

Constraining cosmological parameters using cosmic voids

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Motivation

- Develop a statistical characterization of the geometry of the voids found by our Void Finder.
- Quantify the influence of the cosmological constant on the shapes of the voids found. In order to constrain the cosmological parameters of the simulated universe.
- Study the possibility of applying a geometric analysis method on observational data to constrain the cosmological parameters.

Cosmic voids

Cosmic voids are geometrically approximated to an ellipsoid characterizable by its **ellipticity** and **prolateness**. [1]

Since ellipticity variations are sensitive to the cosmology used to generate the temporal evolution of the system, in particular to dark energy, these characteristics allow us to constrain cosmological parameters. [2]

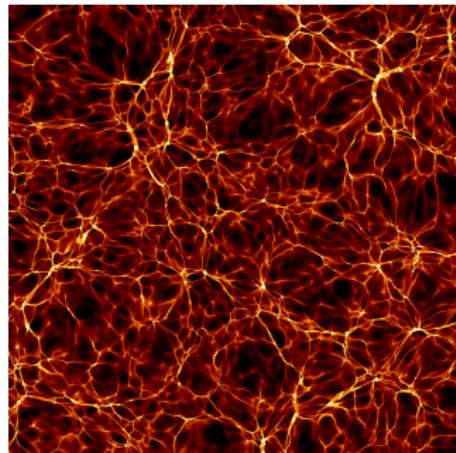
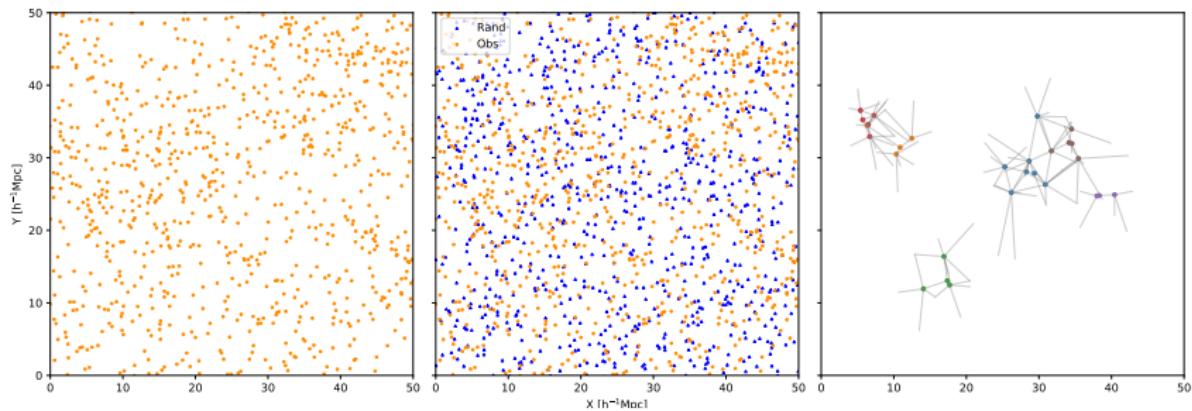


Figura: A slice through an Abacus simulation box at $z=1.0$. [3]

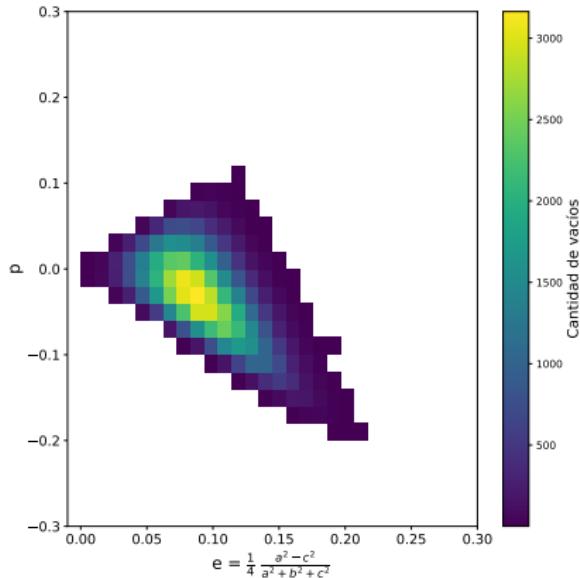
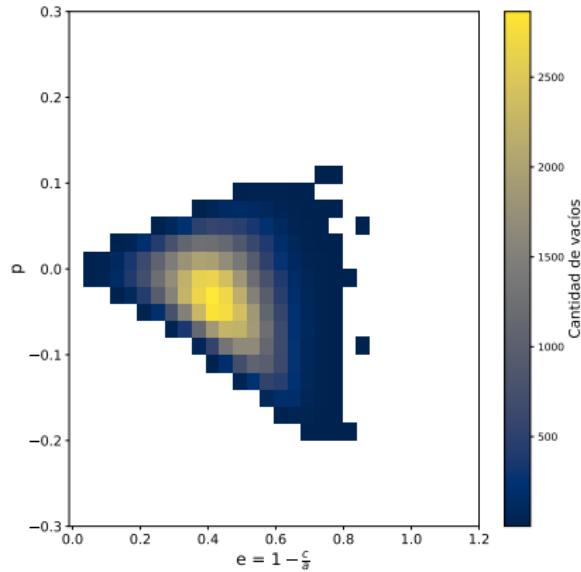
Void Finder

The operation of the Void Finder is based on the property of close neighbors maintained by the graph β -Skeleton to determine the particles that are with a close neighbor a zone that excludes the existence of a second neighbor. [4]

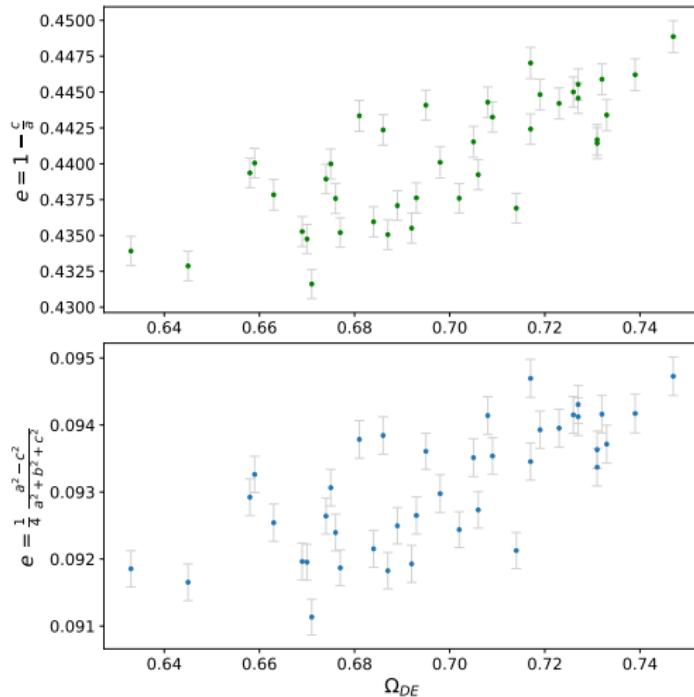
Void Finder



Relation between ellipticity and prolateness



Relation between ellipticity and Ω_{DE}



Conclusions

- Ellipticity and prolaticity values are not randomly distributed. On the contrary, they were close to a focus determined by the mean value of ellipticity linked to the mean value of Planck's cosmology for Abacus Cosmos data set.
- The statistical method used during this work allows us to determine a relationship between ellipticity of the voids in a simulation and the cosmological parameters Ω_{DE} with which the simulation was constructed.

References I

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