



HI, 21cm (LAB)



stars, JHK$_s$ (2MASS)

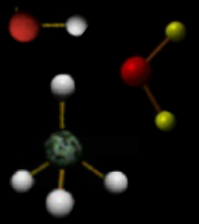
atoms

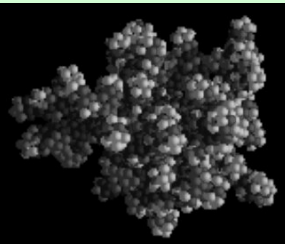
small molecules

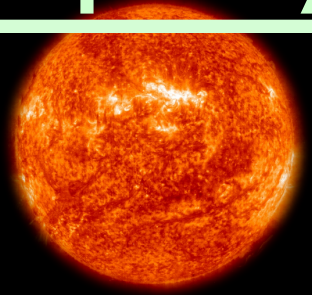
dust grains

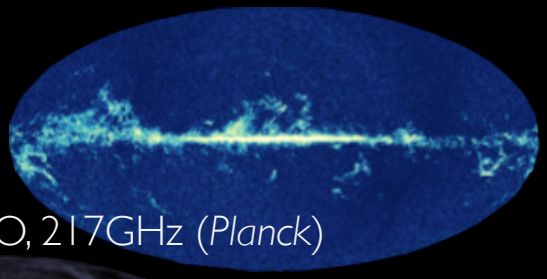
stars

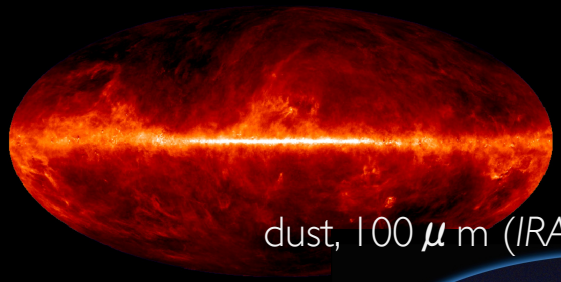
complexity

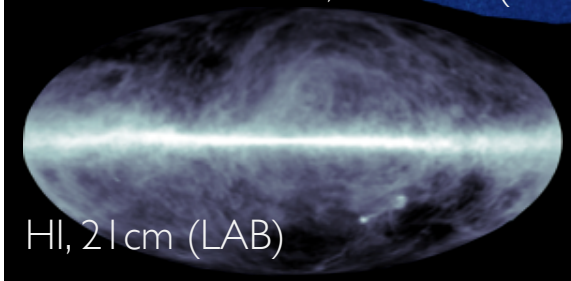


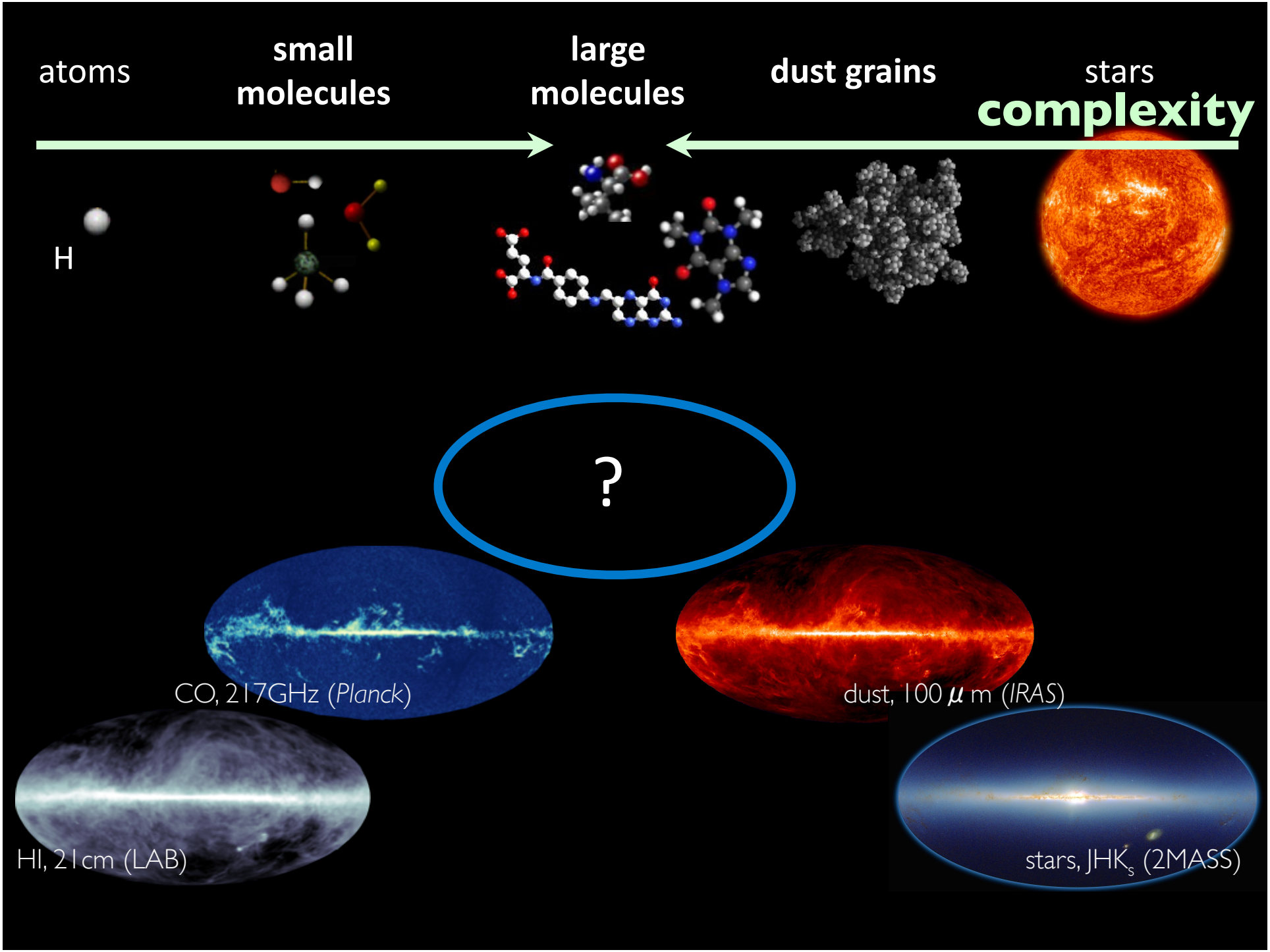








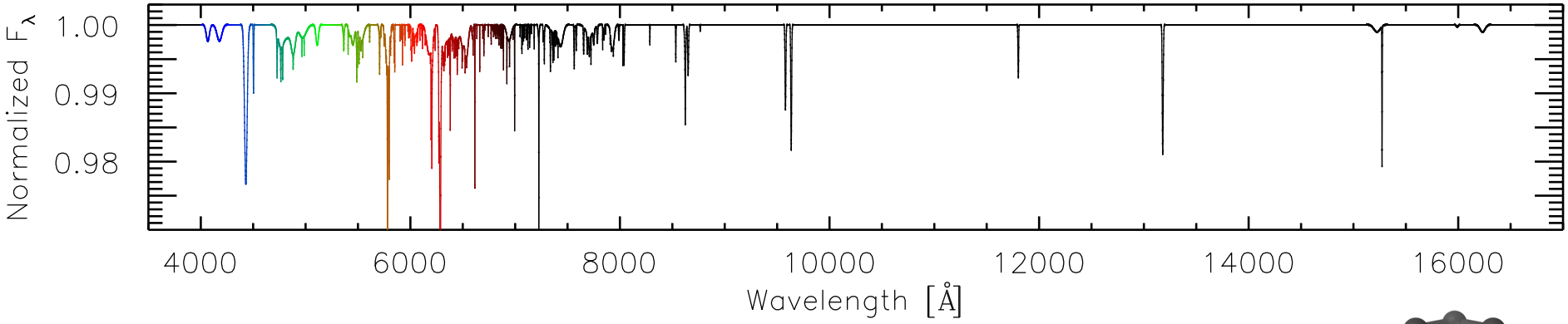


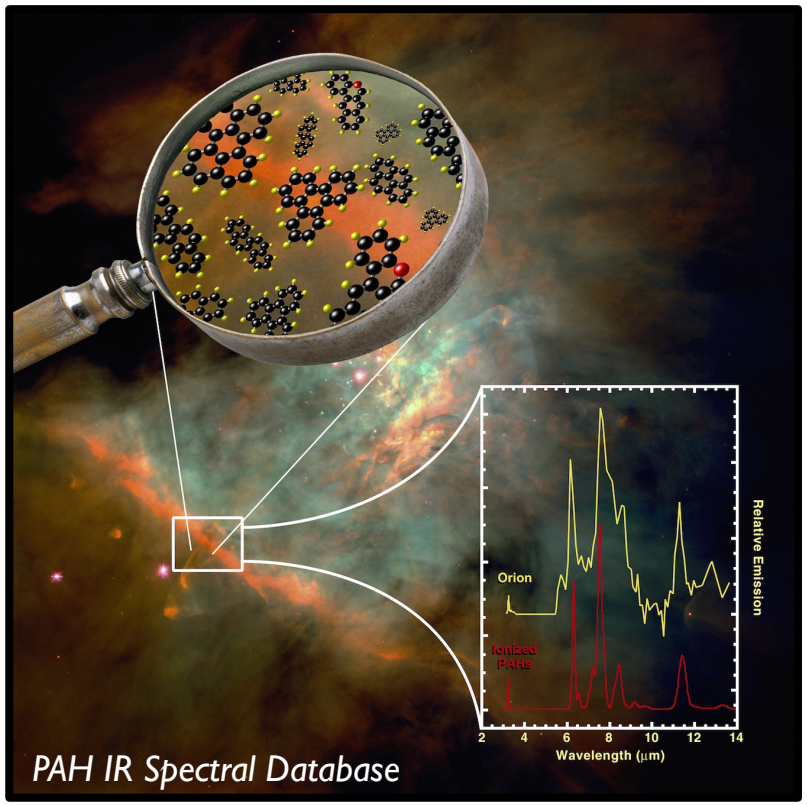

atoms
small molecules
large molecules
dust grains
stars
complexity
H
?
CO, 217GHz (*Planck*)
dust, 100 μm (*IRAS*)
HI, 21cm (LAB)
stars, JHK$_s$ (2MASS)

