



Testing spin parity in galaxies, groups and clusters

Galaxy winding and projected group / cluster motions across the sky

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1 Why study spin parity across scales?

Could nature prefer a handedness?



Clockwise (CW)

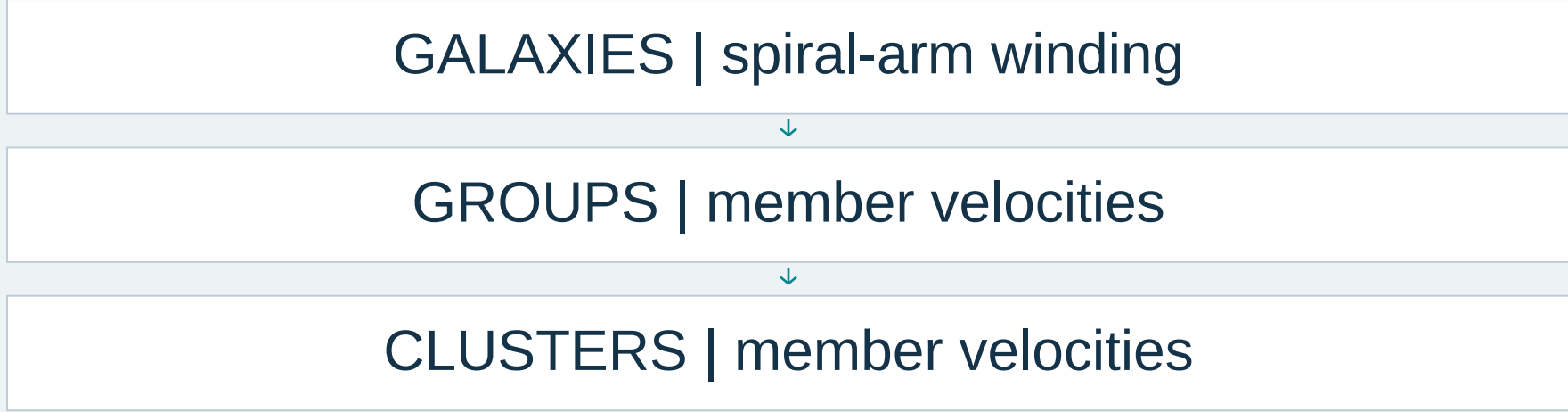


Anticlockwise (ACW)

Spin-parity violation is a cosmic handedness preference. Standard LambdaCDM predicts no preference; a confirmed signal would challenge it.

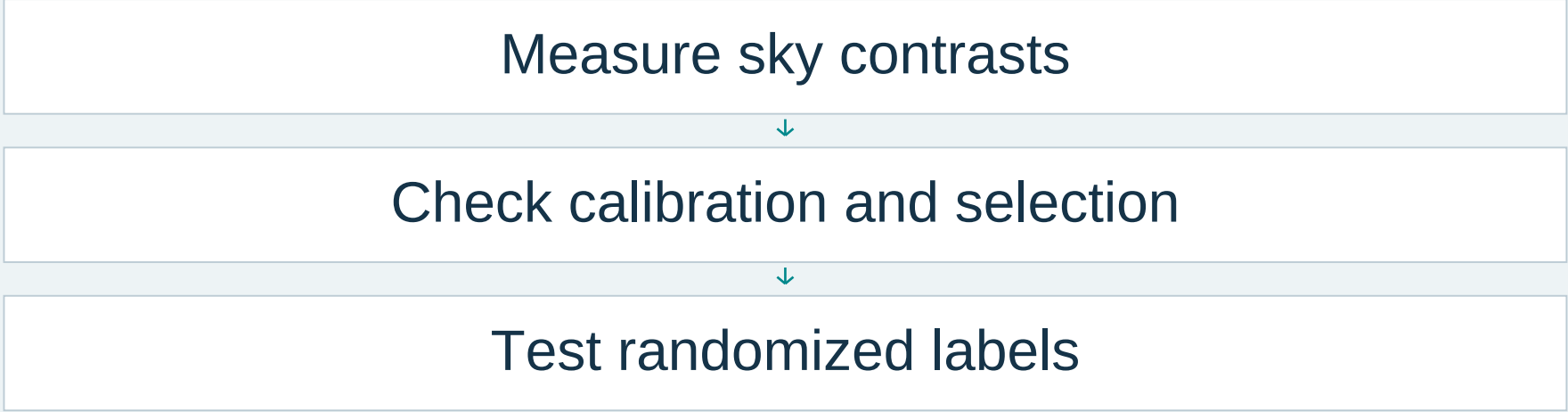
Schematic: outward arm winding, not rotation arrows.

