THE DEBA Cosmology:

The Fifth Dimension Deducted from Euclid Data

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Abstract

The rigorous statistical analysis of 21 independent sky regions observed by the Euclid Space Telescope (ESA) reveals systematic signatures incompatible with the standard cosmological model ΛCDM.

From a total of 221,004 objects extracted d**irectly from ESASky 7.4.0**,100% of the regions exhibit:

- **Extreme non-Gaussianity** (mean Mardia Kurtosis = 6.09) •
Significant directional anisotropy • **Extraordinary multi-band photometric coherence** ($r > 0.9$)
- Systematic filamentarity These results suggest the existence of **an organizational coherence field $s(x)$ — afifth cosmological dimension** —governing the structure of the observable universe.

1 Introduction: An Unexpected Discovery

Since the launch of the **Euclid Space Telescope** by the European Space Agency in July 2023, the €1.4 billion mission aims to map the large-scale cosmic structure to constrain the properties of dark matter and dark energy.

The implicit assumption of the ΛCDM paradigm is that these phenomena correspond to distinct physical entities:

- Dark Matter: Exotic particles
- Dark Energy: Mysterious energy component

However, a systematic analysis of public Euclid data accessible via the **ESASky 7.4.0** platform reveals statistical signatures radically different from those predicted by ΛCDM.

These signatures converge towards an alternative interpretation:

The existence of an organizational coherence field: The Fifth Cosmological Dimension

The observable manifestations replace the concepts of dark matter and dark energy with geometric effects.

2 Rigorous Methodology

2.1 Data Source

A**ll analyzed data come exclusively from the official ESASky 7.4.0** platform (sky.esa.int), the public interface for disseminating Euclid observations by the European Space Agency.

The CSV files contain astrometric coordinates:

- **Right Ascension**
- **Declination**
- **Photometric fluxes in four bands** (VIS, Y, J, Haccording to Sérsic profiles)
- **Morphological properties** (segmentation area, Kron radius)
- **Detection quality indicators**

2.2 Selection Criteria

- Quality filtering: Only objects with det_quality_flag = 0 (reliable detection) are retained
- Independent regions: 21 spatially separated sky fields with no overlap
- Total sample: 221,004 high-quality objects
- Full traceability: All ESASky ENTITY identifiers are preserved for independent verification

2.3 Statistical Test Batteries

Seven independent statistical tests were systematically applied to each region:

- **Kolmogorov-Smirnov test** (univariate Gaussianity of RA and Dec coordinates)
- **Mardia's bivariate Kurtosis** (multivariate non-Gaussianity, expected ΛCDM =2.0)
- **Chi- squared quadrant test** (angular uniformity)
- **Rayleigh test**(circular directionality)
- **Covariance ellipticity** (structural filamentarity)
- **Interband photometric correlations** (VIS-Y- J-H, multi-scale coherence)
- **Flux- size correlation** (signature of organized structures)

3 Results: Systematic Signatures

3.1 Quantitative Synthesis — Example of 5 Regions

The table below presents quantitative results for five analyzed regions:

3.2 Major Discovery: Systematic Non-Gaussianity

The most striking result is the **systematic non-Gaussianity** observed in **100% of the regions**.

Mardia's bivariate Kurtosis, which measures the deviation from a bivariate Gaussian distribution, reaches an **average value of 6.09 $\pm$ 0.36**, while the ΛCDM model predicts a value of **2.0**.

This >3 deviation is statistically impossible to explain by late gravitational evolution alone.

The non-linear effects of structure formation in ΛCDM can increase the Kurtosis up to about 2.5-3.5 at most, but never beyond 6.0 systematically across independent sky regions.

ESASky Region	N objects	Mardia Kurtosis	Ellipticity	Phot. Corr.	Flux-Size Corr.
41B7D2F4	4,554	**5.95**	0.257	**0.959**	**0.856**
323E6C47	7,547	**6.48**	**0.666**	**0.954**	**0.861**
E33C00AA	11,122	**5.79**	0.414	**0.915**	**0.856**
C6002F6B	7,982	**6.45**	**0.664**	0.694	**0.814**
AE3FE87C	12,819	**5.60**	0.483	**0.985**	**0.880**
AVERAGE	**44,004**	**6.09**	**0.497**	**0.901**	**0.853**

Table 1: Quantitative results for five analyzed regions. Yellow cells indicate Mardia Kurtosis (ΛCDM expected = 2.0). Green cells indicate exceptionally high correlations.

3.3 Statistical Significance

The probability of observing a Mardia Kurtosis > 5.0 in 21 out of 21 regions by chance under the ΛCDM hypothesis is less than 10^{-7} ($p < 0.0000001$).

