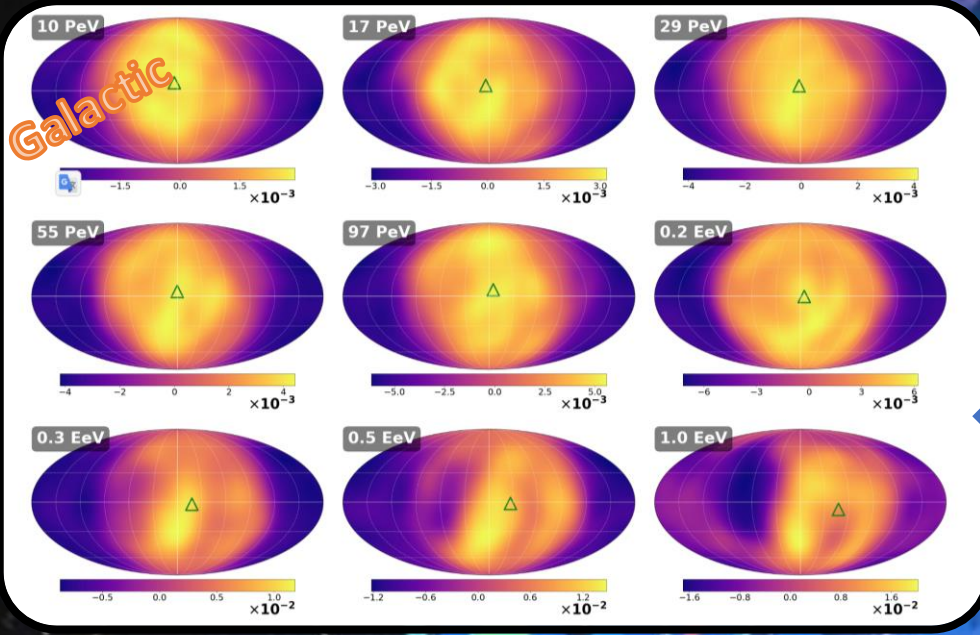


# Anisotropy Evolution from galactic CR to extragalactic CR

Wenyi Bian<sup>1\*</sup>, Gwenael Giacinti<sup>2</sup>

## Resulting Anisotropy maps

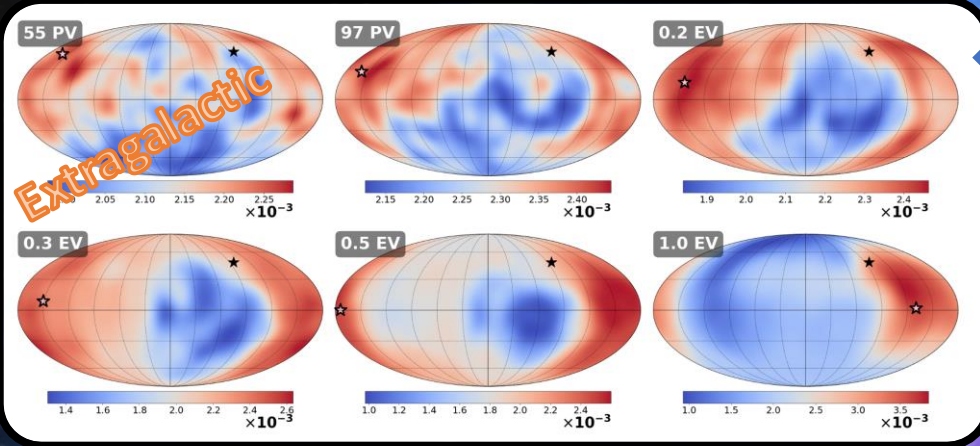


## Abstract

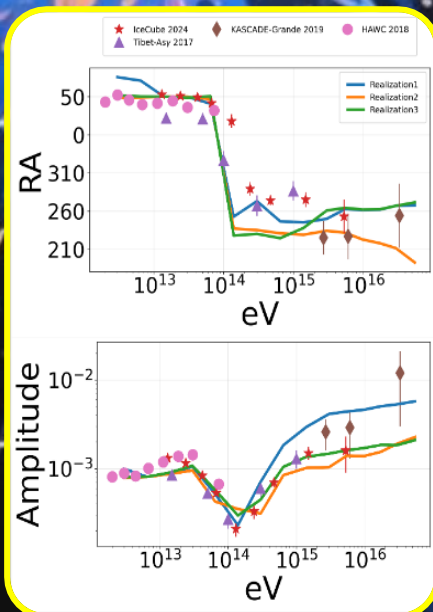
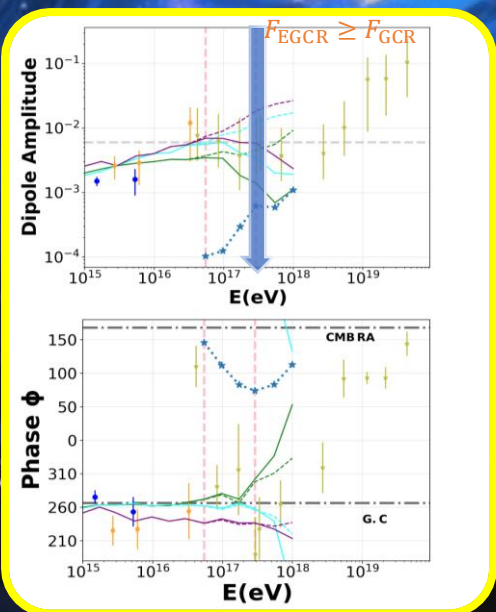
We obtain multi element anisotropy sky maps from TeV to EeV by backtracking test particles in a turbulent magnetic field. We discuss the flip of dipole at several hundred TeV. In the 'knee' region, we suggest the anisotropy can be a probe for distinguishing the galactic CRs (GCRs) and extragalactic CRs (EGCRs).

In this figure, we show the GCR simulation results at different energy. The morphology of middle-scale structures depend on the magnetic field configuration. The sky maps are in Galactic coordinates. The triangular marker indicates the direction of the Galactic center.

In this figure, we show the EGCR simulation results from 55PeV to 1EeV with only proton component. We do the simulations by backtracking the test particles outside the Galactic magnetic halo. The galactic magnetic field we used here is the JF12 model [1]. The EGCR flux is assumed to have a dipole anisotropy with 0.6% amplitude, due to the cosmological Compton-Getting (CCG) effect.[2]. The dark star marker indicates the CCG dipole direction and the pink star indicates the resulting dipole direction.



## Dipole Anisotropy Evolution with energy



## Summary

We obtain GCR and EGCR anisotropy sky maps by simulating test-particle backtracking in turbulent magnetic fields and JF12 galactic magnetic field model and show the predicted dipole feature evolution with energy.

In the 'knee' region, we suggest the anisotropy can be a probe for distinguishing the GCRs and EGCRs. The features of dipole anisotropy from our simulations agrees the experiments.

The flip at  $\sim 100$  TeV can be naturally explained by CR gradient direction change with dipole phase change being smaller than 180 degrees in some of our simulations

In this figure, we show the evolution of the dipole anisotropy from 1PeV to 1EeV. Different colors are for different configurations.

The dark blue dotted lines represent the features of EGCR. Dashed lines are for GCR and solid lines for GCR and EGCR together.

In this figure, we show the evolution of the dipole anisotropy from several TeV to tens of PeV. Three turbulence configurations are presented here.