Why compare different scales?



Compare complementary tracers: does a sky pattern persist beyond individual galaxies?

Could selection mimic a signal?

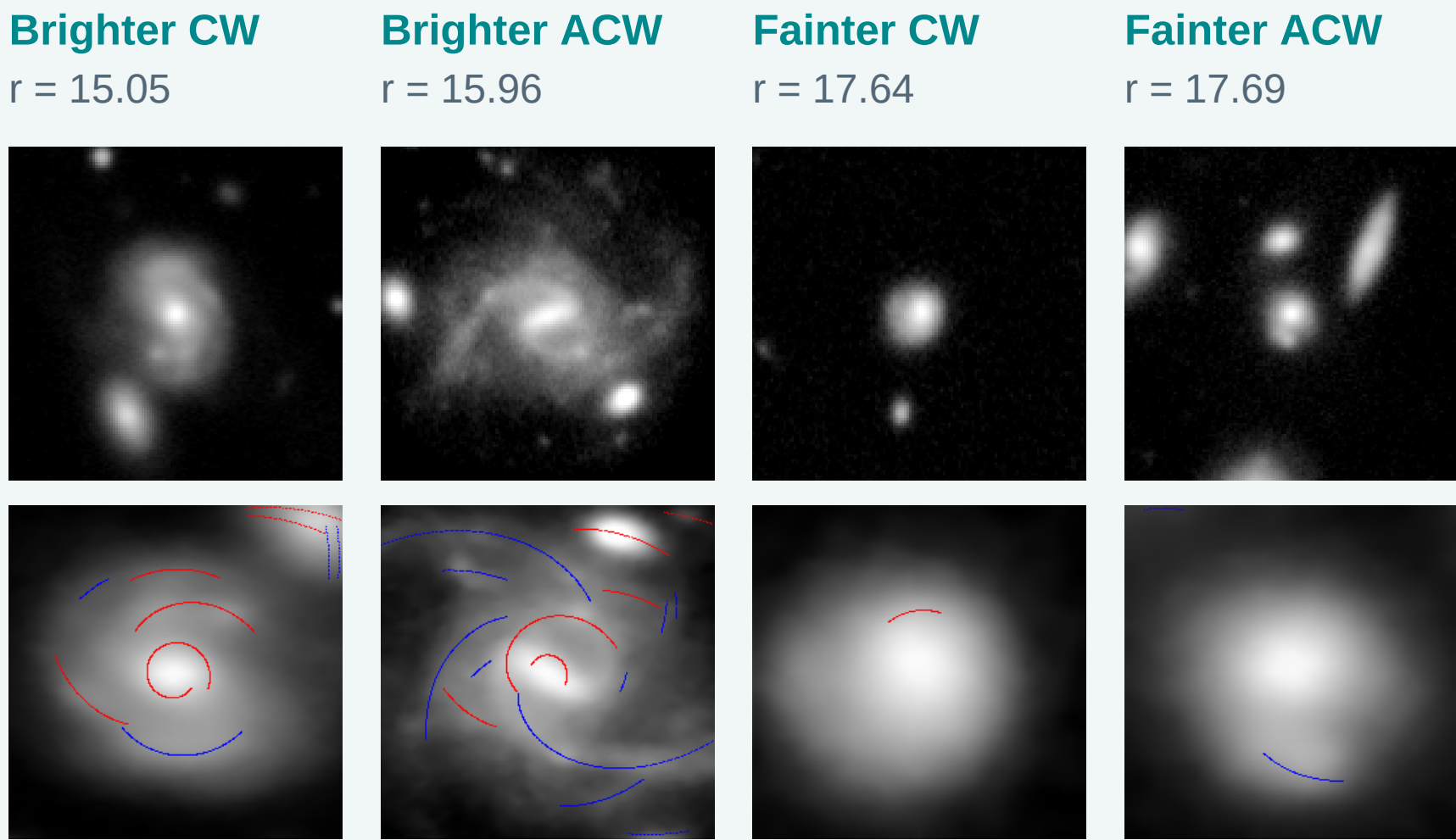


Winding and projected motions are proxies, not full 3D spin. A dipole alone is not proof of parity violation.

