# The Hercules-Corona Borealis Great Wall: The Largest Structure in the Universe!

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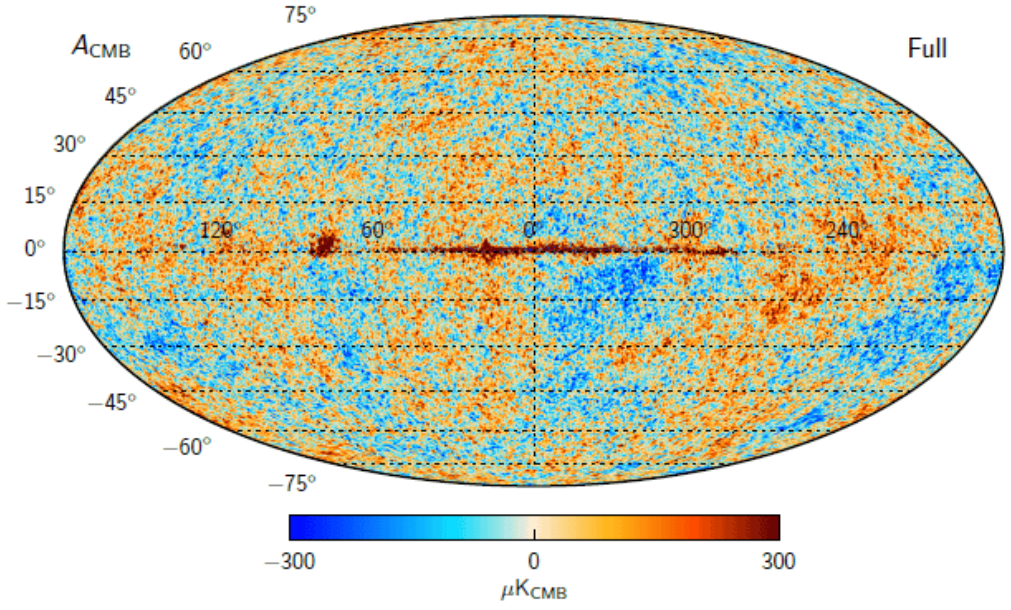
Monday 1 September 2025 at 11:00 A.M.

Universe **11**(4), 121 (2025)

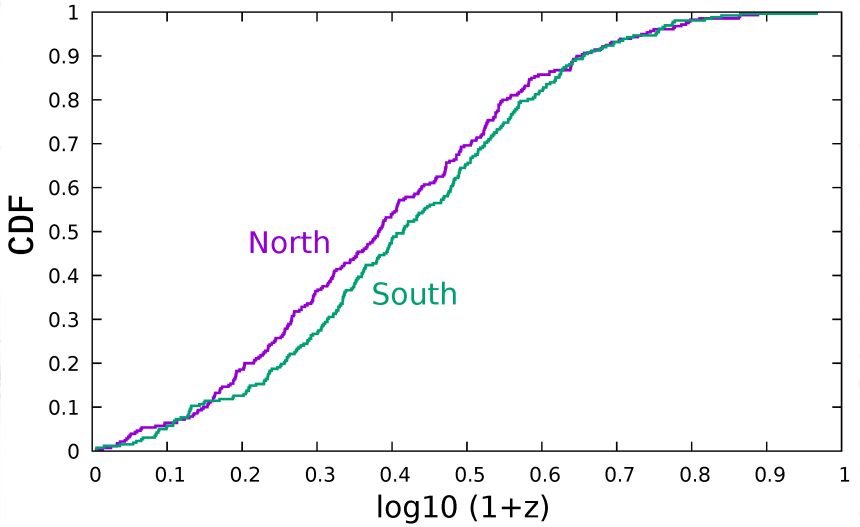
arXiv:2504.05354

Astrophysics (Cosmology and Nongalactic Astrophysics)


$A_{\mathrm{CMB}}$
Full
75°
60°
45°
30°
15°
0°
−15°
−30°
−45°
−60°
−75°
120°
60°
0°
300°
240°
−300
0
300
$\mu\mathrm{K}_{\mathrm{CMB}}$

- According to current models, nothing in the universe should exceed approximately 1.2 billion light-years in size.
- Large universal structures have been discovered, challenging the homogeneity and isotropy expected in mainstream cosmological models.
- In 2014, the Hercules-Corona Borealis Great Wall was discovered in the northern galactic hemisphere at redshifts ranging from 1.6 to 2.1.
- Reanalyzing data from 542 gamma-ray bursts revealed that it might reach an incredible 15 billion light-years, which is 50% greater than originally anticipated.
- Subsequent investigations employed a growing gamma-ray burst database to demonstrate that the cluster was unlikely to be generated by statistical sampling errors.
- However, the quantity and sizes of these walls defy mainstream cosmological models, unless their detection can be attributed to statistical fluctuations.
- As a result, it is critical to revisit and continue investigating claims of large-scale universal structures discovered through GRBs.

