

LSS & Galaxy Flows discussion session

ICISE, Vietnam 2016/07/08

Data

- Future is bright - past 1000 - now 10,000 - future 100,000
 - Taipan (starting soon) then ASCAP Wallaby
 - can we get an all-sky (homogeneous) survey??
 - SBF - why slow to take off? Is MCAO a game-changer?
 - Optical TF with IFUs?
 - Photometric fundamental plane? Is it rubbish?
 - SDSS fundamental plane? How to go beyond "pilot study"?
 - how do we deal with the penalty of constant fractional error
 - currently β limits from flows competitive with RSD, but how long?
 - is the game nearly over (except for kSZ)?

Data questions - continued

- J-PAS or PAU - wide area photo-z to $\sigma_z/(1+z) = 0.003$
 - how do these complement cosmic flow studies?
- Combine kSZ with TF or FP distances?
- ASKAP/MeerCat/SKA
 - what are the key contributions these will make? (Y-Z Ma)
- What's needed to bring flows back to prominence?
 - 10^5 distances to 10% error? 10^6 with 5%?
 - is this possible?

Peculiar velocity vs. pec. gravity

- How well does the observed velocity match that predicted?
 - Is the problem solved?
 - or is there excess noise? what does it mean?
 - systematic error? physics?
 - how does it bias or feed into error on β ?
- Is the local group 600km/s fully explained?
 - what is left to explain?
 - is it systematic error? the repeller? ZOA? physics?