Context: Land et al. (2008); Hayes et al. (2017); Shamir (2021); Patel & Desmond (2024); Philcox (2022). Full references: QR link.

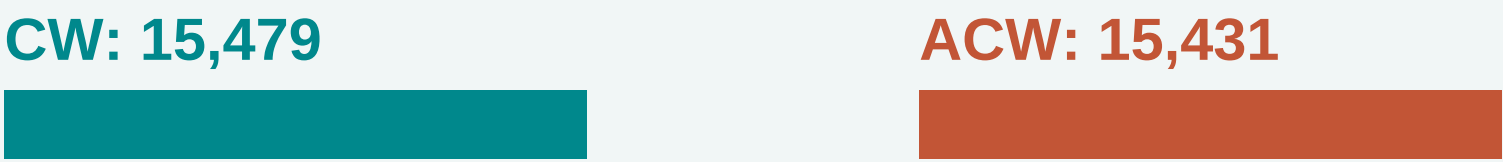
2 Galaxy winding: dipole as the main directional test

Our galaxies: images and fitted arms



Our input cutouts (top) and stored arm fits (bottom). Development examples, not validation. Brighter ACW chosen for visible structure. Curves are stored fits, not proof of spin. Smaller r = brighter.

30,910 resolved / 49,211 images



Observed imbalance +0.155%

$A = (CW - ACW) / \text{resolved}$; 18,301 unresolved

Selection: 46.7% of smallest vs 75.2% of largest resolve.

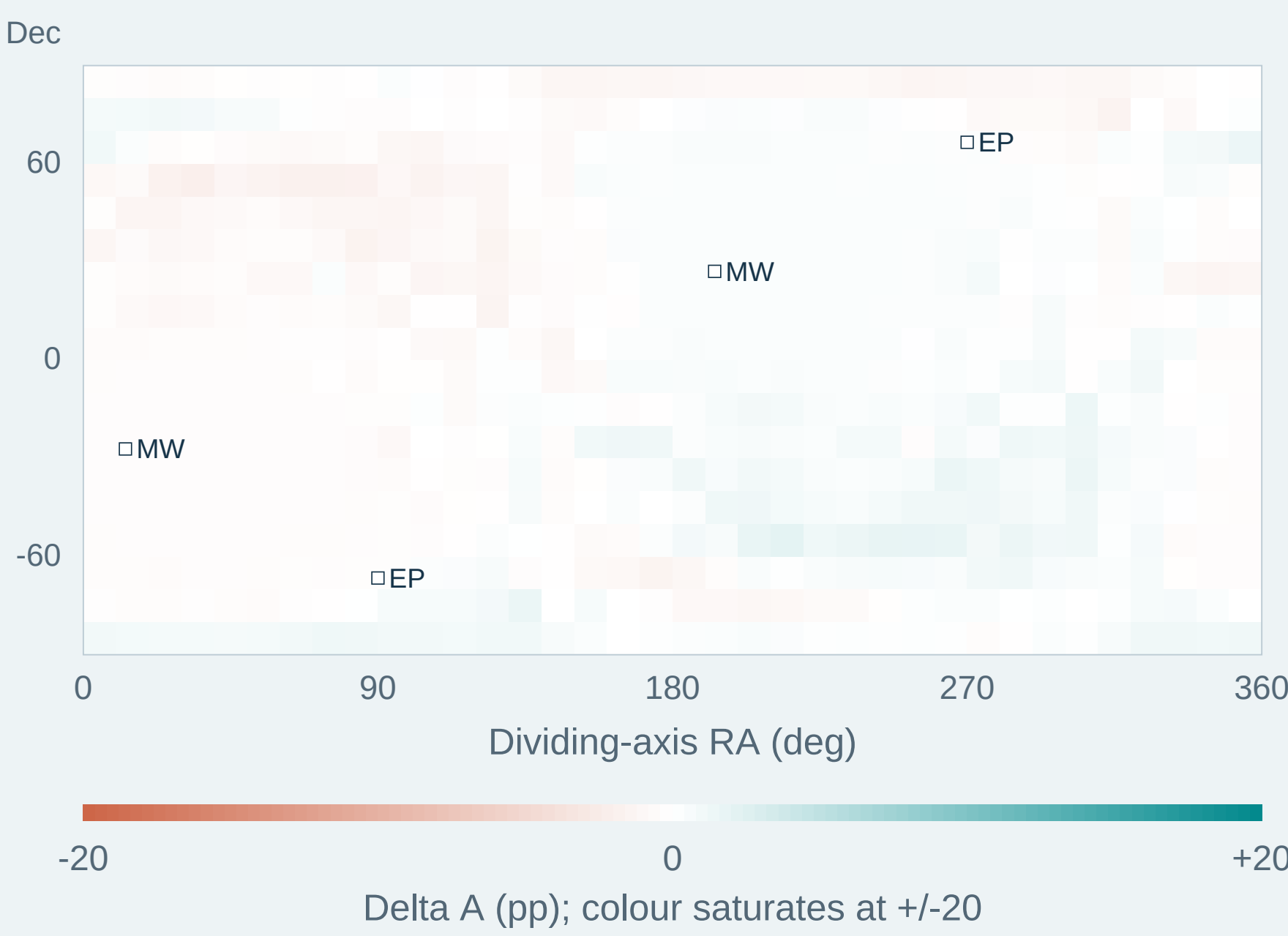
DESI: 7,905 positional matches; 4,920 also resolved.