The Hercules-Corona Borealis Great Wall, it's hurtling closer to Earth at incredible speed, only 100,000 trillion kilometers distant.




Purple represents the 262 GRBs identified in the northern galactic sky, while green represents the 280 GRBs found in the southern galactic sky. The difference between the two cumulative distribution functions (CDFs) is negligible.

# Cosmic Filament



**Astrophysics > Astrophysics of Galaxies**

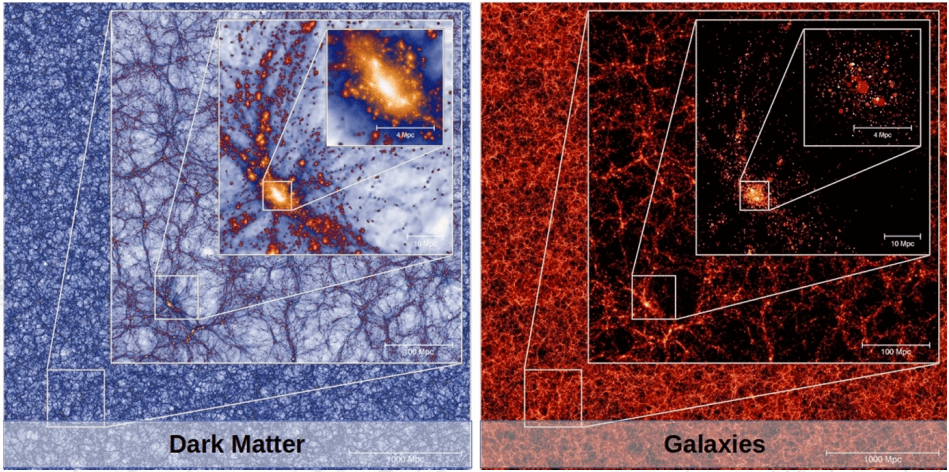
*[Submitted on 18 Aug 2025]*

## A 15 Mpc rotating galaxy filament at redshift z = 0.032

Madalina N. Tudorache, S. L. Jung, M. J. Jarvis, I. Heywood, A. A. Ponomareva, A. Varasteanu, N. Maddox, T. Yasin, M. Glowacki

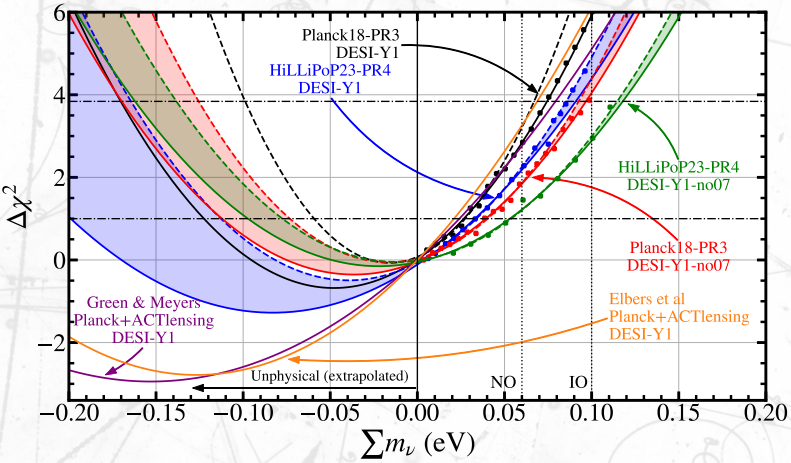
Understanding the cold atomic hydrogen gas (HI) within cosmic filaments has the potential to pin down the relationship between the low density gas in the cosmic web and how the galaxies that lie within it grow using this material. We report the discovery of a cosmic filament using 14 HI-selected galaxies that form a very thin elongated structure of 1.7 Mpc. These galaxies are embedded within a much larger cosmic web filament, traced by optical galaxies, that spans at least $\sim 15$~Mpc. We find that the spin axes of the HI galaxies are significantly more strongly aligned with the cosmic web filament ($\langle|\cos\psi|\rangle = 0.64 \pm 0.05$) than cosmological simulations predict, with the optically-selected galaxies showing alignment to a lesser degree ($\langle|\cos\psi|\rangle = 0.55 \pm 0.05$). This structure demonstrates that within the cosmic filament, the angular momentum of galaxies is closely connected to the large-scale filamentary structure. We also find strong evidence that the galaxies are orbiting around the spine of the filament, making this one of the largest rotating structures discovered thus far, and from which we can infer that there is transfer of angular momentum from the filament to the individual galaxies. The abundance of HI galaxies along the filament and the low dynamical temperature of the galaxies within the filament indicates that this filament is at an early evolutionary stage where the imprint of cosmic matter flow on galaxies has been preserved over cosmic time.