Observed v_p versus predicted v_p

400 km/s dipole subtracted, to aide visualization

ITF modes

gravity

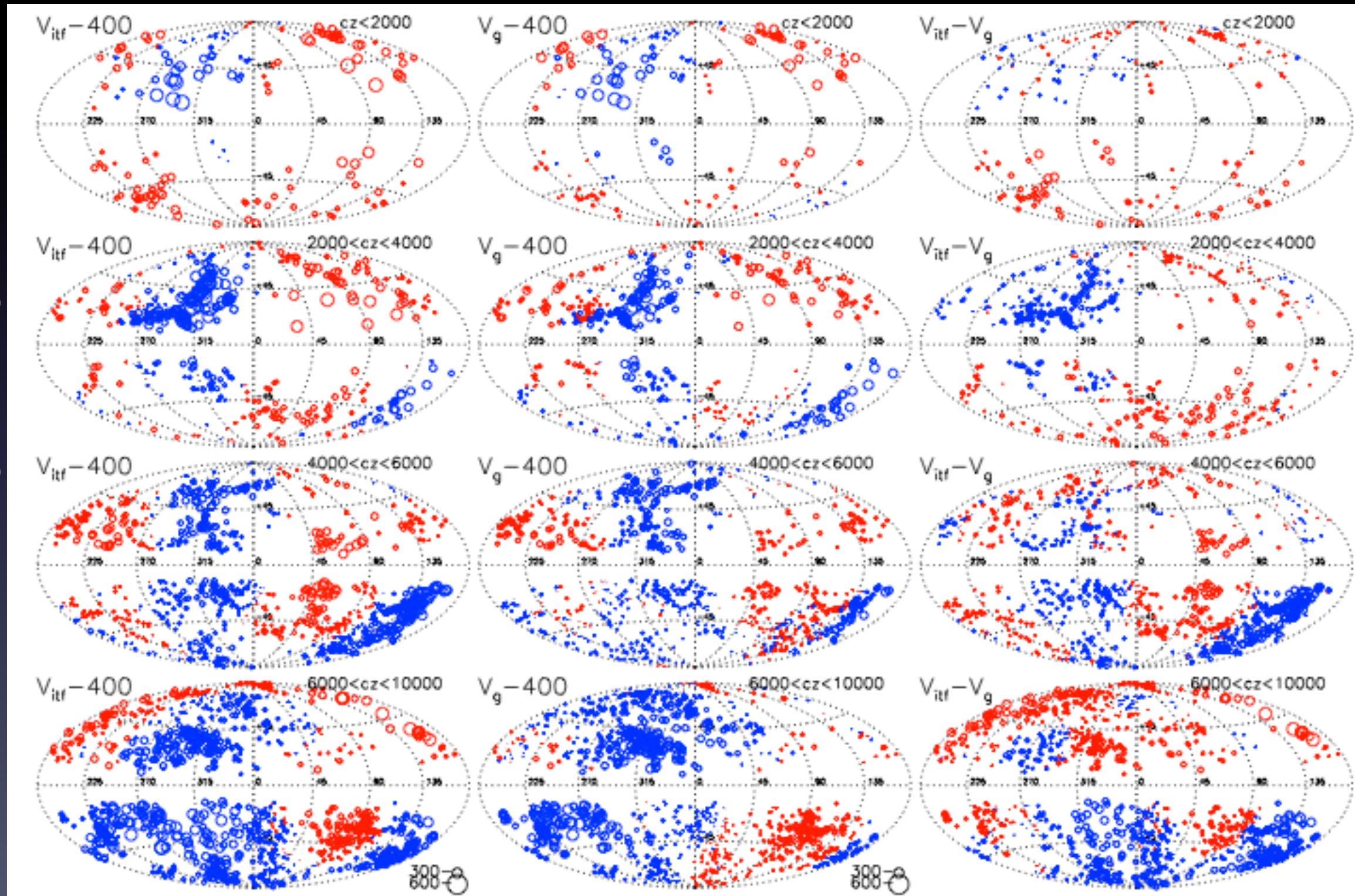
residual

$cz < 2000$ km/s

$2000 < cz < 4000$

$4000 < cz < 6000$

$6000 < cz < 10000$



Flows on largest scale

- Is there really an excess of P_{vv} on very large scales?
 - how significant is it?
 - is there any sign of what's driving this in $P_{\delta\delta}$? Or in $P_{\delta v}$?
 - how can this be firmed up?
 - if it persists, will larger the community be convinced?
- Does the bulk-flow extend to very large radius?
 - significance? how inconsistent with Λ CDM?
 - do we see the source? (is Shapley + GR etc. enough?)
 - distance of source $D \sim v / (dv/dr)$. Consistent?
- What is the best statistic for large scales? Bulk-flow? Coherence length?