DESI associations are provisional. Added dipole/quadrupole terms did not improve held-out prediction.

SpArcFiRe | 30,910 galaxies

Stored spiral-arm fits

Colour: imbalance toward the axis minus the opposite half.



CW 15,479 | ACW 15,431

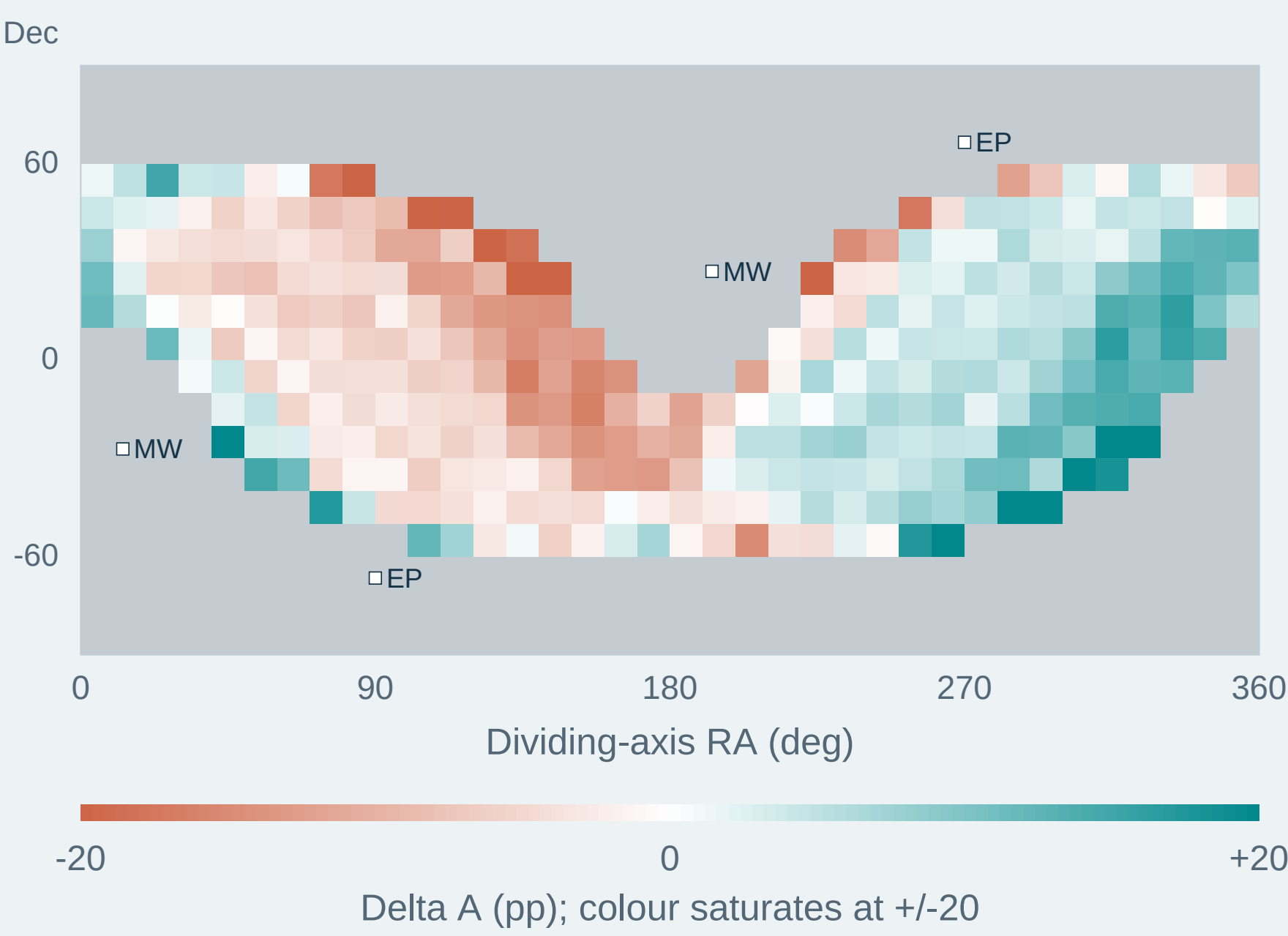
Map cells: -2.09 to +2.09 pp (not a confidence range)
Main directional fit: dipole 2.27% [0.00%, 7.79%], approx. 95%. Global shuffle p = 0.684.

The contrast map is not dipole amplitude. No preferred direction established.

Fourier | 1,657 galaxies

Stored image-pattern estimator

Colour: imbalance toward the axis minus the opposite half.



CW 812 | ACW 845

Map cells: -25.24 to +25.24 pp (not a confidence range)
Different, smaller DR9-north development cohort. This is not a matched-sample method comparison.

Sparse halves are noisy. Grey: fewer than 30 per half. No new significance test.

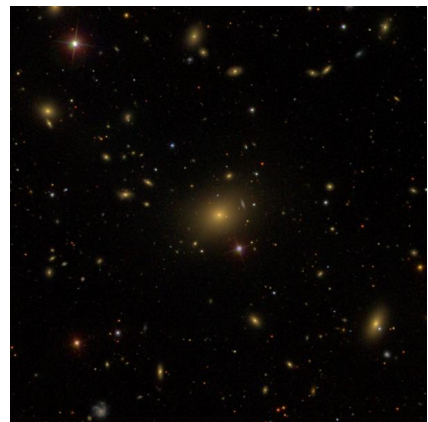
Two algorithms; different samples. CW/ACW use the same display orientation. Maps are observed contrasts, not detections. Shared GZ/CzSL calibration: -0.06% [-4.44%, +4.32%]. Sample-specific errors: [-19.07%, +11.10%]. Details: QR.

3 Groups and clusters: exploratory motion patterns



Our DESI group: real core image

One fixed group with 15 spectroscopic members. Legacy Surveys DR9, 10-arcmin core; not the full membership footprint.