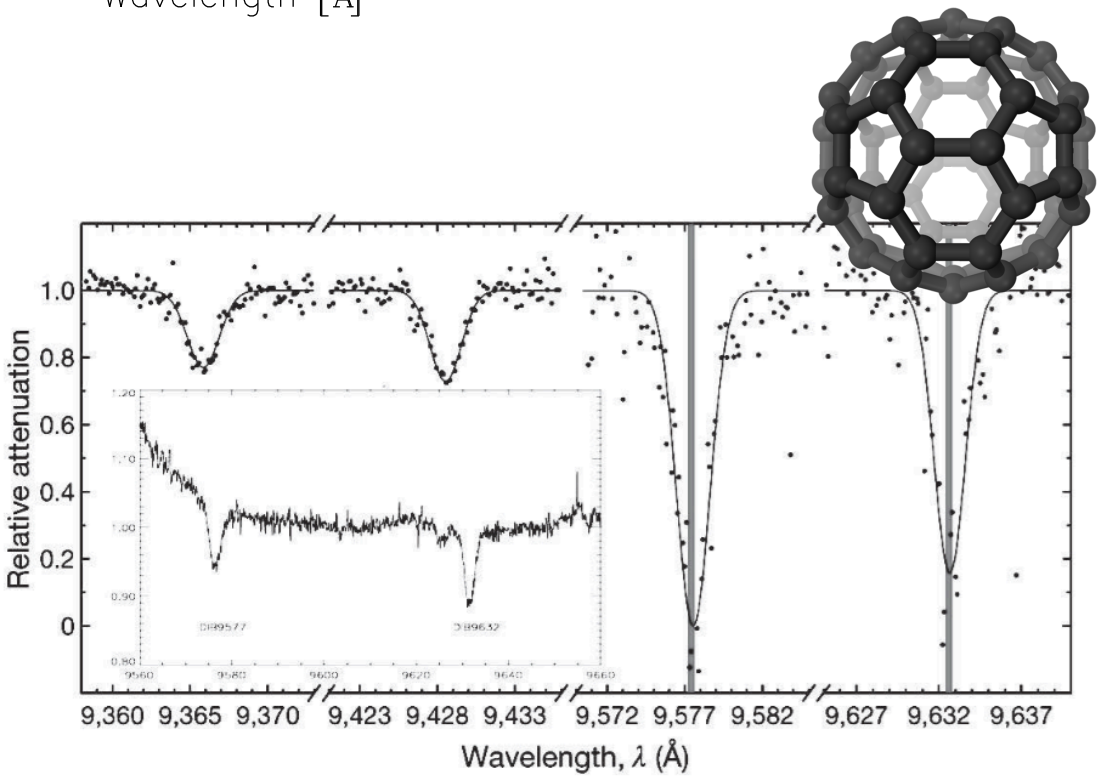
Large Molecules ⟷ DIBs?

A_V=1 mag

adapted from Jenniskens & Désert (1994)

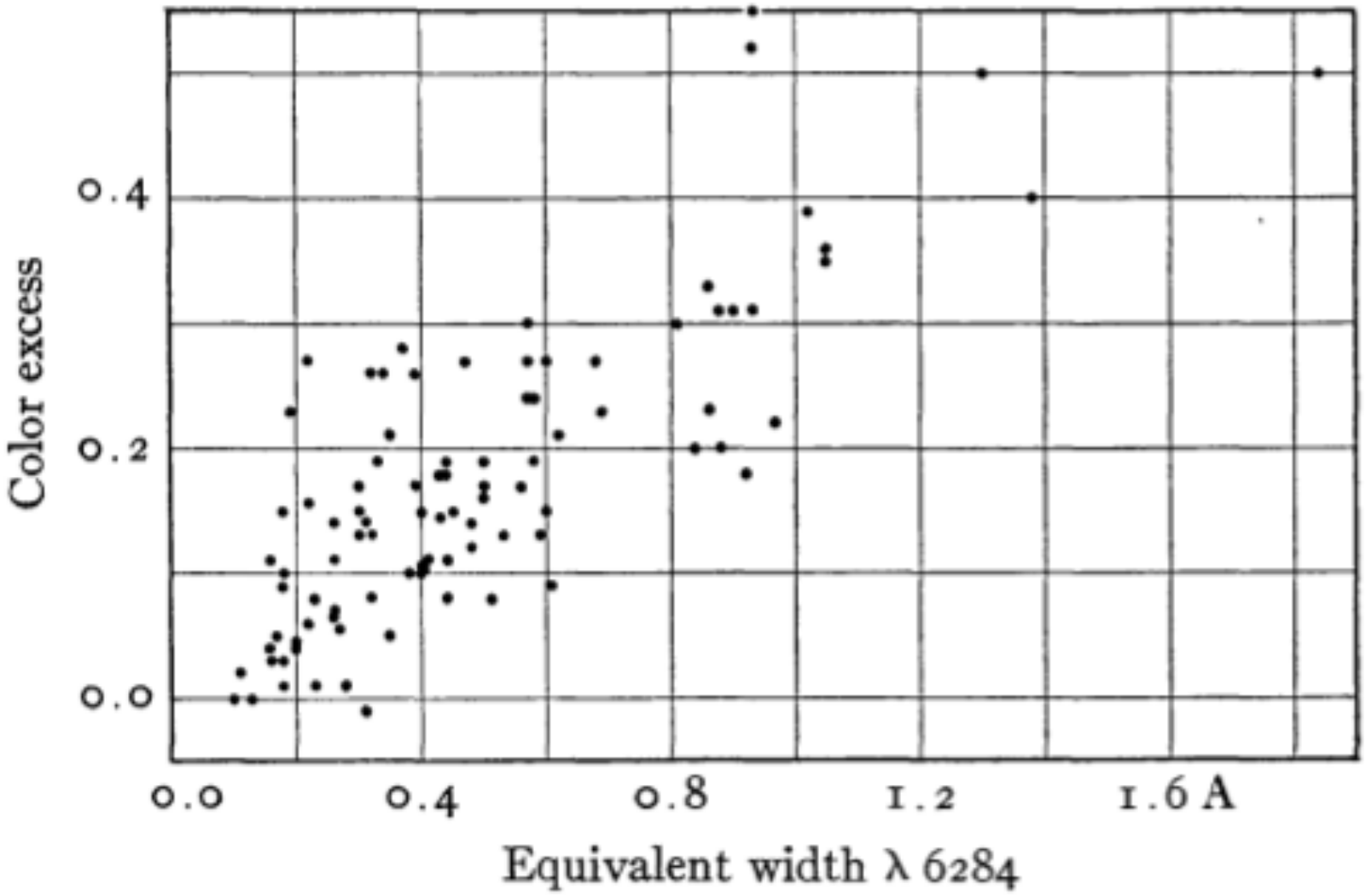






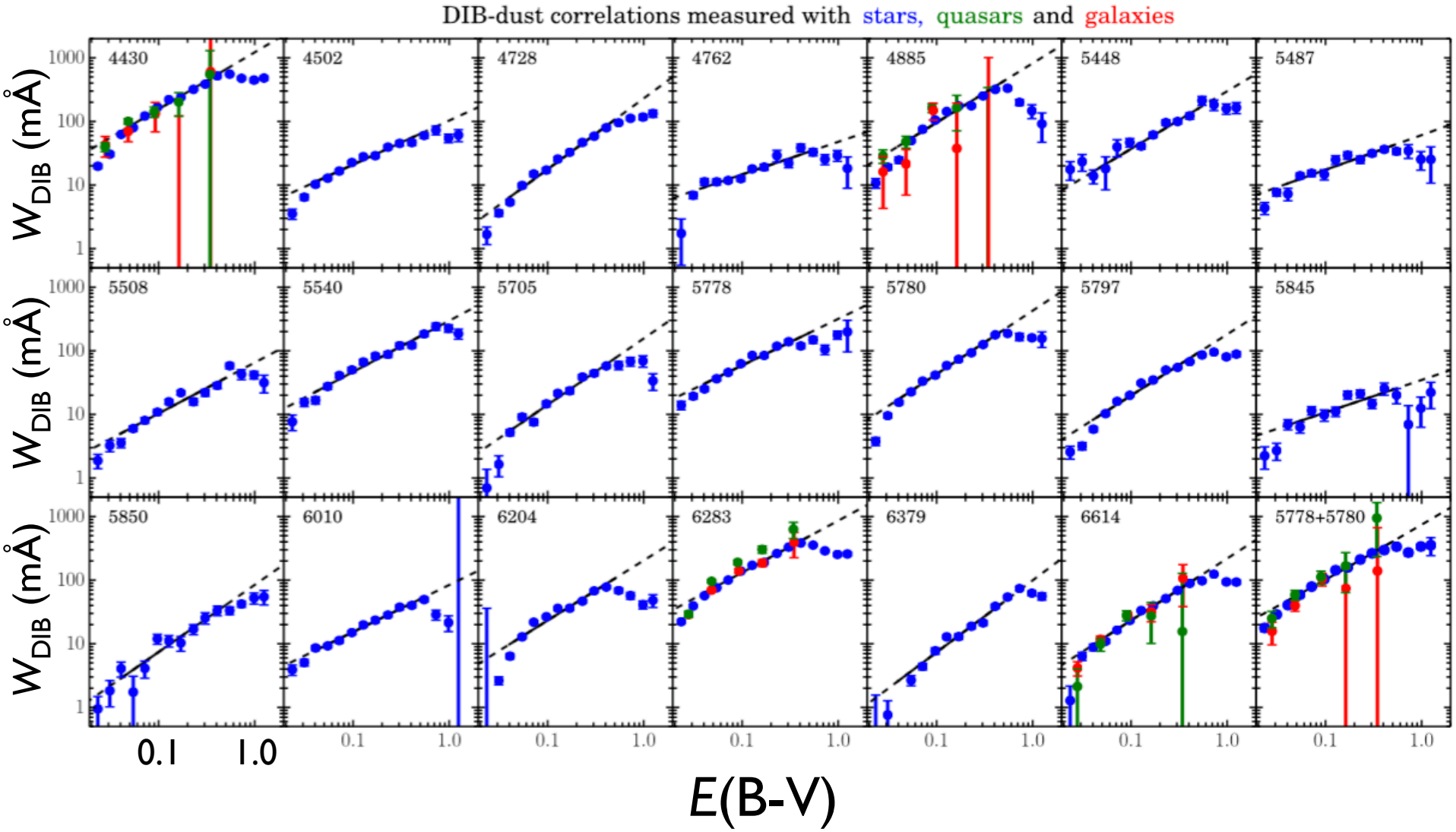
Campbell et al. (2015)