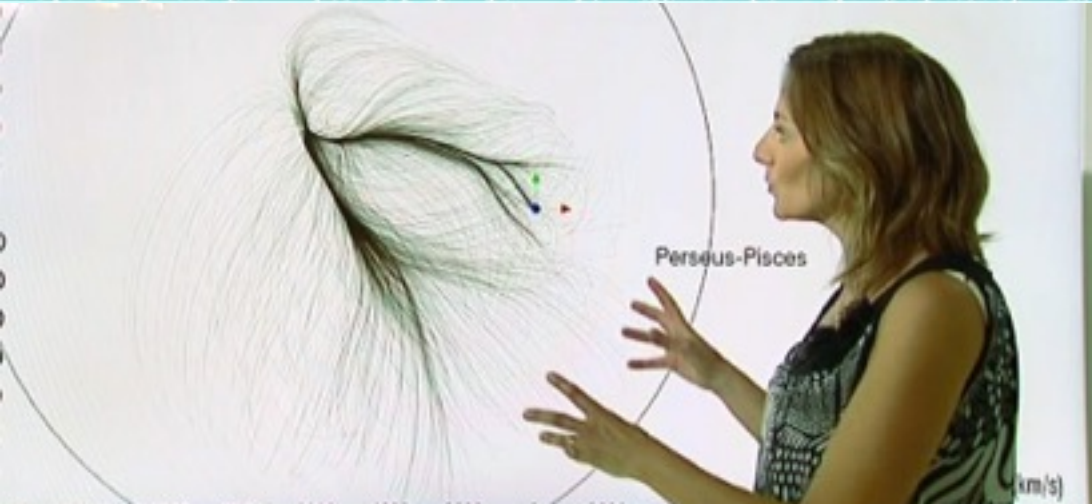
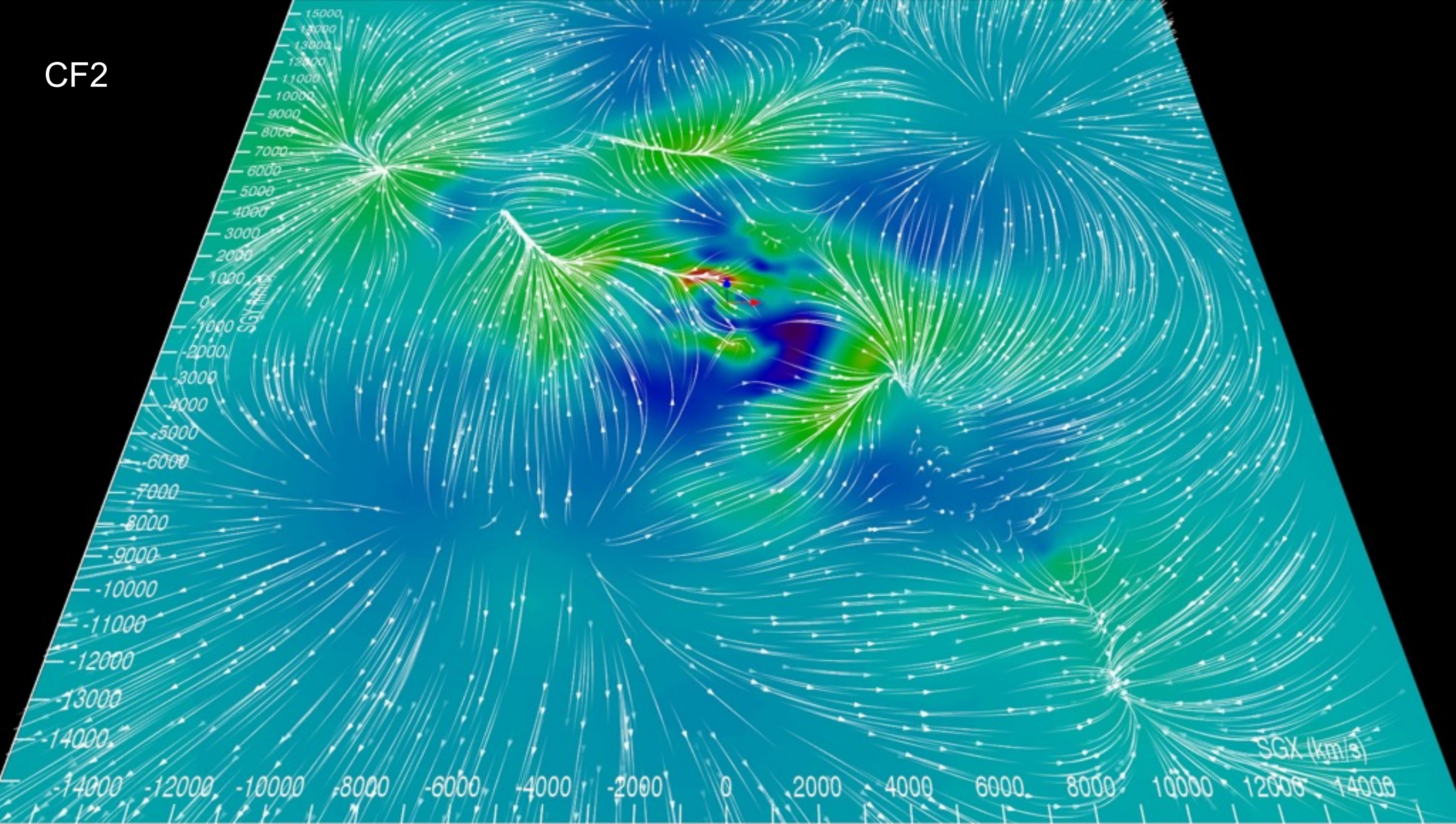
Voids

- Are these well defined observationally?
 - why do the algorithms produce such different results?
 - why aren't these simple objects to detect & measure
 - and better described by linear theory?
- Can we do useful dynamics with voids?
 - specifically re-do the Dekel & Rees test
 - this was one of strongest pieces of evidence for high β
 - was it wrong?