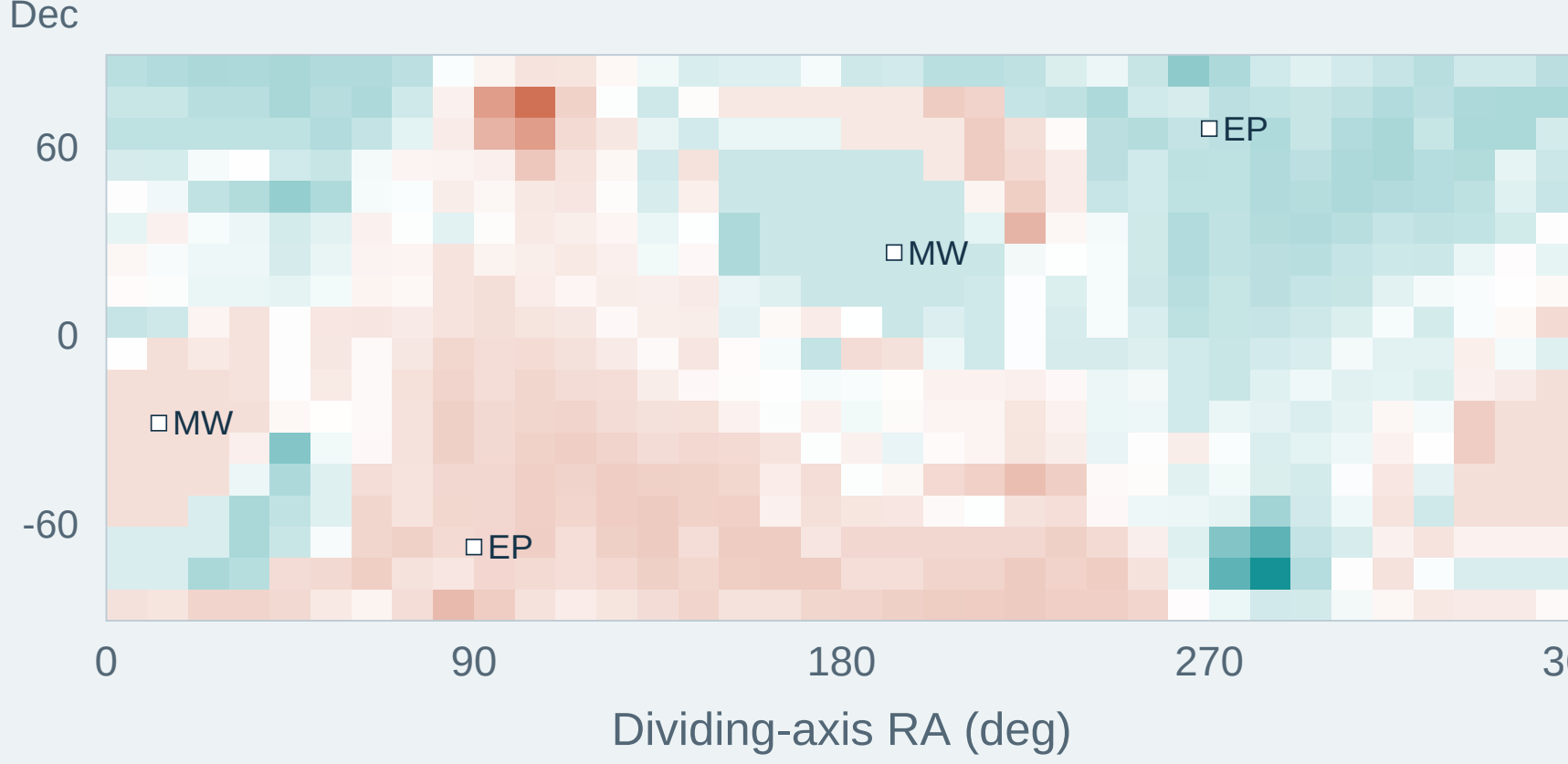


A2107: separate case study

SDSS, 10-arcmin field. These photographs illustrate our targets; neither demonstrates physical spin.