DIBs + Dust



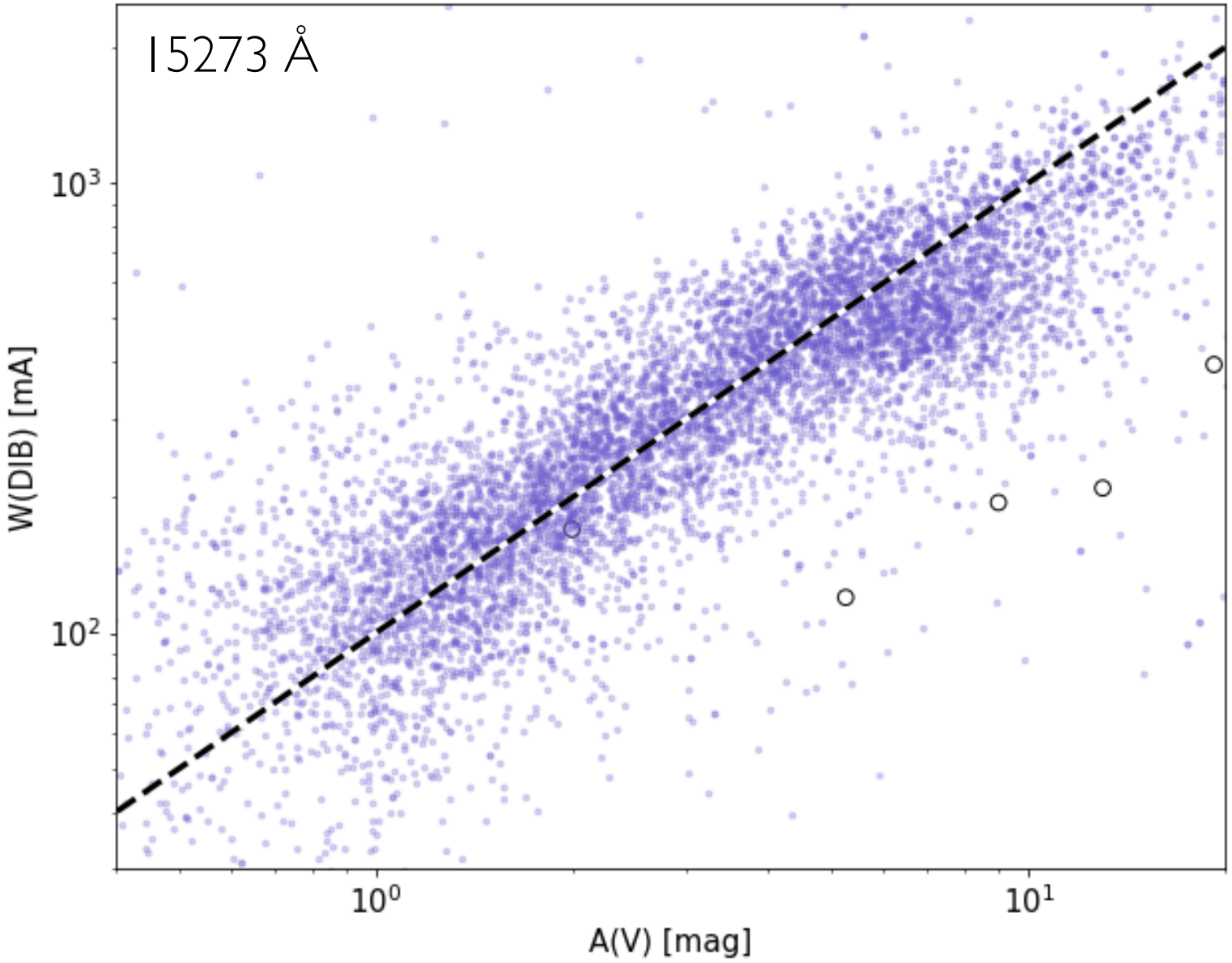
Merrill (1938)

DIBs + Dust



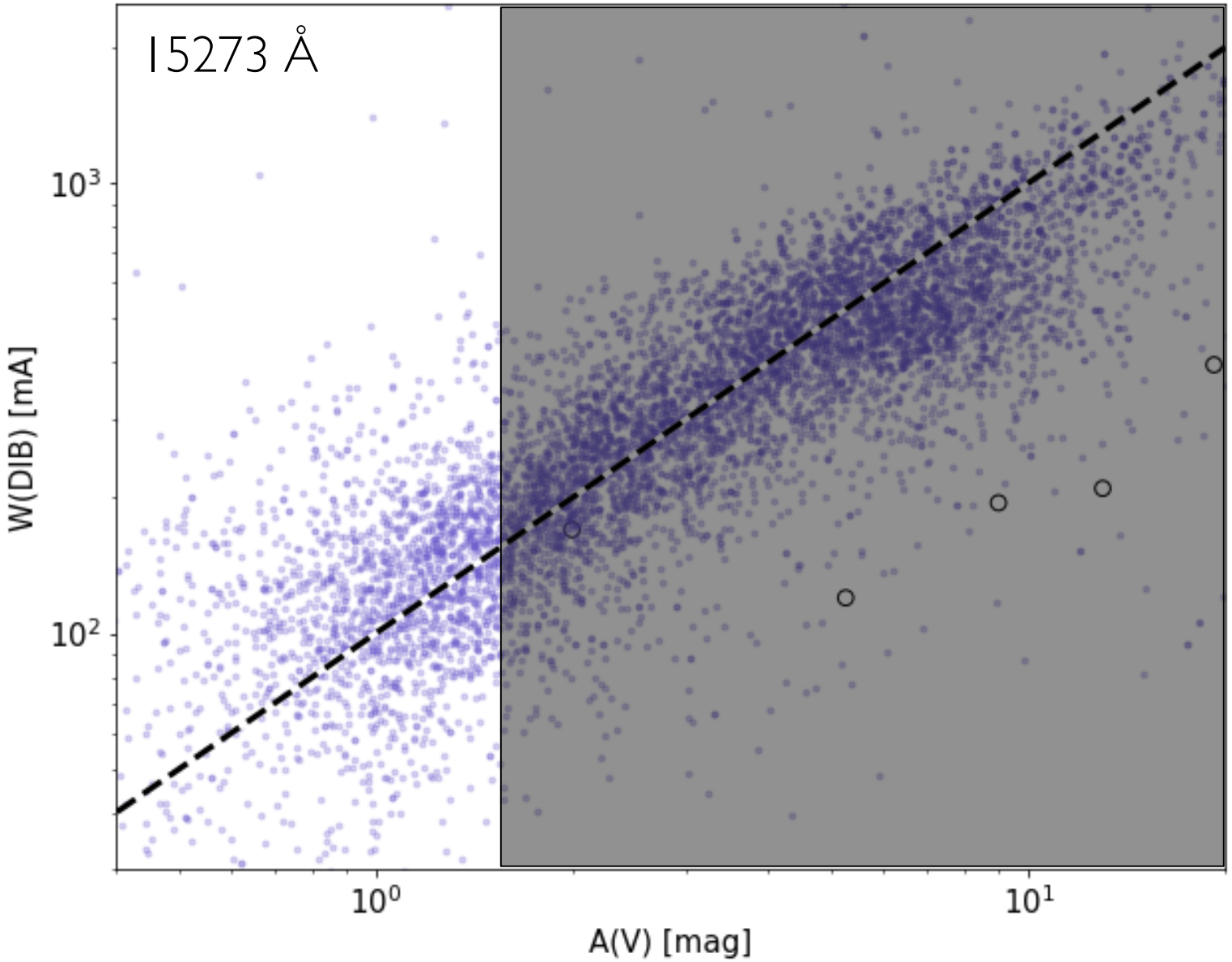
Lan et al. (2015)

DIBs + Dust



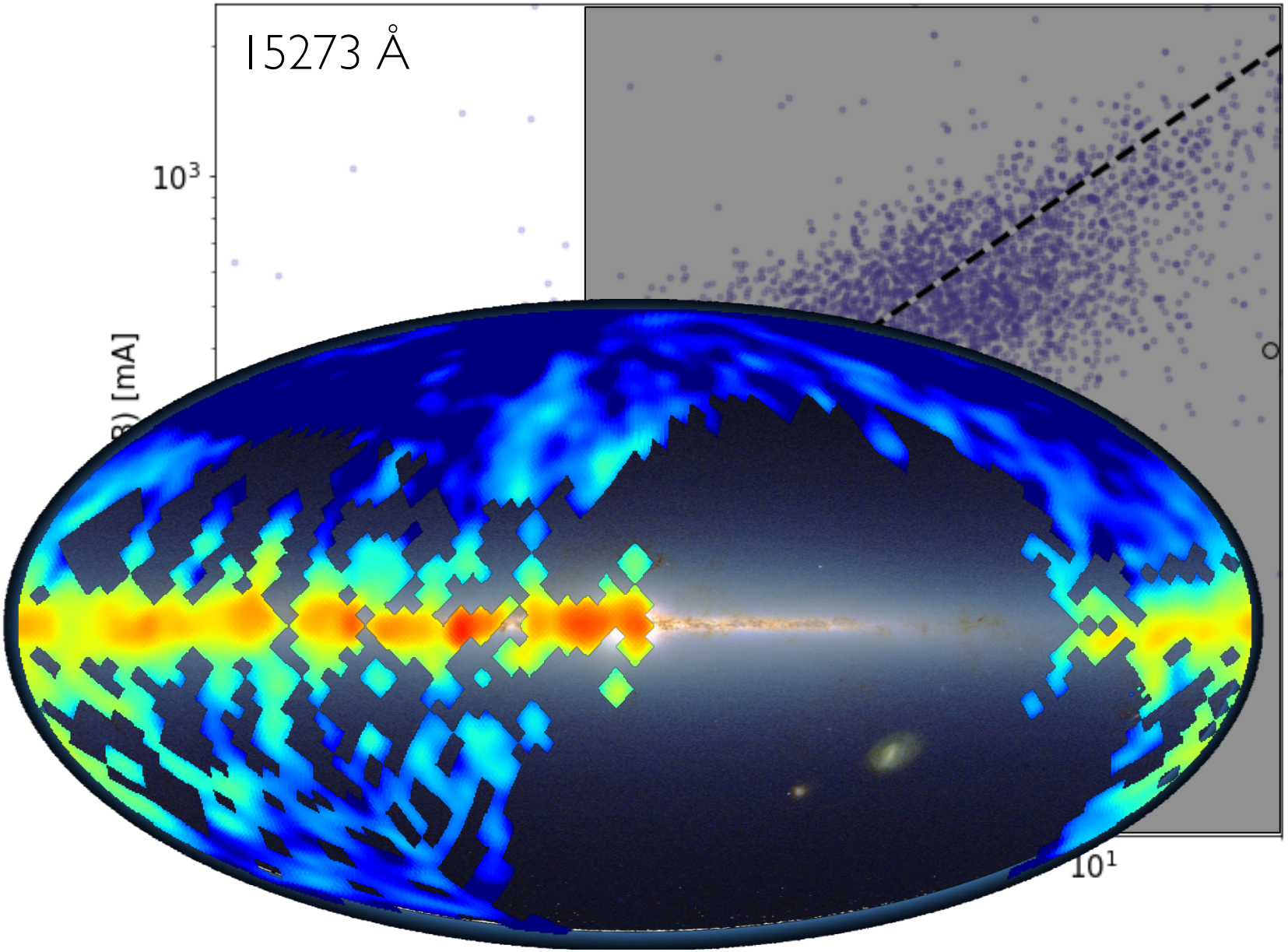
GZ et al. (2015)

DIBs + Dust



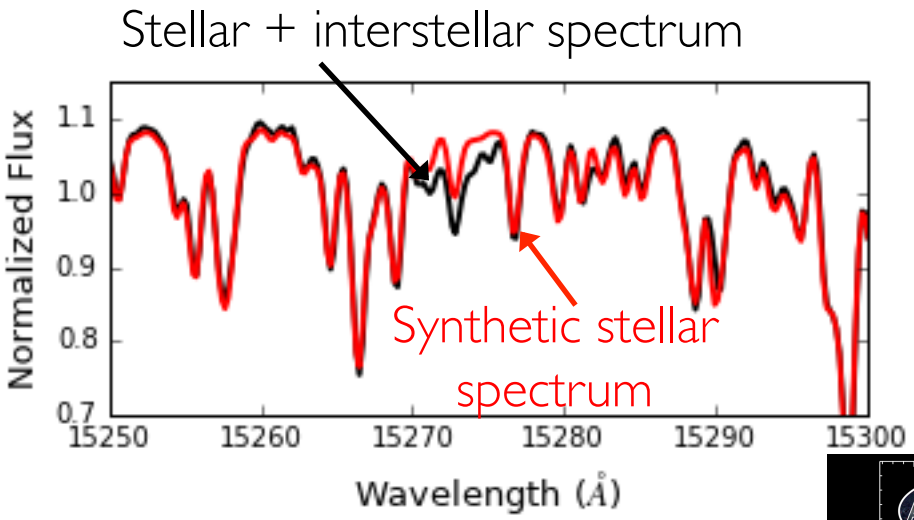
GZ et al. (2015)

