IAU CB1 Newsletter No. 17

July 19, 2023

Editorial

Dear CB1 members & friends,

The CB1 OC is continuing planning for the virtual ChaICA-V conference on 7–9th November 2023 We are happy to inform your that Hideyuki Hotta, Eugene Vasiliev, David Radice, Stefanie Walch-Gassner, and Bhargav Vaidya have confirmed their participation in the ChaICA-V conference. Please, see the conference web-site available at

https://dias.ie/chaica5/

for updates.

Meanwhile, you can register and submit an abstract for your suggested talk by filling a form at

https://forms.gle/Ai4sr1gBKUSAPnVt5

The deadline for abstract submission is **Sep. 15th**.

We are also excited to let you know that the proposal for the 2024 Focus Meeting has been approved. More details will be provided in the next newsletter.

Three announcements are attached to this newsletter. Generally, you can send us your announcements and other news at any time for a next newsletter. The deadline for contributions to the next newsletter to be circulated in the middle of August is set to 31 July, 2023.

With kind regards,

Christian Boily
CB1 president

New simulations for new problems in galaxy formation

Communicated by: Yohan Dubois

Abstract

We are organising a conference on "New simulations for new problems in galaxy formation" at IAP, Paris between 11-15 December 2023. The website for this colloquium is now open for registration and abstract submission. This conference will be the opportunity to gather experts in the field of numerical galaxy simulations, discuss the advances of such models, their shortcomings, and the routes the community should take to make significant progress in our theoretical understanding of galaxies in light of current and new observations.

The program will be organised in the following sessions:

- Galaxy formation from 1 to 14 Gyr
- Galaxies in the first Gyr
- Feedback from stars
- Feedback from active galactic nuclei
- Large-scale structures and galaxies
- The nature of the circum-galactic medium
- Galaxies in non-standard cosmologies
- Are cosmic rays a missing ingredient?
- Can we make robust predictions about dust?

Please circulate this announcement among your colleagues.

Contact email — dubois@iap.fr

For more information — The colloquium website

The diffuse gamma-ray flux from clusters of galaxies

Saqib Hussain, Rafael Alves Batista, Elisabete M. de Gouveia Dal Pino, Klaus Dolag

Abstract

The origin of the diffuse gamma-ray background (DGRB), the one that remains after subtracting all individual sources from observed gamma-ray sky, is unknown. The DGRB possibly encompasses contributions from different source populations such as star-forming galaxies, starburst galaxies, active galactic nuclei, gamma-ray bursts, or galaxy clusters. Here, we combine cosmological magnetohydrodynamical simulations of clusters of galaxies with the propagation of cosmic rays (CRs) using Monte Carlo simulations, in the redshift range $z \leq 5.0$, and show that the integrated gamma-ray flux from clusters can contribute up to 100% of the DGRB flux observed by Fermi-LAT above 100 GeV, for CRs spectral indices $\alpha = 1.5 - 2.5$ and energy cutoffs $E_{\rm max} = 10^{16} - 1017$ eV. The flux is dominated by clusters with masses $10^{13} \lesssim M/M_{\odot} \lesssim 10^{15}$ and redshift $z \lesssim 0.3$. Our results also predict the potential observation of high-energy gamma rays from clusters by experiments like the High Altitude Water Cherenkov (HAWC), the Large High Altitude Air Shower Observatory (LHAASO), and potentially the upcoming Cherenkov Telescope Array (CTA).

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For more information — https://doi.org/10.1038/s41467-023-38226-w

Particle acceleration by magnetic reconnection in relativistic jets: the transition from small to large scales

Tania E. Medina-Torrejón, Elisabete M. de Gouveia Dal Pino, Grzegorz Kowal

Abstract

Several MHD works and, in particular, the recent one by Medina-Torrejon et al. (2021) based on three-dimensional MHD simulations of relativistic jets, have evidenced that particle acceleration by magnetic reconnection driven by the turbulence in the flow occurs from the resistive up to the large injection scale of the turbulence. Particles experience Fermi-type acceleration up to ultra-high-energies, predominantly of the parallel velocity component to the local magnetic field, in the reconnection layers in all scales due to the ideal electric fields of the background fluctuations ($V \times B$, where V and B are the velocity and magnetic field of the fluctuations, respectively). In this work, we show MHD-particle-in-cell (MHD-PIC) simulations following the early stages of the particle acceleration in the relativistic jet which confirm these previous results, demonstrating the strong potential of magnetic reconnection driven by turbulence to accelerate relativistic particles to extreme energies in magnetically dominated flows. Our results also show that the dynamical time variations of the background magnetic fields do not influence the acceleration of the particles in this process.

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For more information — 10.48550/arXiv.2303.08780