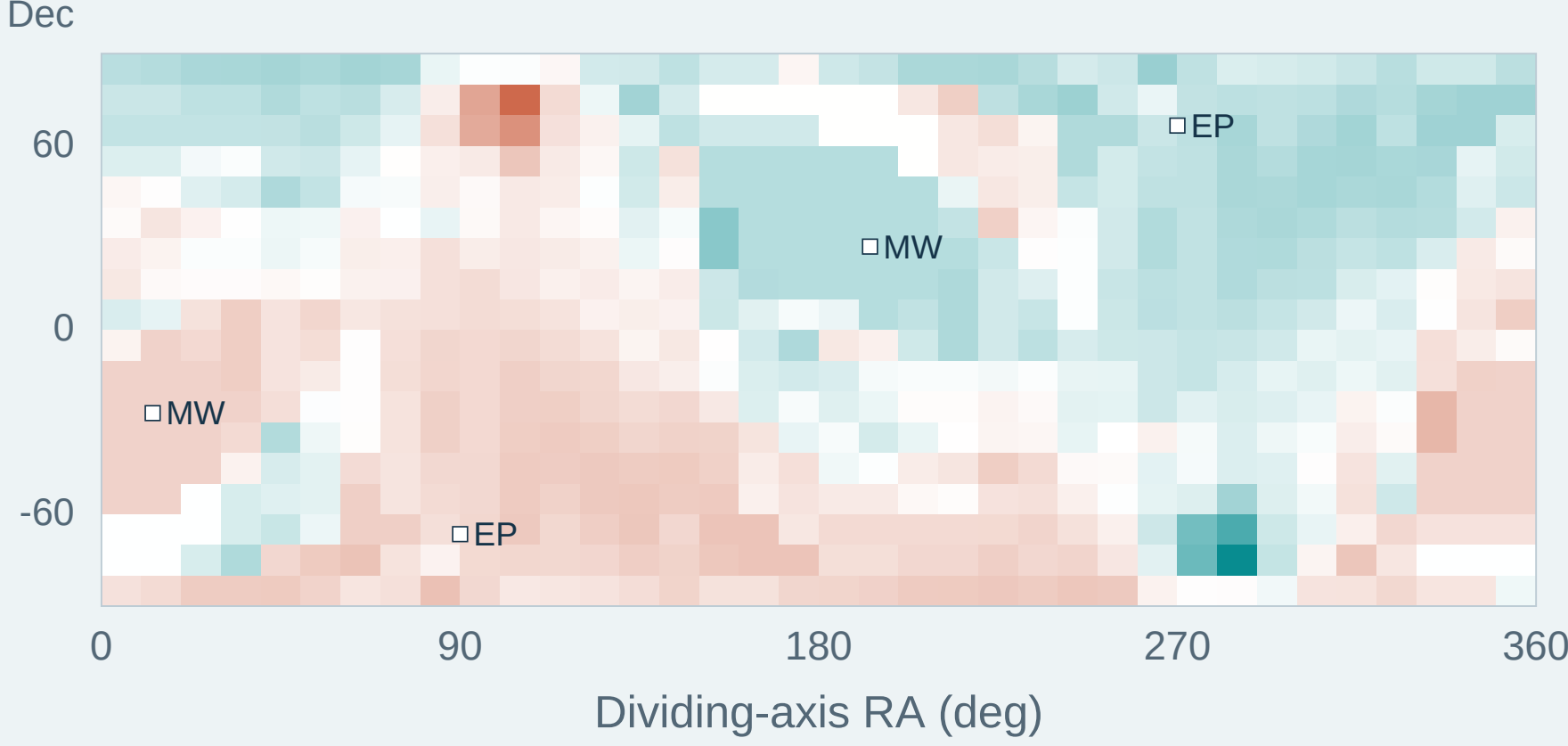
Same 90 systems: 80 groups + 10 clusters. Published-only systems remain in the online comparison.