DIBs + Dust



GZ et al. (2015)

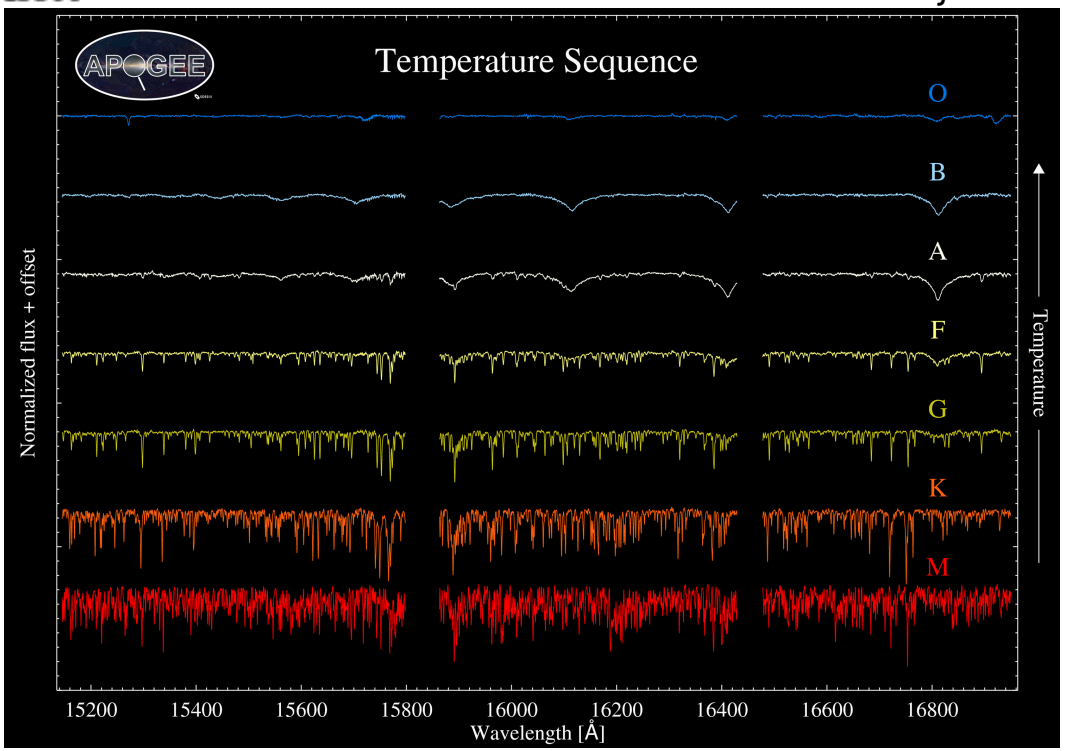
Extracting the 1.53μm DIB



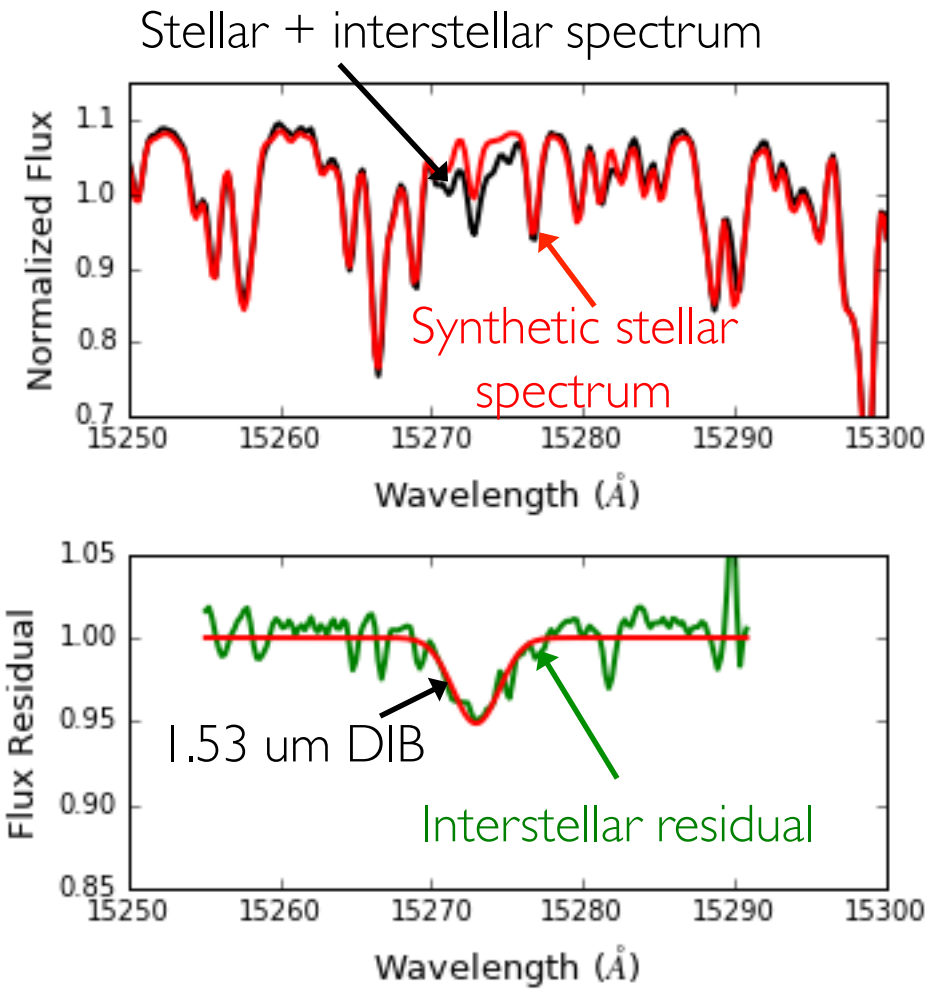
Relatively easy to use these

To probe large distances in the disk, need to use these

D. Chojnowski

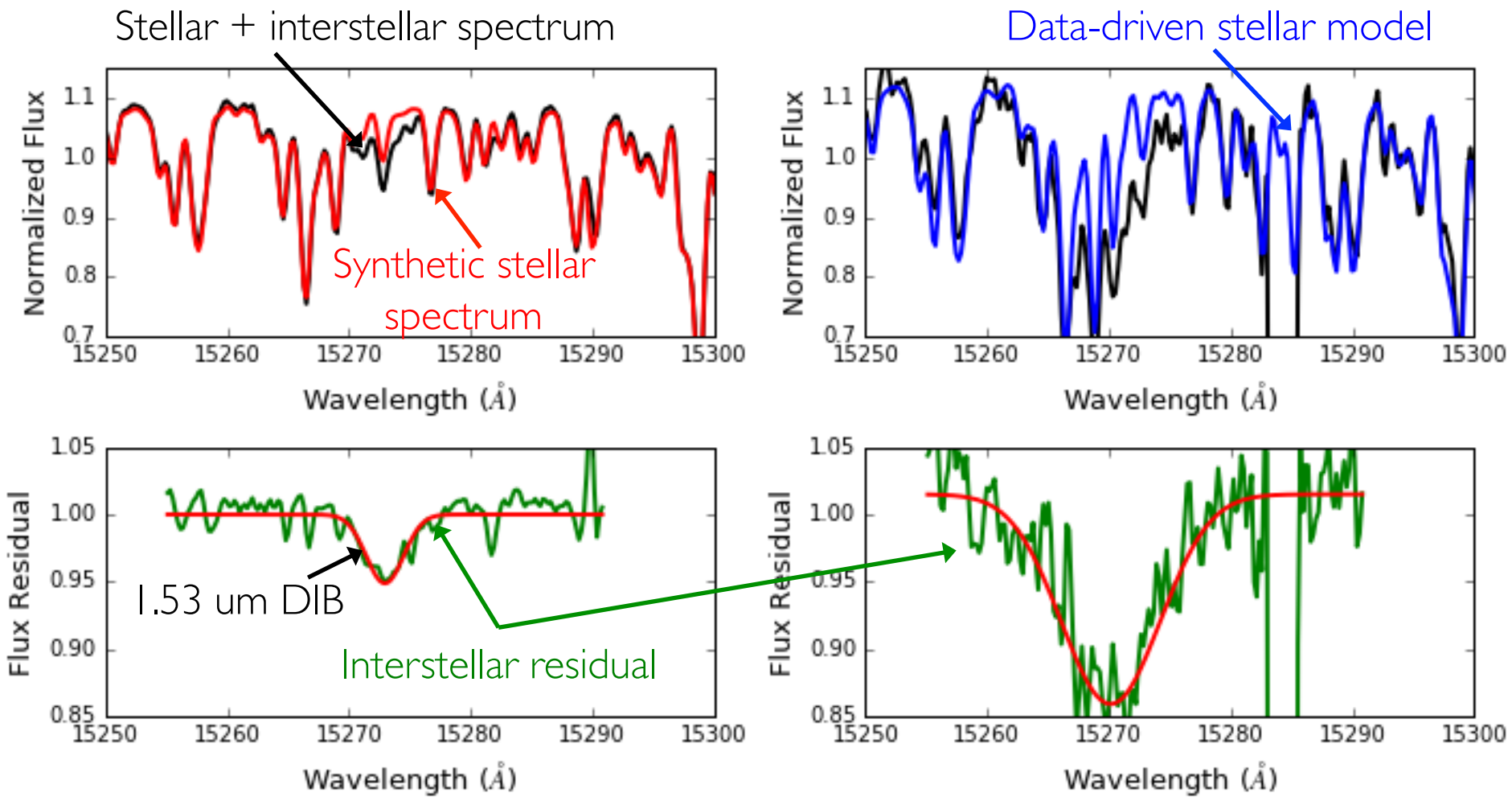


Extracting the 1.53μm DIB



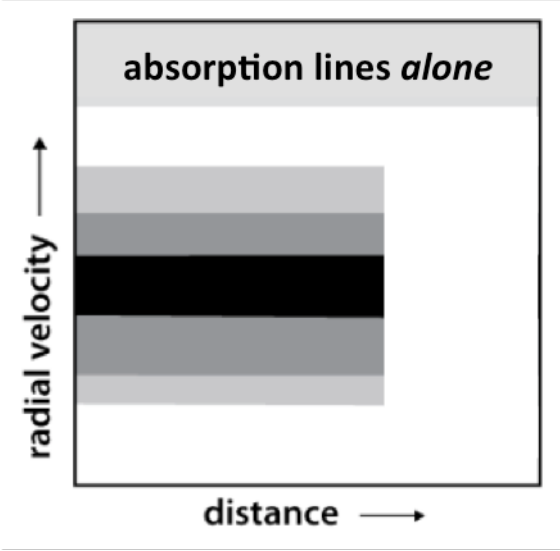
GZ et al. (2015)