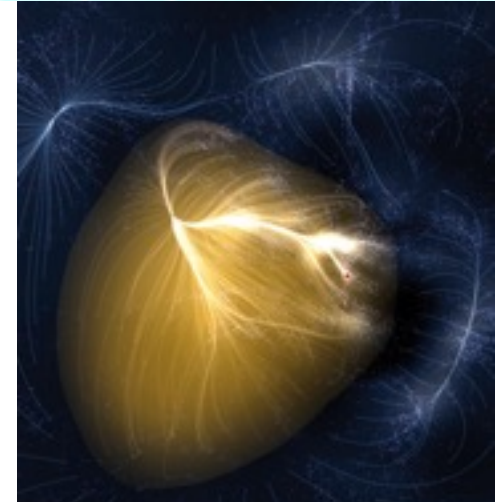
Cosmography

- Why?
 - Great PR for the subject
 - and a path to science (i.e. cosmological parameters)?
- Partitioning space into superclusters
 - are watershed borders sensible?
 - isn't there a frame independent method based on gravity?
- What's the best way to visualise the cosmic flow data?
- The V-web. Why? Nice pictures - what else?
 - compare to ab initio predictions for Lagrangian volume statistics?
 - dv/dr correlates with filaments direction - is this surprising? or useful?
 - is this testable by observation of galaxy properties?
 - is the bias just driven by density or does tidal field play a role?