1 Regression

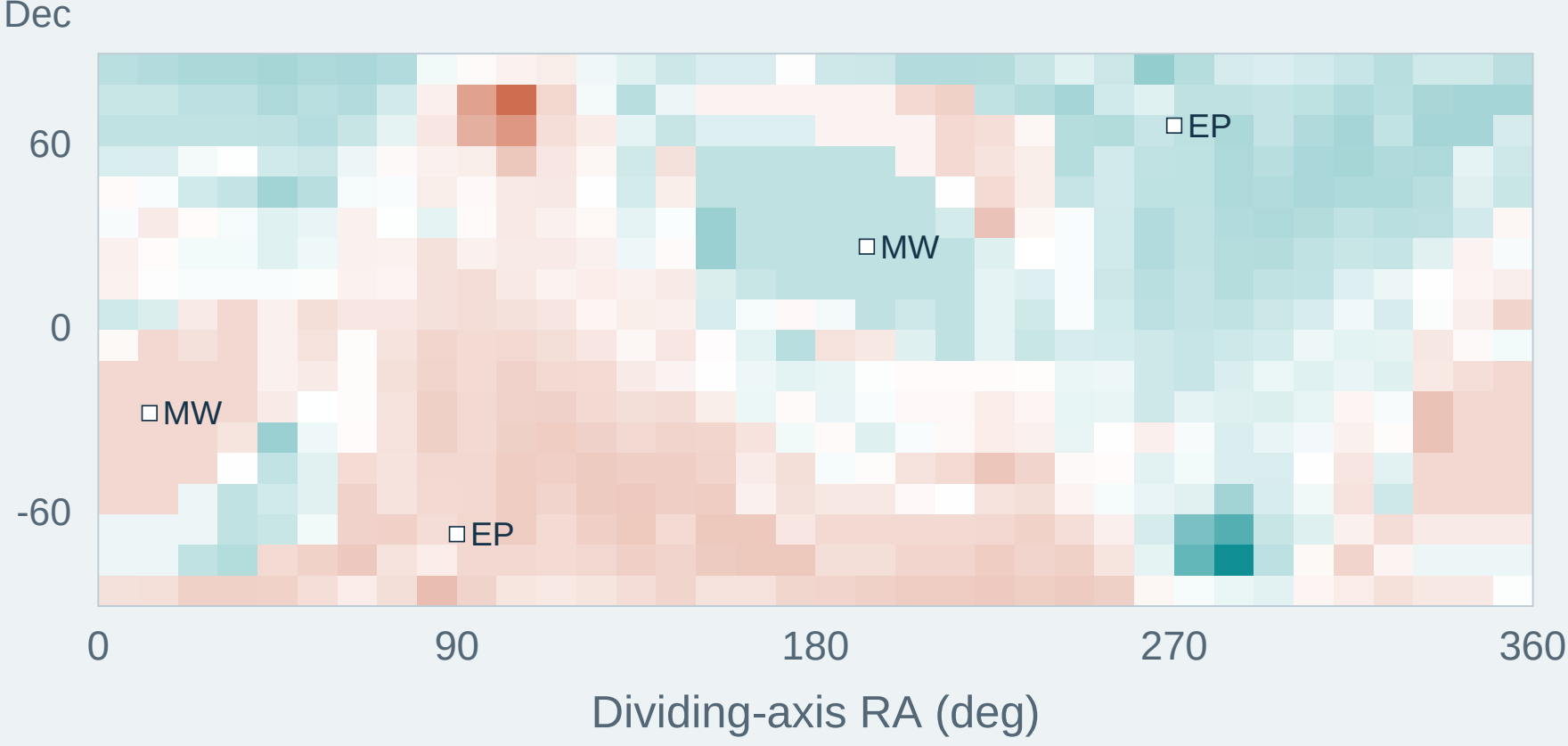


Colour = Delta H: $H(\text{toward}) - H(\text{opposite})$. Grey: fewer than 3 systems in a half. H is a dimensionless pair-handedness statistic, not speed or CW/ACW %. The average does not add independent evidence.

2 Half-plane



3 Average of methods



Average = (regression + half-plane) / 2.
EP / MW: ecliptic / Galactic reference poles.

Take away

Galaxies: no preferred sky direction established. Dipole 2.27% [0.00%, 7.79%]; global shuffle p = 0.684.

Calibration: -0.06% [-4.44%, +4.32%] assumes shared errors. Sample-specific errors widen the range.

Groups / clusters: compare methods on the same systems. Motion patterns are not confirmed physical spin.

No robust spin-parity detection. A confirmed cosmic asymmetry would challenge standard cosmology.



Research details
NebulaMind

Research details and references: nebulamind.net/studies/spin-parity-2026.html

Duho Kim | KAS 2026 Fall | v52, 9 Oct 2026 | Method maps are exploratory; no parity detection.