Extracting the 1.53μm DIB



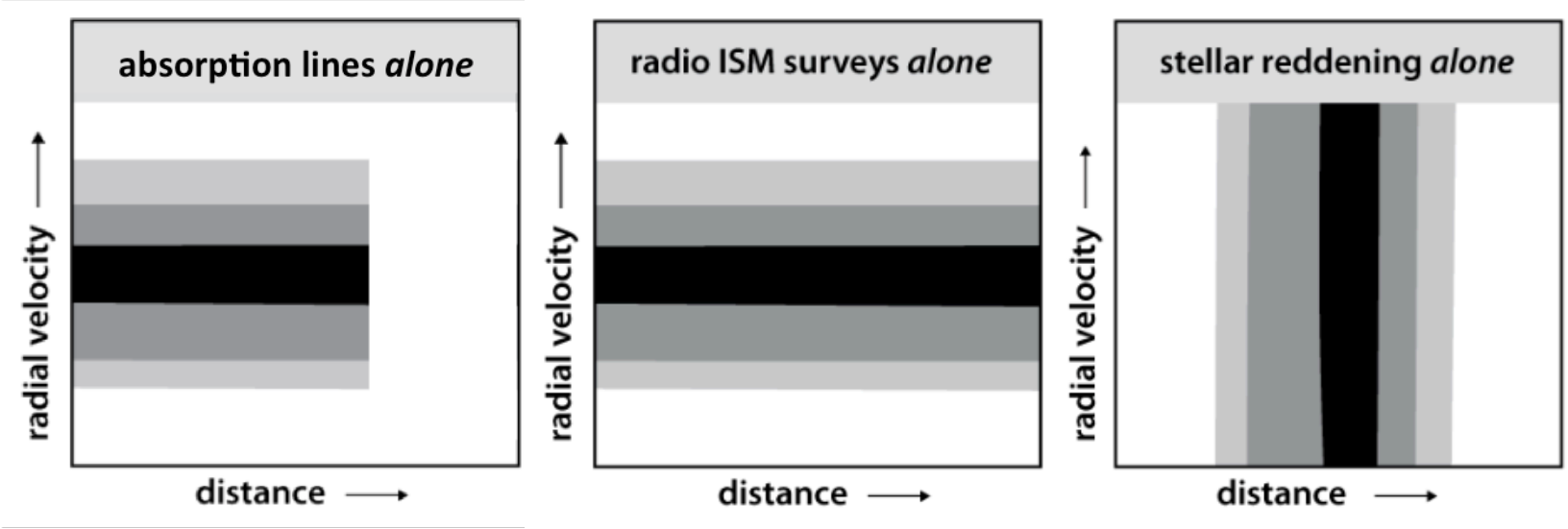
GZ et al. (2015)

Galaxy Evolution via the 4-D ISM



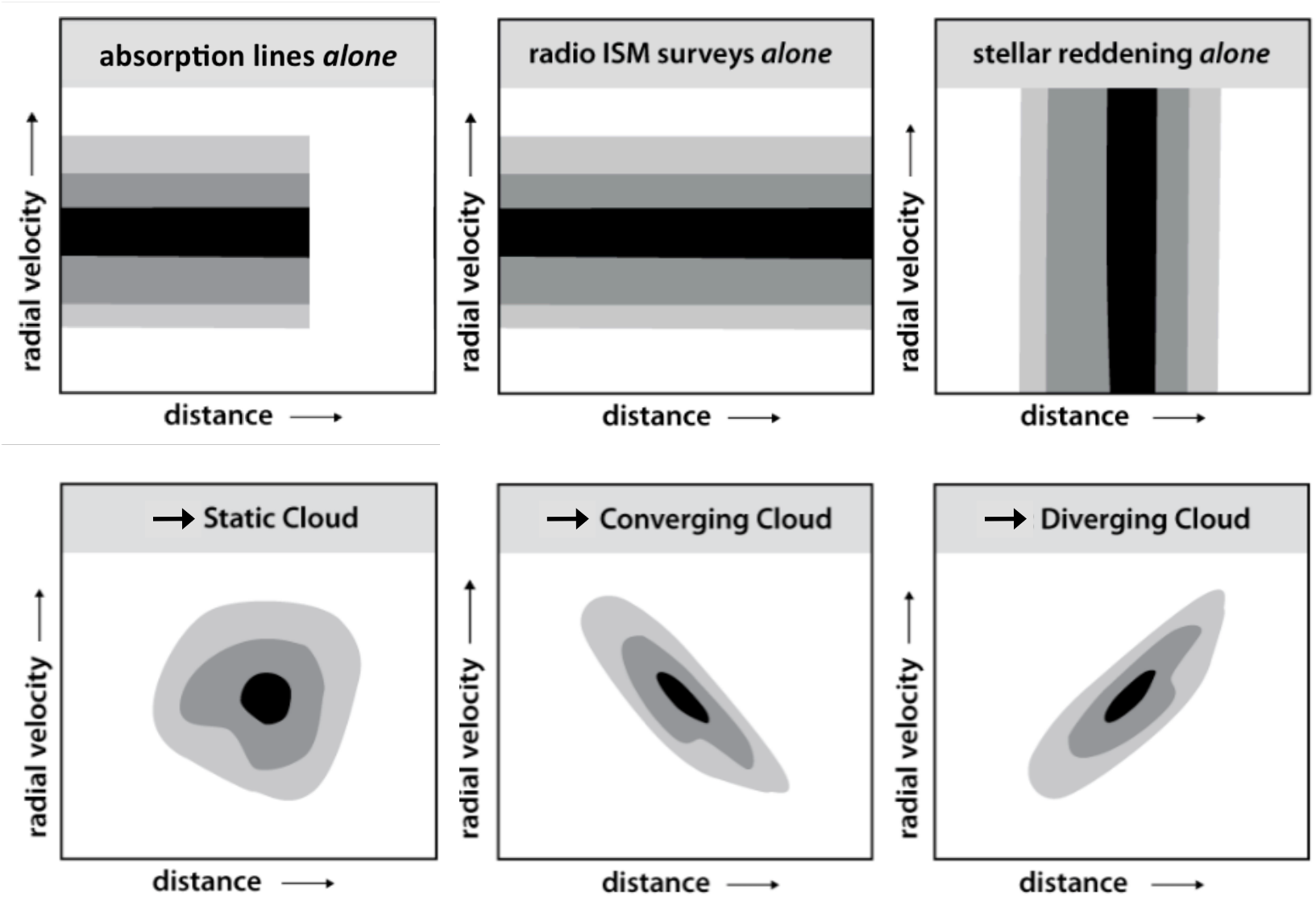
J. E. G. Peek

Galaxy Evolution via the 4-D ISM



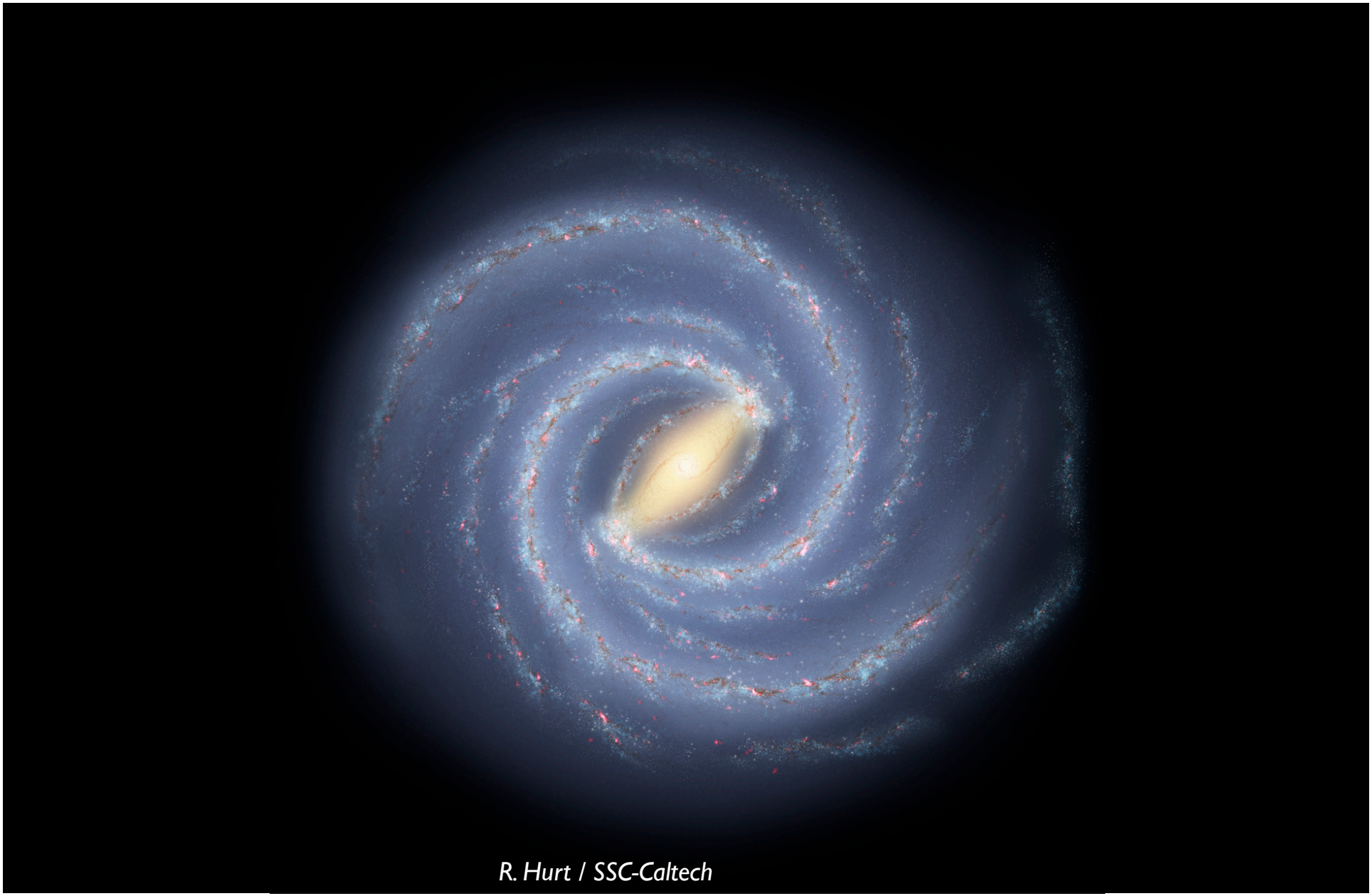
J. E. G. Peek

Galaxy Evolution via the 4-D ISM



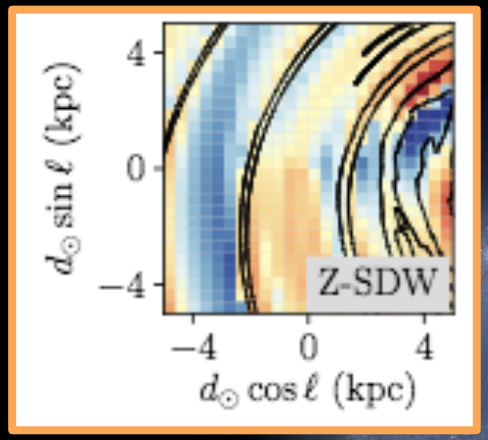
J. E. G. Peek

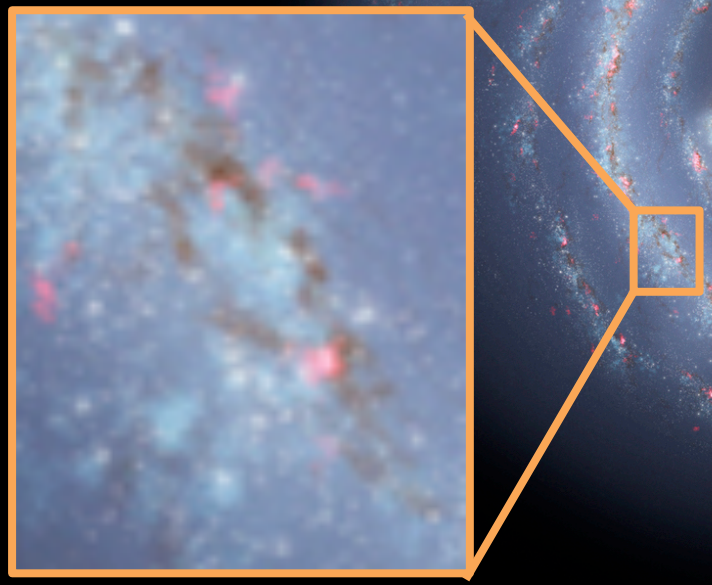
Galaxy Evolution via the 4-D ISM



Galaxy Evolution via the 4-D ISM

What drives spiral arms?