# Dark Matter Simulations



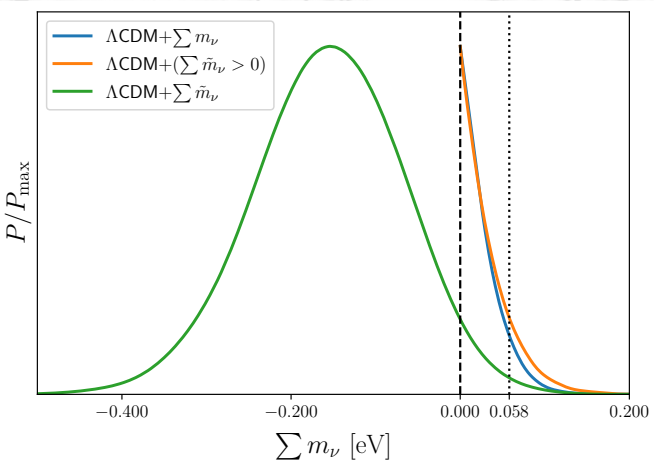

*Large-scale dark matter simulations*, Raul E. Angulo & Oliver Hahn, *Living Rev. Comput. Astrophys.*, **8**, 1 (2022)

# Neutrino Mass Simulations




*Critical look at the cosmological neutrino mass bound, Daniel Naredo-Tuero et al., Phys. Rev. D* **110**, *123537 (2024)*

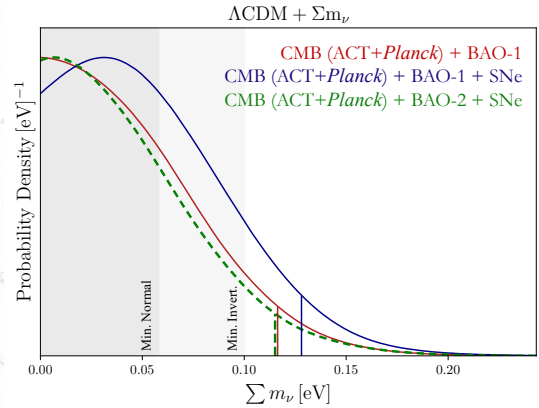
# Neutrino Mass Simulations

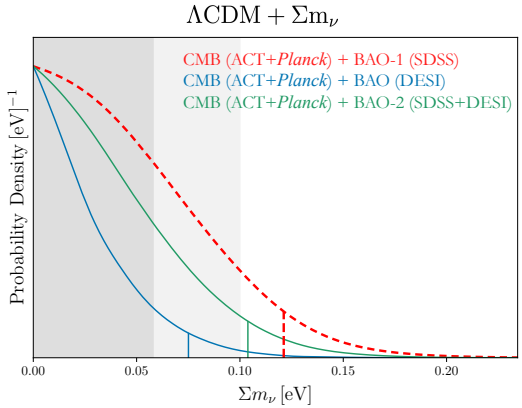





*No $\nu$s is Good News*, N. Craig, D. Green, J. Meyers, et al., *J. High Energ. Phys.* **2024**, *97 (2024)*