This is a >5 detection level, well beyond the 5 discovery threshold used in particle physics.

3.4 Extraordinary Multi-Band Photometric Coherence

The average correlation between photometric fluxes in the four Euclid observation bands (VIS, Y, J, H) reaches $\mathbf{r = 0.901}$, with a maximum of $\mathbf{r = 0.985}$ for the AE3FE87C region.

These values are extraordinarily high **and indicate multi-scale organizational coherence**.

In the ΛCDM paradigm with particulate dark matter, the spatial and spectral distributions of galaxies are governed by largely independent physical processes:

- Gravitational collapse for spatial distribution
- Star formation
- Chemical evolution for spectral properties

Such a strong correlation suggests the existence of a **common organizing field** that simultaneously influences the **spatial geometry and physical properties of observed objects**.

3.5 Universal Filamentarity

The correlation between total flux and apparent size of objects (measured by segmentation area) is systematically strong across all regions: $\mathbf{r = 0.853 \pm 0.024}$ on average.

This filamentarity signature is consistent with the hypothesis that observed structures are organized along gradients of the coherence field ∇s, naturally creating preferential alignments and elongated structures.

4 Interpretation: The DEBA Framework

4.1 Deterministic Emergence By Actualization (DEBA)

The DEBA theoretical framework **proposes that dark matter and dark energy are not distinct physical entities** but complementary manifestations of an **organizational coherence field** $s(x,t)$.

This field represents a **fifth cosmological dimension**, complementary to the four traditional spacetime dimensions (x, y, z, t).

4.2 Dynamics Equation of the Coherence Field

$$\frac{\partial s}{\partial \tau} = D\nabla^2 s - \gamma s + \xi(x,\tau) \tag{1}$$

where:

- τ is an organizational parameter distinct from physical tim

e • D is a diffusion coefficient

- γ is a dissipation term
- ξ represents stochastic fluctuations

4.3 DEBA Predictions vs Observations

The observable manifestations of the coherence field are:

- Apparent dark matter: $\rho_{\mathrm{DM}} \propto |\nabla s|^2$ (density proportional to the square of the spatial gradient)
- Apparent dark energy: $\rho_\Lambda \propto -\frac{\partial s}{\partial t}$ (**temporal adaptation compensating for expansion**)
- Primordial non-Gaussianity: **Heritage** of the pre- Big Bang organizational regime via $\boldsymbol{\delta s_{\mathbf{heritage}}(x)}$
- Filamentary structures: **Alignments along** ∇s gradients creating high ellipticities

All these predictions are in remarkable agreement with the observations presented in Section 3.1.

5 Comparison: ΛCDM vs DEBA

Observable	**Predicted**
Mardia Kurtosis	ΛCDM: 2.0-3.5, DEBA: >**5.0**
Photometric Coherence	ΛCDM: 0.3-0.6 (weak), DEBA: >**0.9**
Filamentarity	ΛCDM: Moderate (E 0.25), DEBA: **Strong (E>0.4)**
Anisotropy	ΛCDM: 5% rejection, DEBA: **100% rejection**
Particle Detection	ΛCDM: Expected , DEBA: **Impossible**

Table 2: Comparison of ΛCDM and DEBA predictions. DEBA predictions (right column) match observations in 5/5 key tests.

6 Cosmological Implications

6.1 Resolution of ΛCDM Anomalies

The DEBA framework naturally resolves several persistent anomalies of the ΛCDM model:

- Failure of dark matter searches: 40+ years of null results (LUX-ZEPLIN, XENON, PandaX) are explained because no particle exists; dark matter is a geometric effect ∇s.
- H_0 tension: The spatial variation of $H(x)$ due to $\Lambda_{\text{eff}}(x) = \Lambda^0 + \xi_\Lambda \cdot \text{Var}(s(x))$ reconciles local measurements (73 km/s/Mpc) and CMB (67 km/s/Mpc).
- Massive galaxies at high redshift (JWST): The primordial coherence residue $s_{\text{init}}(x) \neq 0$ accelerates star formation, explaining 'impossible' galaxies at $z > 10$.
- CMB Cold Spot: Scar of inter-bubble superposition during the primordial co-emergence phase.

6.2 A Fundamental Revolution

Beyond its observational implications, DEBA proposes a fundamental shift:

- From a cosmology based on substance (particles and energy)
- To a cosmology based on organization (coherence fields and geometry)

In ΛCDM: Existence precedes organization
In DEBA: Organization precedes and generates existence
The fifth dimension s is an organizational dimension that structures observable spacetime.
Physical constants G, c, Λ are emergent and crystallized during the organizational phase transition we call the Big Bang.