CF2

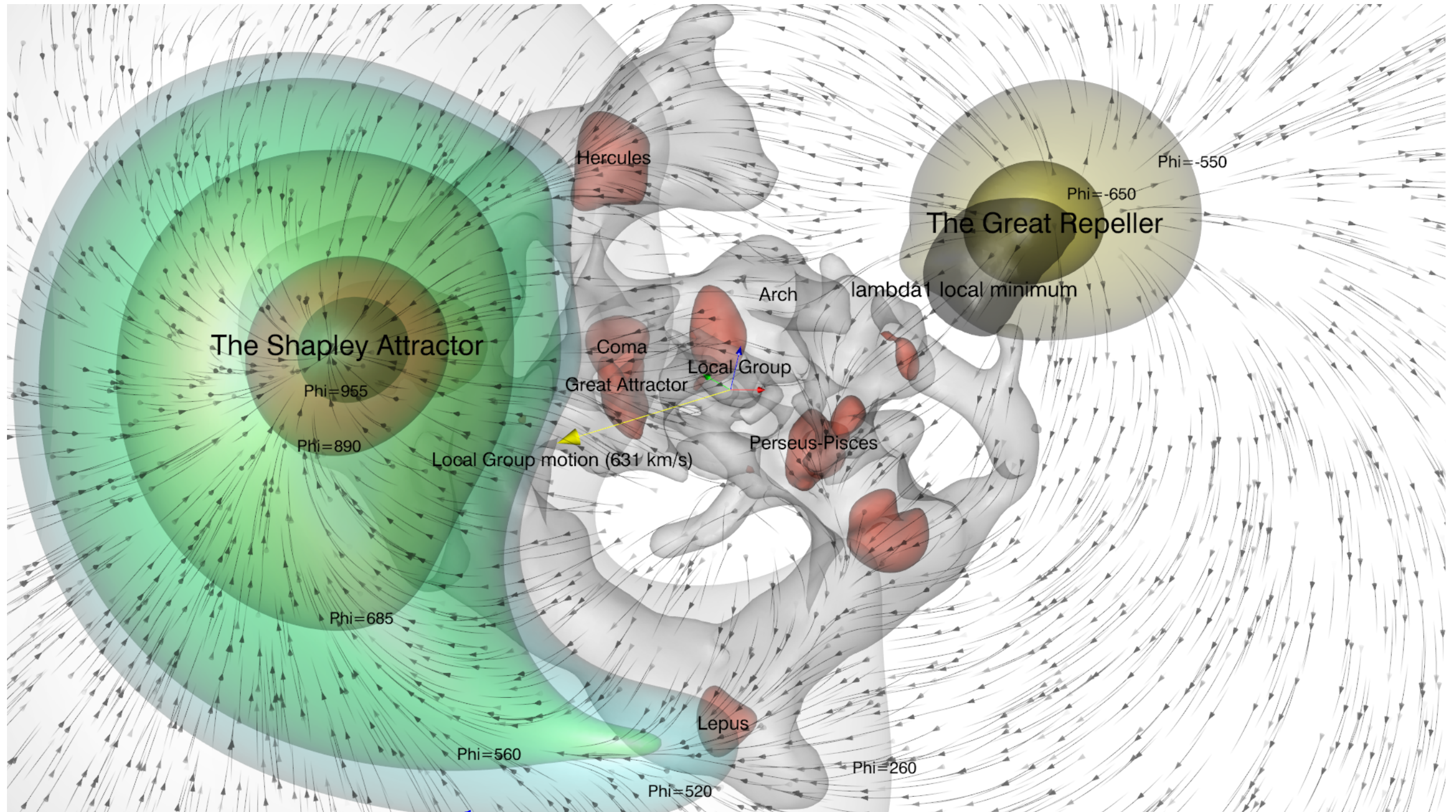


Laniakea



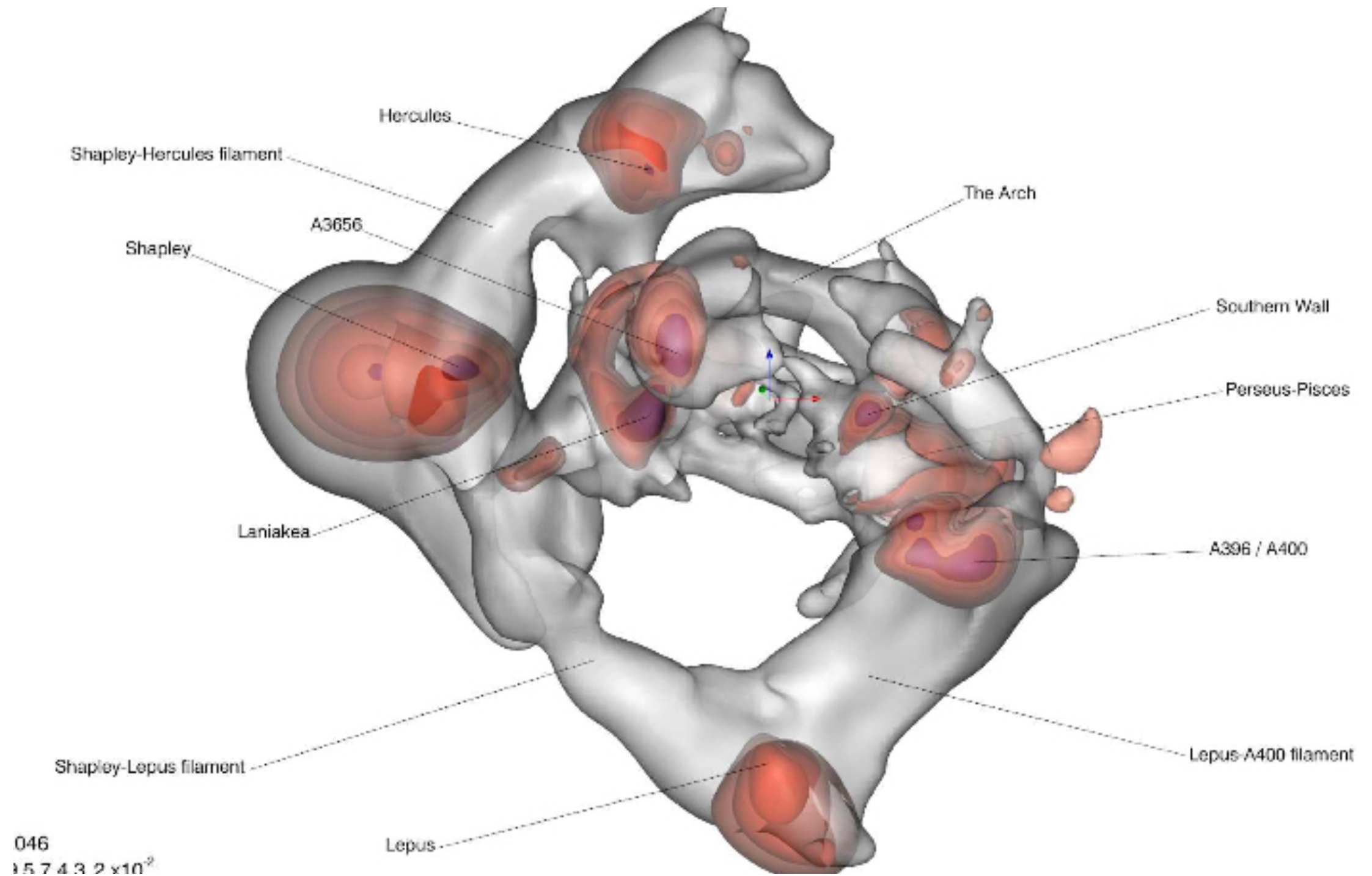
Shapley + GR

does it conserve momentum



Peculiar gravity doesn't suck

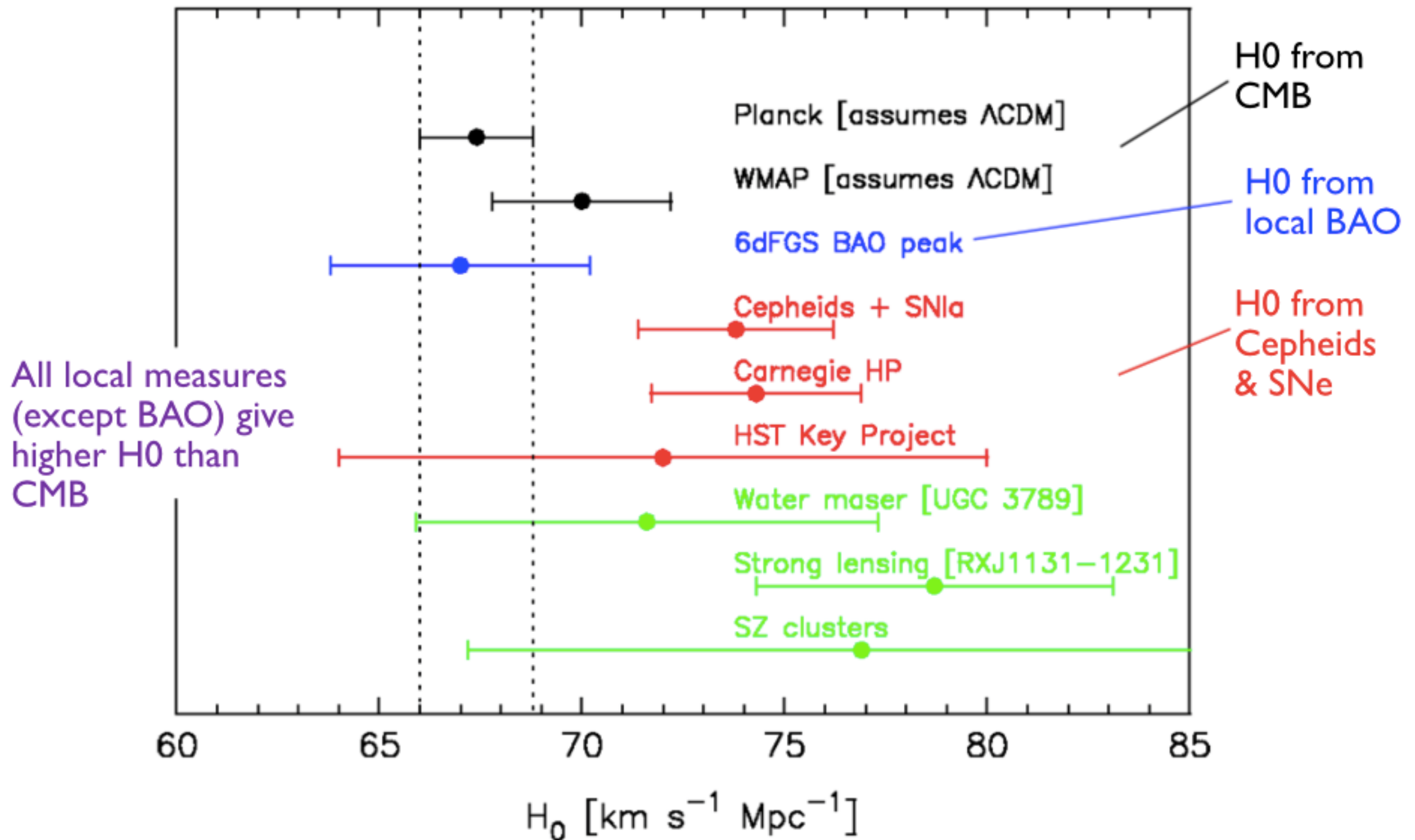
V-web



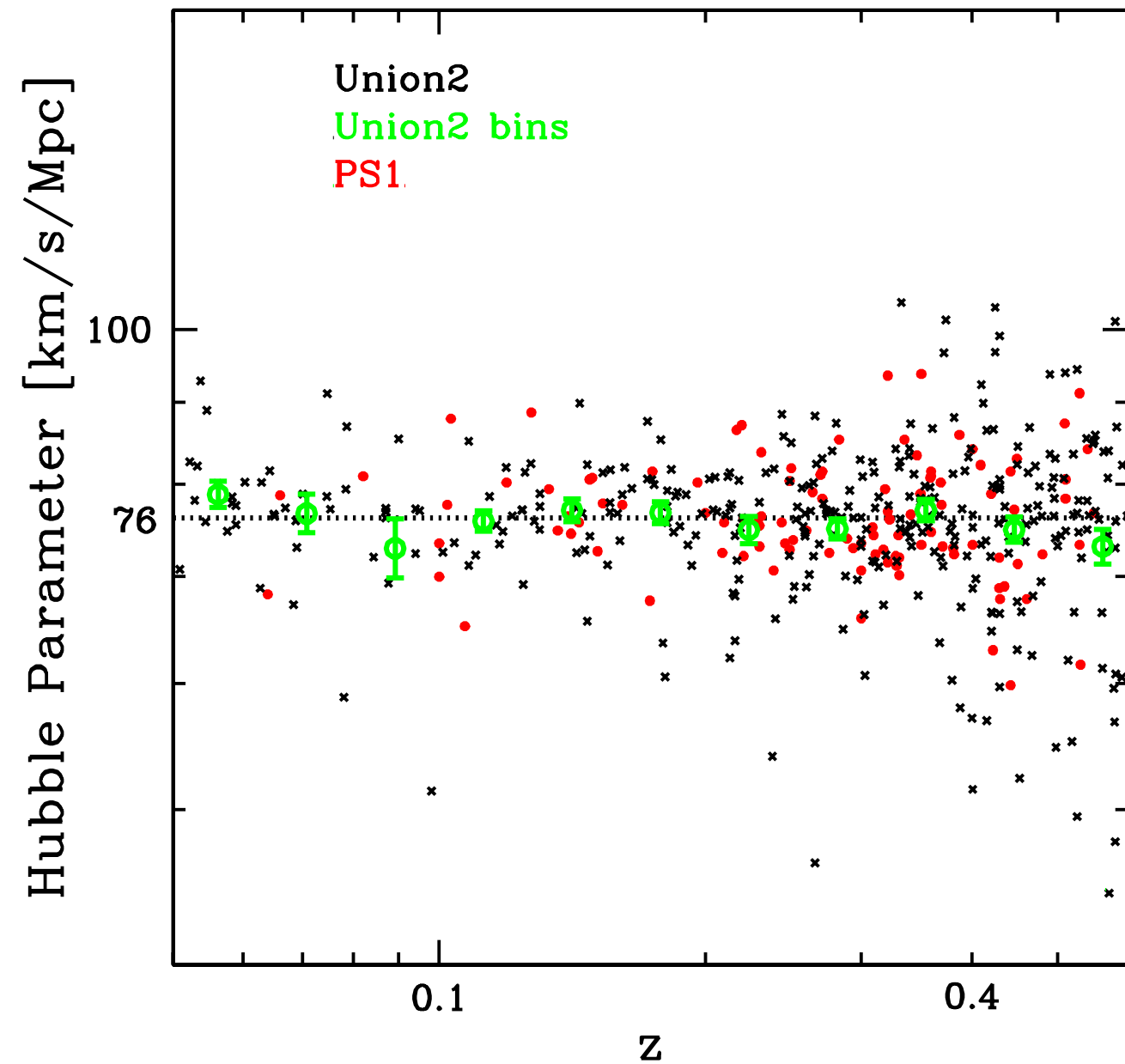
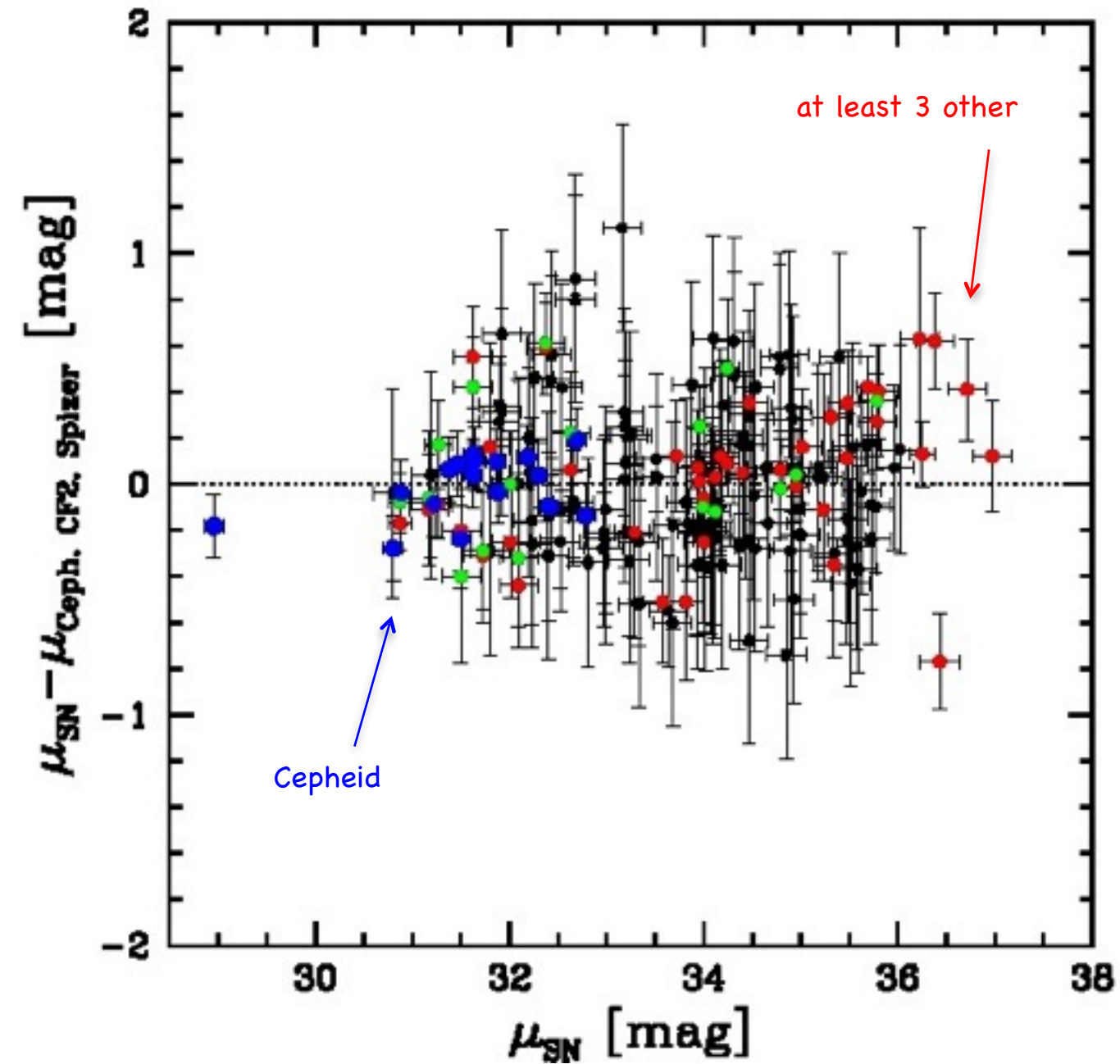
The H_0 "tension" - the 800lb gorilla?

- Is this just a cepheid calibration issue?
 - supported by low-z BAO measurements
 - how precise? Will next generation experiments nail this?
- How can peculiar velocity measurements help?
 - Expand overlap between cepheids & SN1a
 - how much does this help?
 - Independent ladder from galaxy to extra-gal (via TRGB)?
 - Proper treatment of flows in the SN1a data?
 - optimum weighting?
 - correction for flows in the SN1a data?
 - is there a "local void"?

The Hubble parameter "tension"



SN Ia zero point and H_0



Cepheids alone => 73

Riess+ 2011 => 2016
+ SN in groups

75.5

$H_0 = 76.2 \pm 3.4 \text{ rms} \pm 2.7 \text{ sys}$

Other scientific questions

- Mainstream: $v \Rightarrow \text{DM}$; v vs g ; BF; $P(k)$...
- Modified gravity
 - what theories are worth testing? MOND? $f(R)$?
 - what do velocity studies provide?
 - as compared to lensing, for instance?
- The "missing baryons" problem
- Constrained realisation simulations
 - what are the "fossil record" observations we can use?