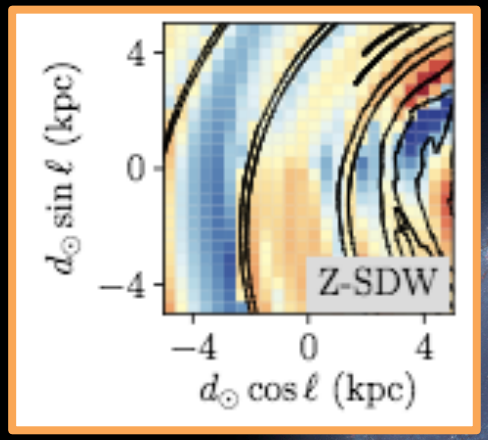


R. Hurt / SSC-Caltech

Galaxy Evolution via the 4-D ISM

What drives spiral arms?

How do GMCs evolve?

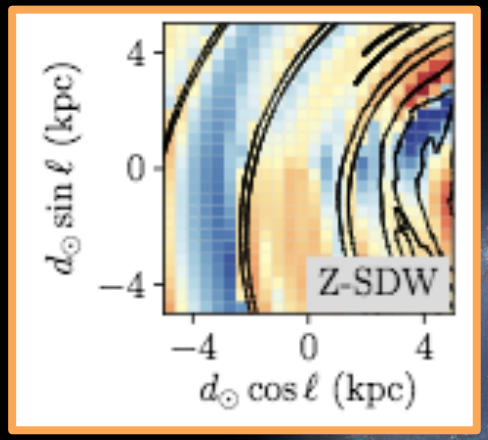


R. Hurt / SSC-Caltech

Galaxy Evolution via the 4-D ISM

What drives spiral arms?

How do GMCs evolve?

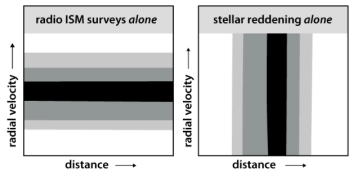


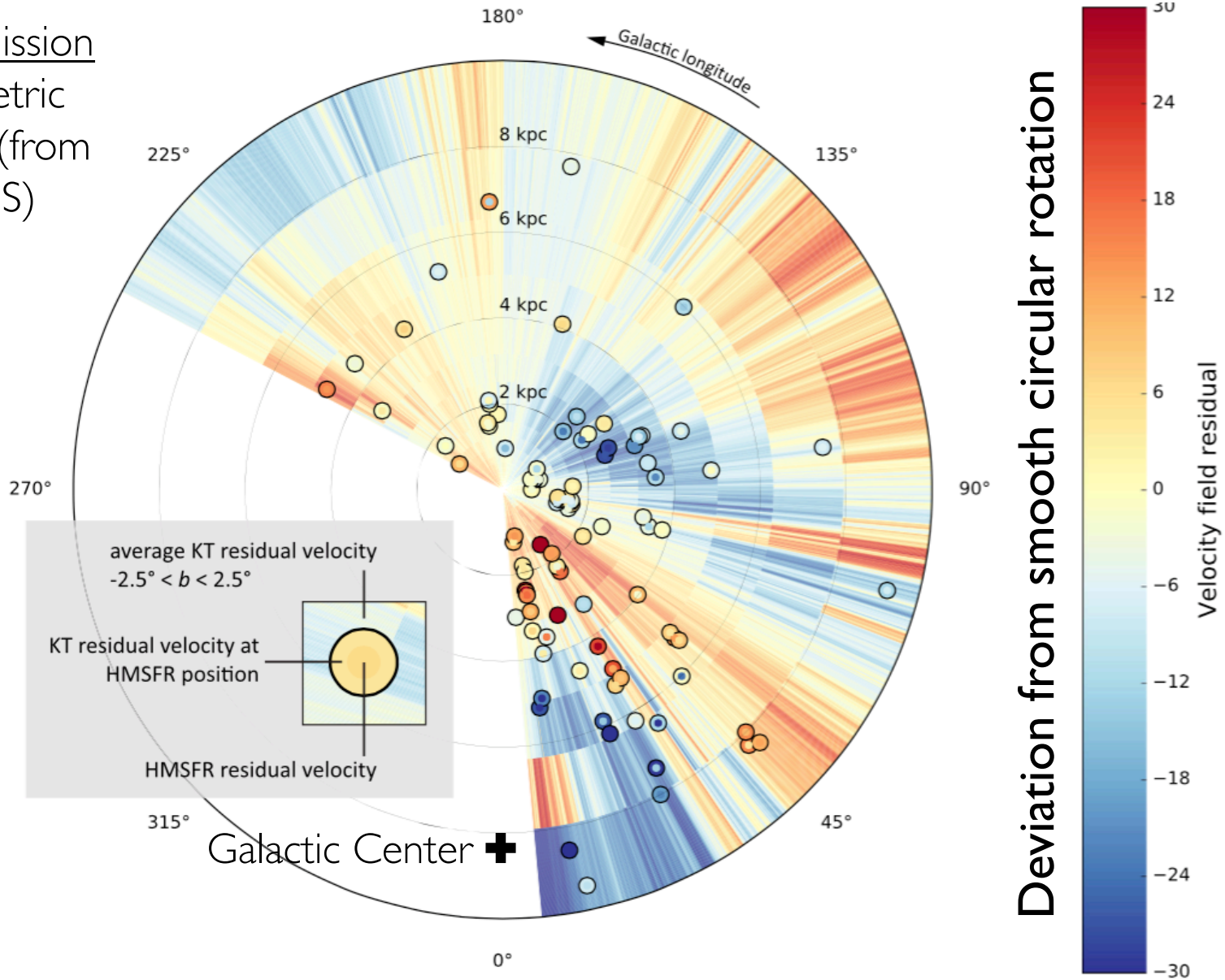
How does the ISM move around the Galaxy?

R. Hurt / SSC-Caltech

Case Study: Kinetic Tomography

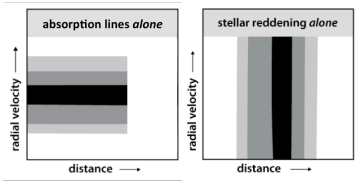
Using HI/CO <u>emission</u> and 3D photometric extinction maps (from Panstarrs+2MASS)



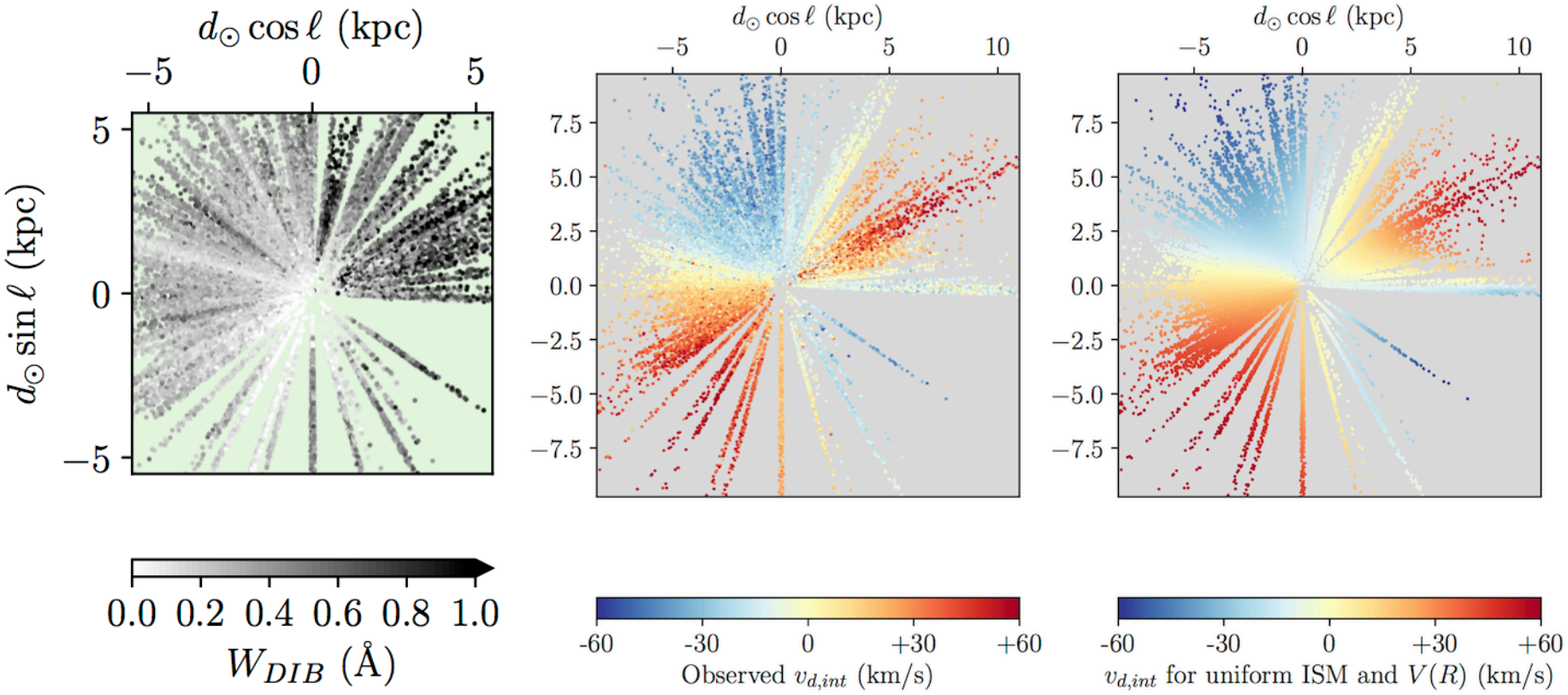


Tchernyshyov & Peek (2017)

Case Study: Kinetic Tomography



- Advantages to using absorption lines



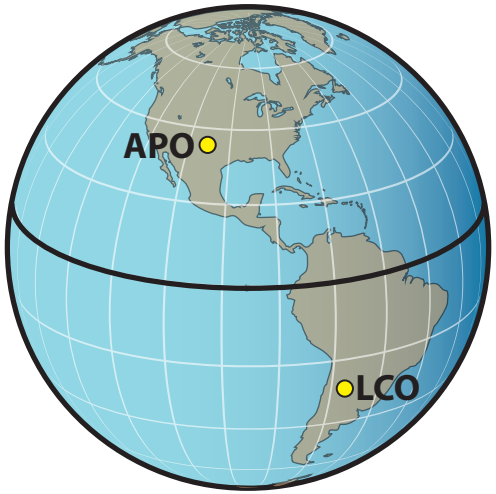
Quite new -- much to explore!