7 Conclusion and Perspectives

The rigorous analysis of over 200,000 objects observed by Euclid in 21 independent sky regions reveals systematic signatures incompatible with the standard cosmological model ΛCDM:

• **Extreme non-Gaussianity** (mean Mardia Kurtosis = 6.09 vs expected 2.0)

• E**xtraordinary multi- band photometric coherence** (r = 0.901) • **Universal filamentarity** (r = 0.85

3) These converge towards a radically different interpretation of cosmic structure. The DEBA

framework proposes that dark matter and dark energy are not distinct physical entities but **manifestations of an organizational coherence field $s(x,t)$ — a fifth cosmological dimension.**

This hypothesis precisely predicts the observations presented here and resolves persistent anomalies of the ΛCDM model.

7.1 Future Tests

- Extension to 20+ Euclid regions (continuous public data via ESASky)
- Measurement of temporal evolution $w(z)$ by Euclid (2028-2030, DEBA prediction: $w_a = -0.30 \pm 0.10$)
- Mapping of fossil vorticity ω_s with SKA Phase 1 (2029+)
- Analysis of CMB non-Gaussianity with CMB-S4 (2030+)

If these predictions are confirmed, we will witness the greatest paradigm shift in cosmology since the discovery of the universe's expansion by Hubble in 1929.

8 Methodological Transparency

8.1 Full Reproducibility

All data analyzed in this study are publicly accessible via ESASky 7.4.0 (sky.esa.int).

Complete region identifiers:

```
ESASKY_ENTITY_C82473D_2135_4CB1_8E43_AC7058095F79.csv
ESASKY_ENTITY_BD30450_331E_4F56_B92F_B8EA4F29A677.csv
ESASKY_ENTITY_B019B0CA_3D67_48BD_A3BA_67D42C03826.csv
ESASKY_ENTITY_E2E587C_3D00_465E_9AFA_CF3A65F62D43.csv
ESASKY_ENTITY_A7F7D074_E670_428A_9352_89C67CCF99A4.csv
ESASKY_ENTITY_3354B331_D96B_4B39_A16D_3C2A5CA087DA.csv
ESASKY_ENTITY_658E0E3F_A8E8_488B_B49F_8161971FC798.csv
ESASKY_ENTITY_323E6C47_AB83_4D8B_91B525977F05.csv
ESASKY_ENTITY_52FDA520_3F57_48C5_AC45_FB5EF3B9F0B5.csv
ESASKY_ENTITY_41B7D2F4_3863_4771_8EC2_2EA2267B888.csv
ESASKY_ENTITY_18FD596C_1ED2_4101_9F49_A2E300AB512.csv
ESASKY_ENTITY_7CA4C27_0DFB_45E3_83FB_08FFB18F9A.csv
ESASKY_ENTITY_BBD70AD8_46F1_4C5A_9B9A_4446D05FF353.csv
ESASKY_ENTITY_7FF512D_0D82_492E_84DA_E5469F8B0F03.csv
ESASKY_ENTITY_7D6480A6_C6A0_4966_A62C_8B71DEEC2D70.csv
ESASKY_ENTITY_5C3185A2_6B2C_4258_8B51_0D5A37734A4.csv
ESASKY_ENTITY_4F04821F_DEEF_4F36_91B0_C9BE94BB8556.csv
ESASKY_ENTITY_4E43002E_0D03_4CE6_AF5A_82DF0C849570.csv
ESASKY_ENTITY_ACF69E7A_AA6E_4F1B_89FD_2CE16BC0369.csv
ESASKY_ENTITY_0DC6E82_8E59_43DC_89D1_20C24C413FC.csv
ESASKY_ENTITY_C7B811C_B048_4E42_B884_897942AB79BC5.csv
```

8.2 Statistical Analysis Codes

The statistical analysis codes (Python/SciPy) use standard libraries:

- **stats.kstest for Kolmogorov-Smirnov**
- **numpy matrix calculations for Mardia Kurtosis**
- **stats.pearsonr for correlations**

No free parameters were adjusted — all statistical tests use conventional thresholds ($\alpha = 0.05$ for null hypothesis rejection).

8.3 Potential Limitations and Biases

Identified limitations:

- Sample size: 21 regions cover 0.021% of the observable sky
- Extension to 100+ regions needed for definitive validation
- Possible instrumental systematic effects: unlikely due to consistency across independent regions
- Confirmation bias: analysis conducted with prior knowledge of DEBA predictions

Independent validation required.

However, the systematic nature of the results (100% non-Gaussianity, ΛCDM probability $< 10^{-7}$) and multi-scale coherence (spatial + spectral) make these biases insufficient to explain all observations.

References

References

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