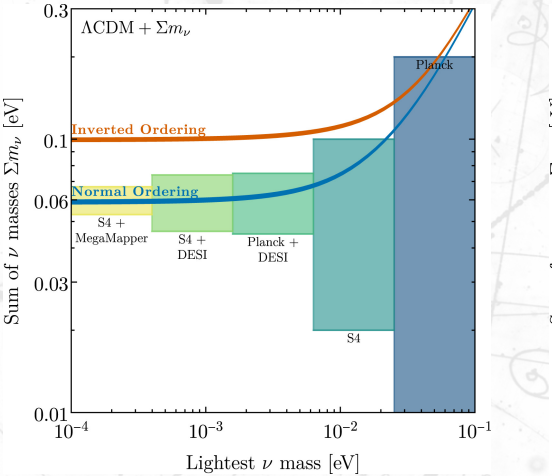
# Neutrino Mass Simulations

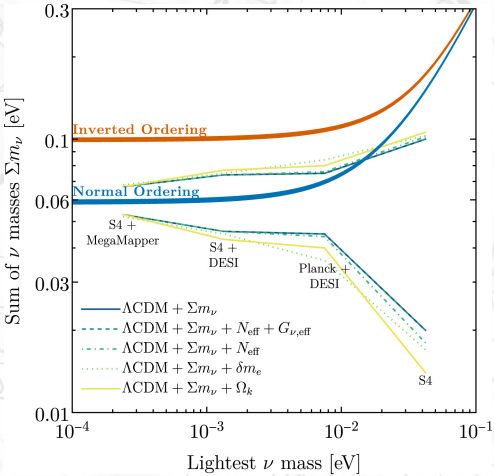



*Cosmological limits on the neutrino mass sum for beyond-ΛCDM models, Helen Shao, et al., Phys. Rev. D* **111**, *083535 (2025)*

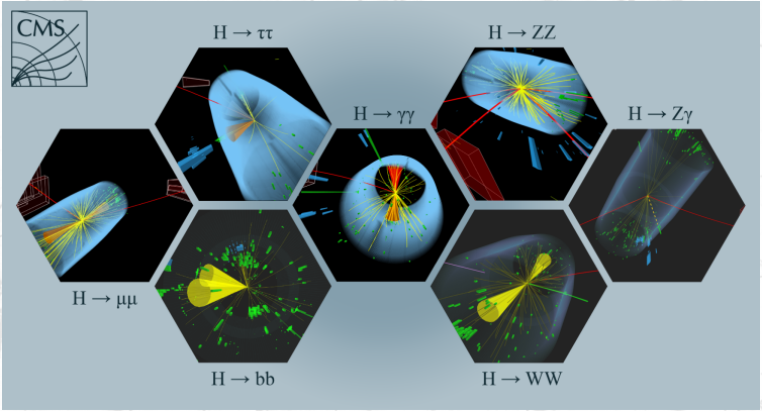
# Neutrino Mass Simulations



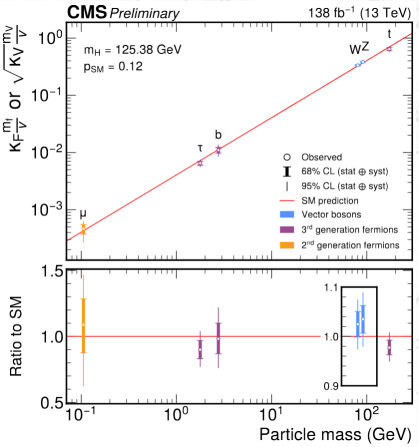

*Neutrino masses from large-scale structures: Future sensitivity and theory dependence, Davide Racco, et al.*, *Physics of the Dark Universe* **47**, *101803 (2025)*

# News



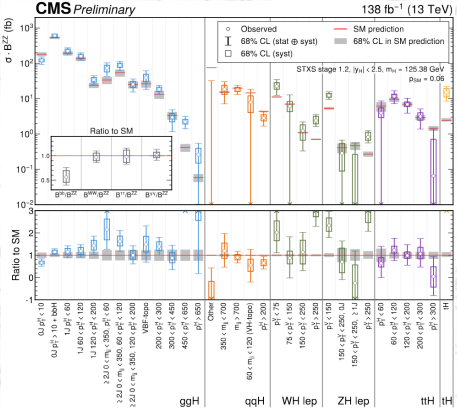

In a much-anticipated finding, the CMS experiment provides the legacy combination of Higgs boson investigations using the whole LHC Run 2 data, collected between 2016 and 2018, resulting in CMS's most precise and comprehensive measurement of the Higgs boson to date.

# News




The measured coupling modifiers of the Higgs boson to various particles. The bottom panel shows the measurement-to-SM prediction ratio, which demonstrates good agreement and extremely high precision.

# News




The production rates (cross-section) for the 32 STXS categories of the Higgs boson are examined. Various production modes and kinematic regions are investigated, with SM predictions (in red) ranging over four orders of magnitude. The bottom panel shows the ratio of measurements to SM predictions.