Tchernyshyov, Peek, & GZ in prep

The Future is...Dark! (in a good way)

- Improved 3-D dust maps with *Gaia*
- 1.53μm DIBs along ~5M sightlines with SDSS-V

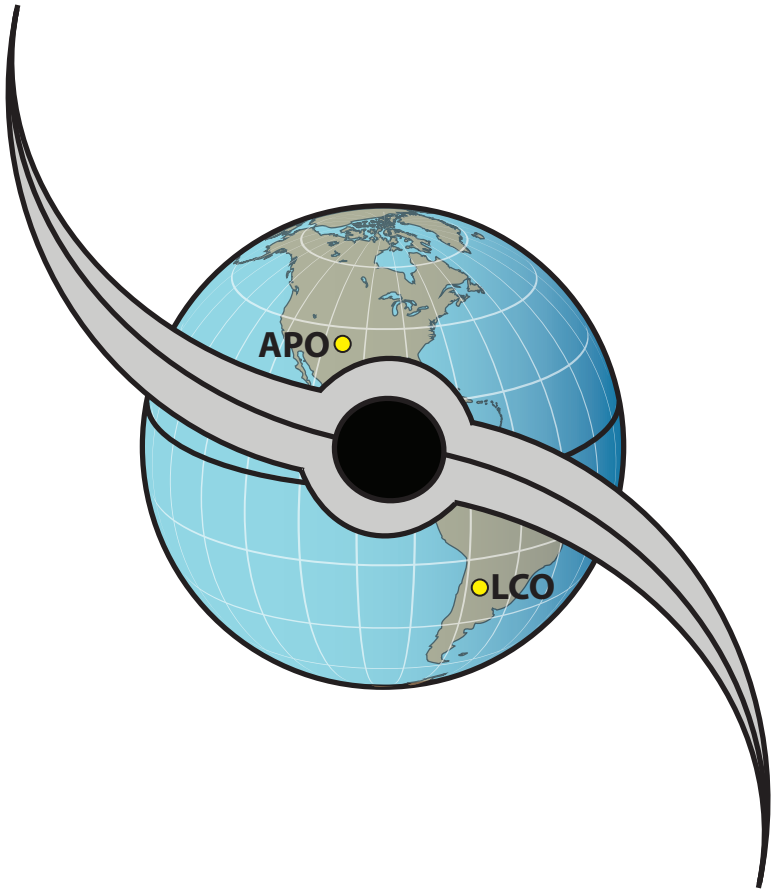
SDSS-V



http://www.sdss.org/future/

M. Seibert

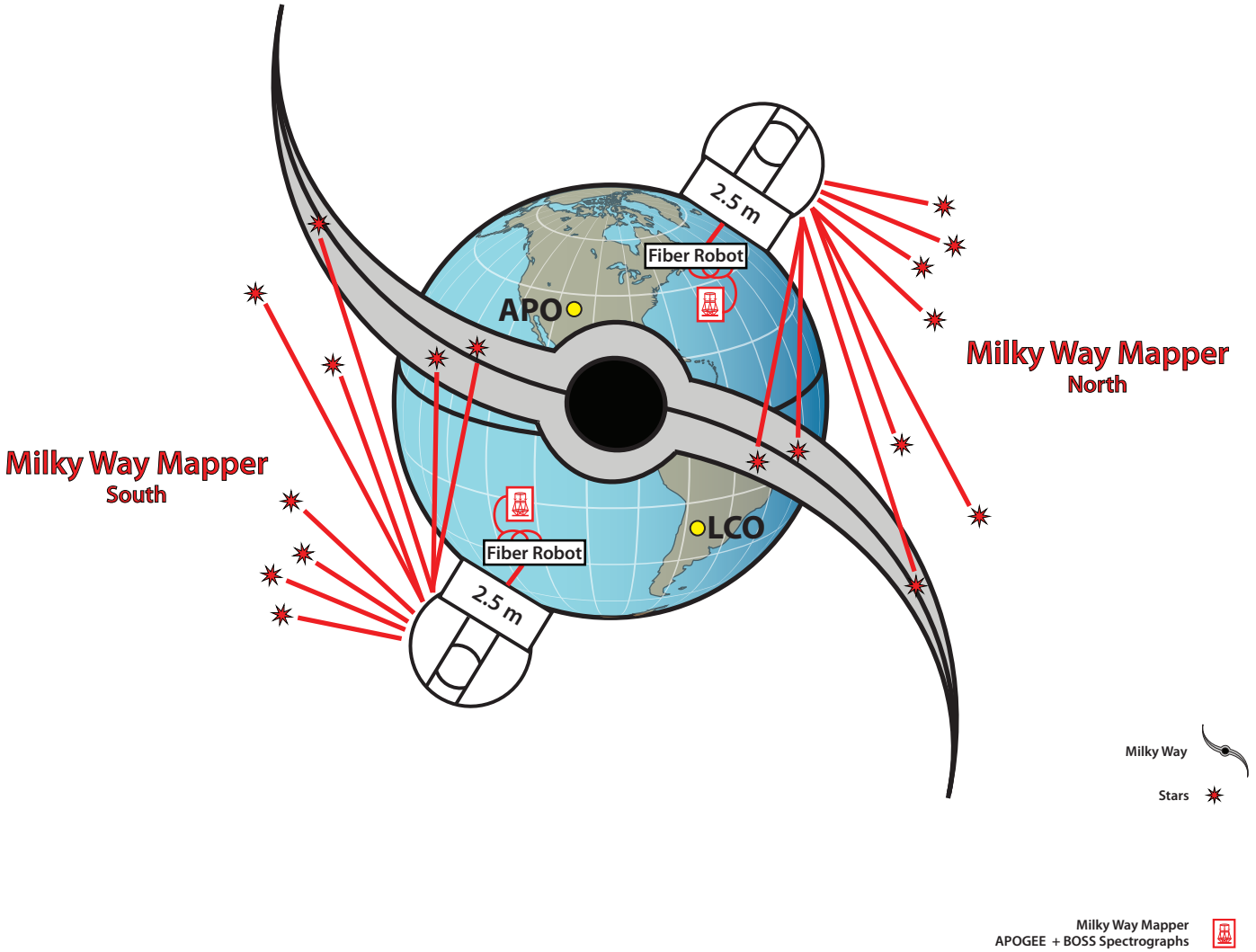
SDSS-V



http://www.sdss.org/future/

M. Seibert

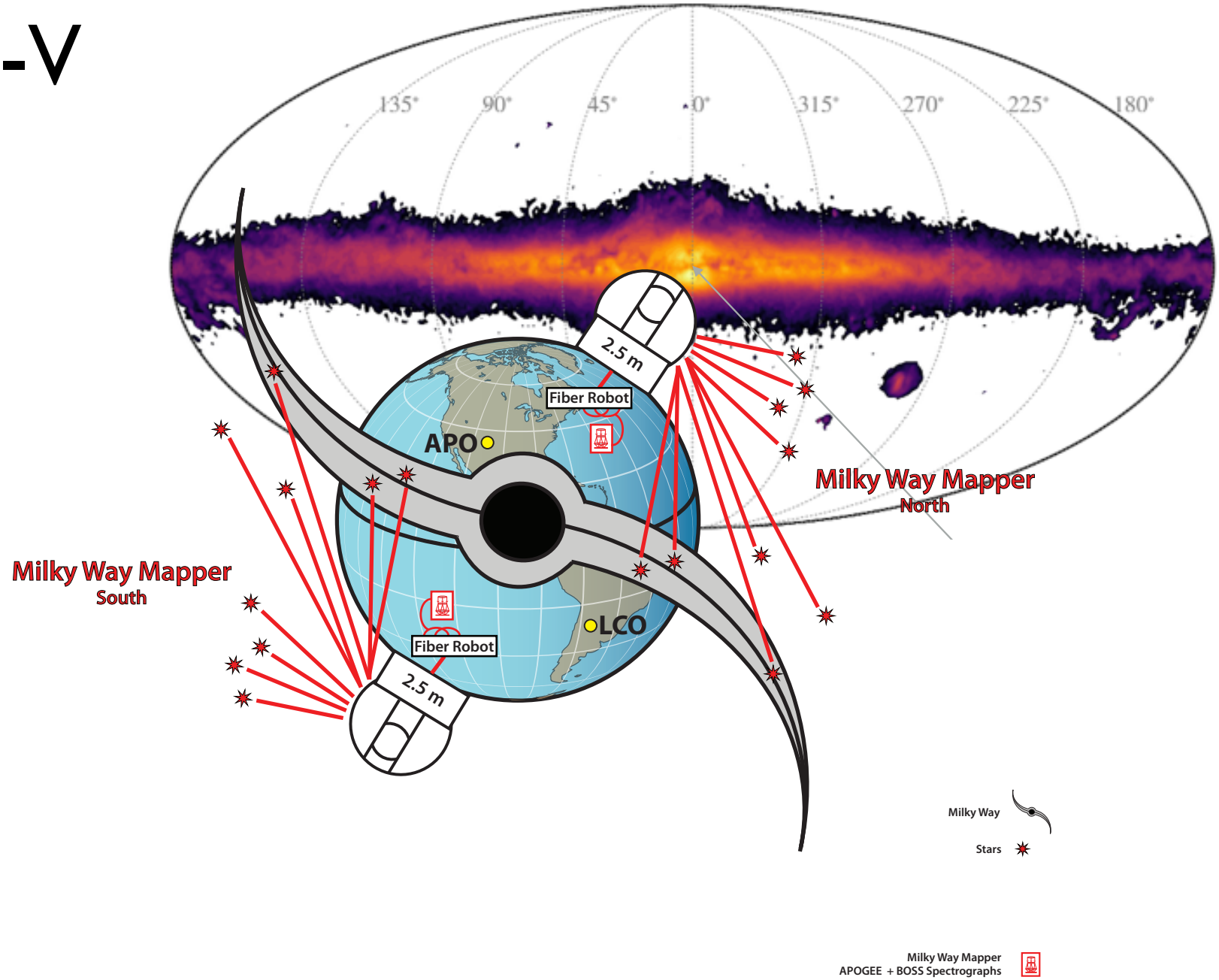
SDSS-V



http://www.sdss.org/future/

M. Seibert

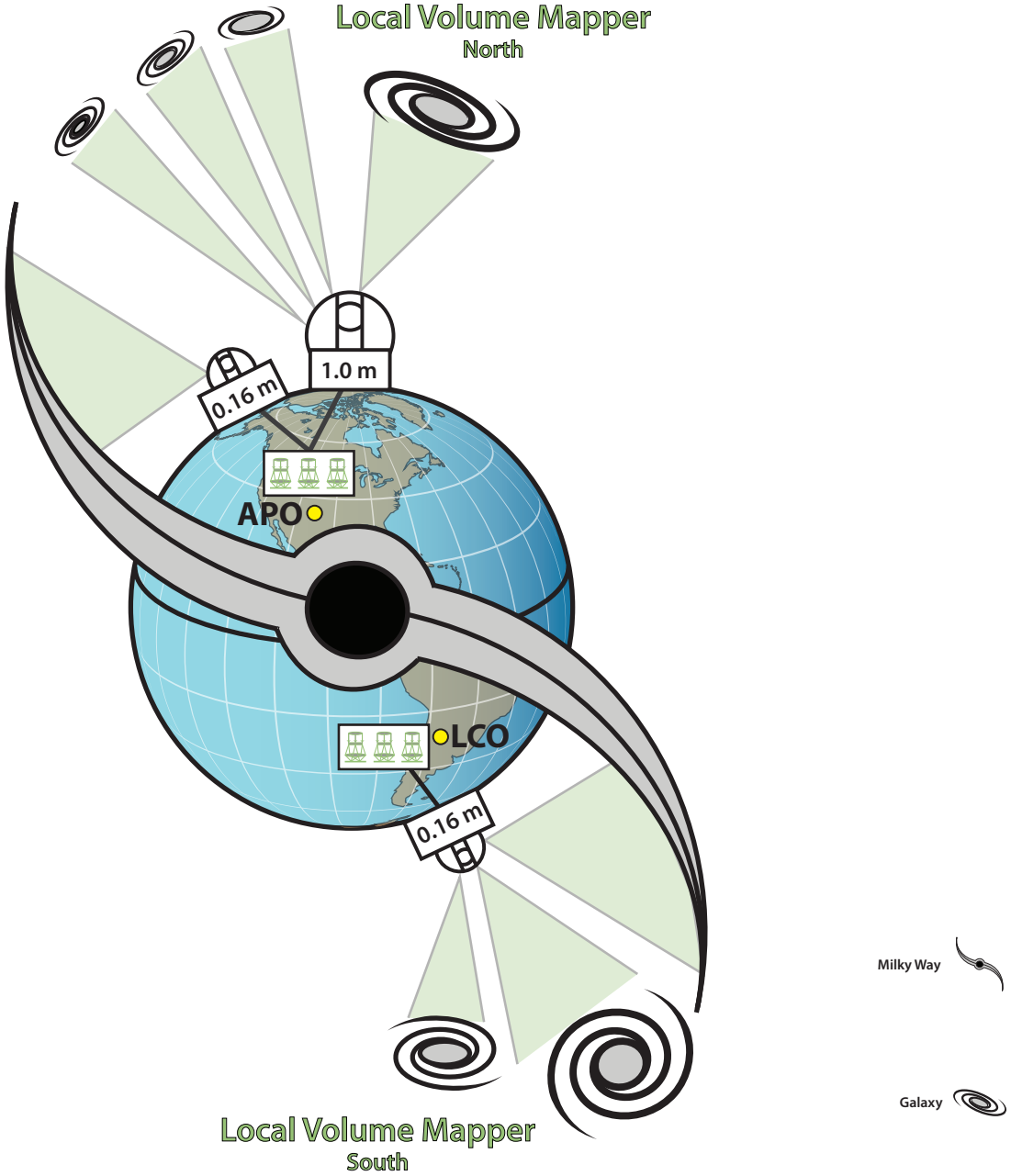
SDSS-V



http://www.sdss.org/future/

M. Seibert

SDSS-V

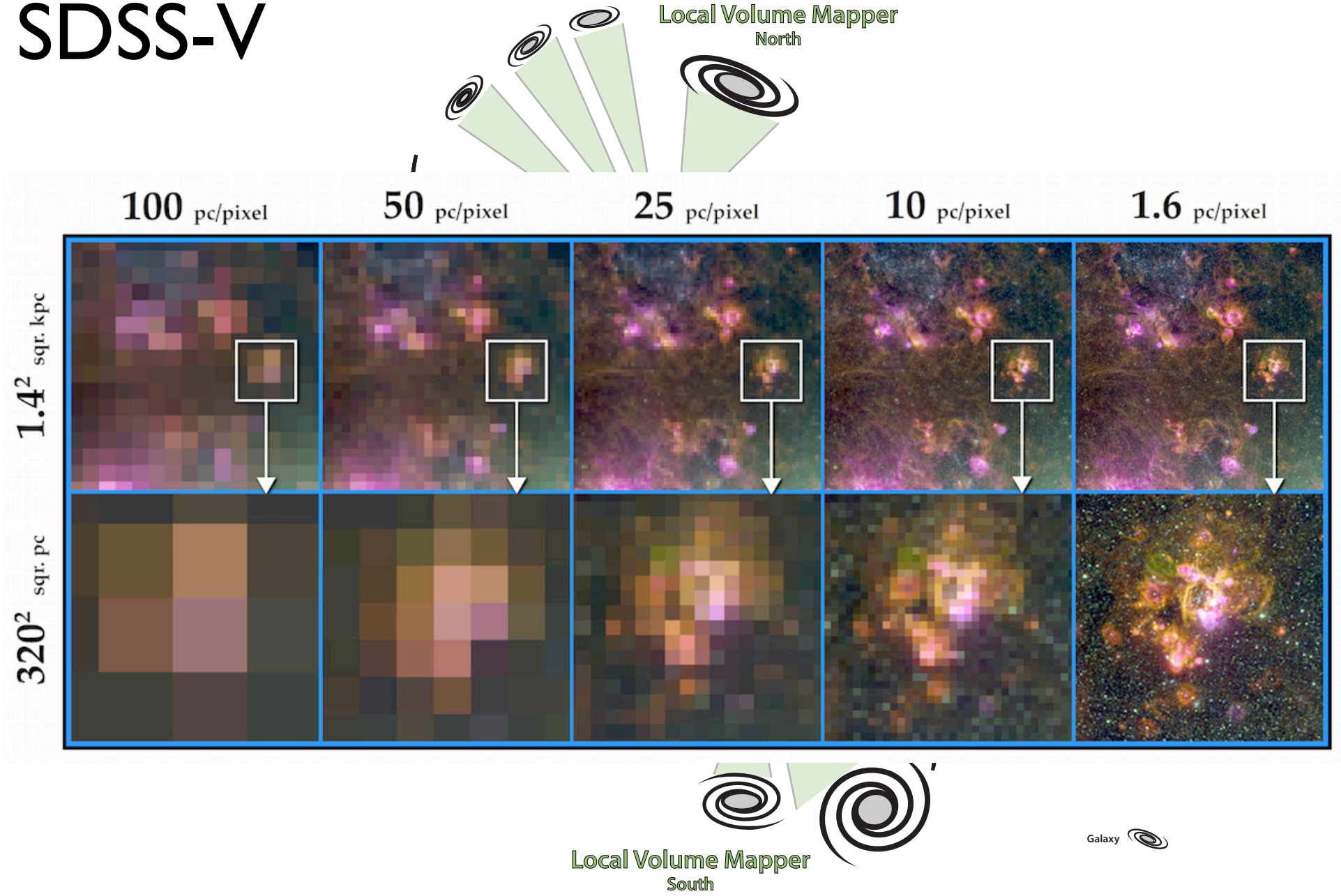


http://www.sdss.org/future/

Local Volume Mapper
Integral Field Spectrograph

M. Seibert

SDSS-V



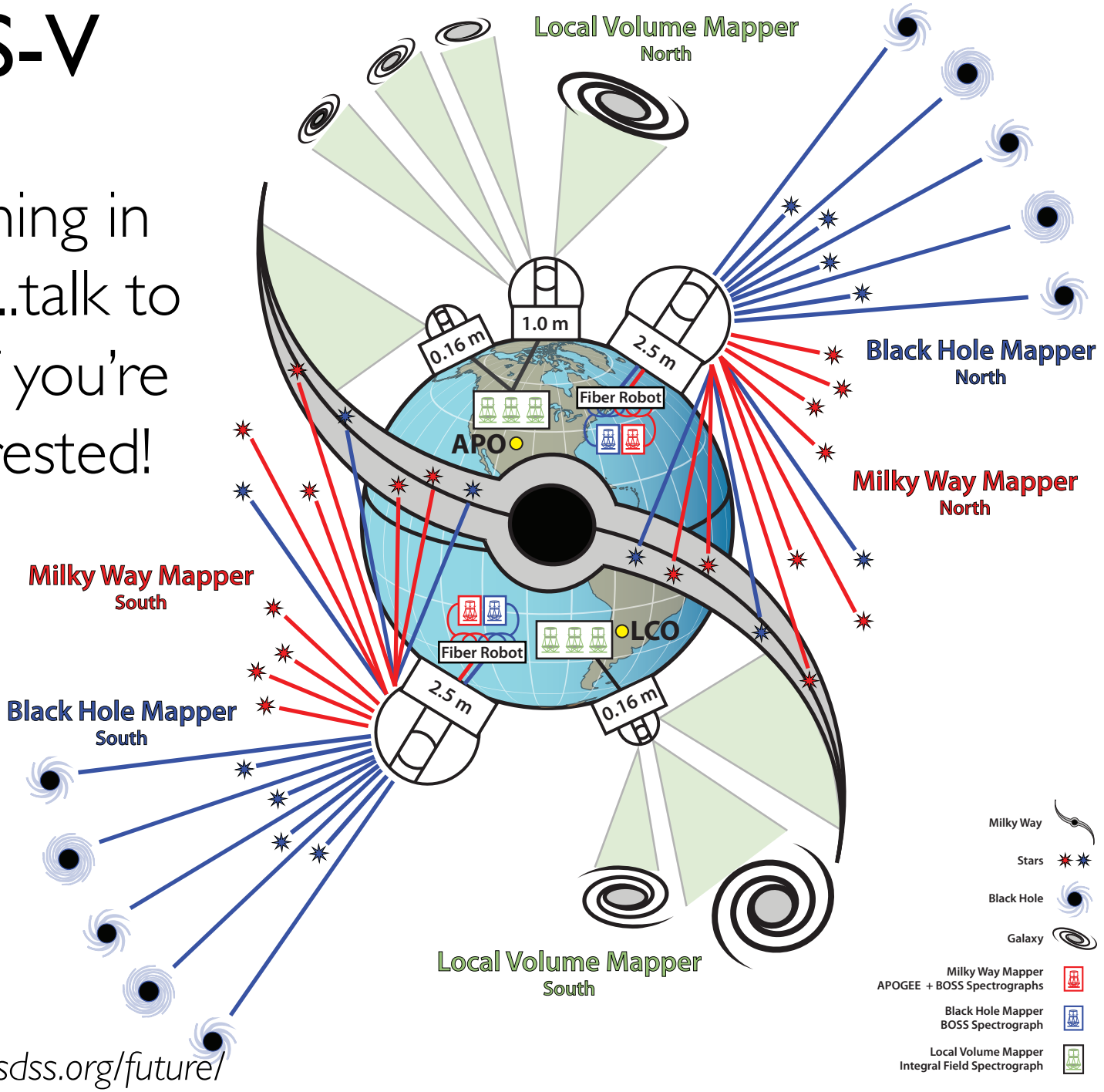
http://www.sdss.org/future/

Local Volume Mapper
Integral Field Spectrograph

M. Seibert

SDSS-V

Coming in 2020...talk to me if you're interested!



http://www.sdss.org/future/

M. Seibert

Thank You

R. Dienel