Three Projects in Astrophysical Magnetohydrodynamics

PI: David C. Collins (Florida State University)

Contents

1 Introduction

We are requesting BLAH. This research is supported by ¡core grant¿ ¡cmb grant¿. We are also hopeful that a third grant to support the galaxy work

These projects support these studnets

Table 1, summary of request.

2 Scientific Background

Here we will introduce everything

2.1 Background: Turbulent Energy

Here we will flesh out these cool ideas.

2.2 Background: Star Formation

Repeat the new things with higher resolution. Skip the chemistry discussion?

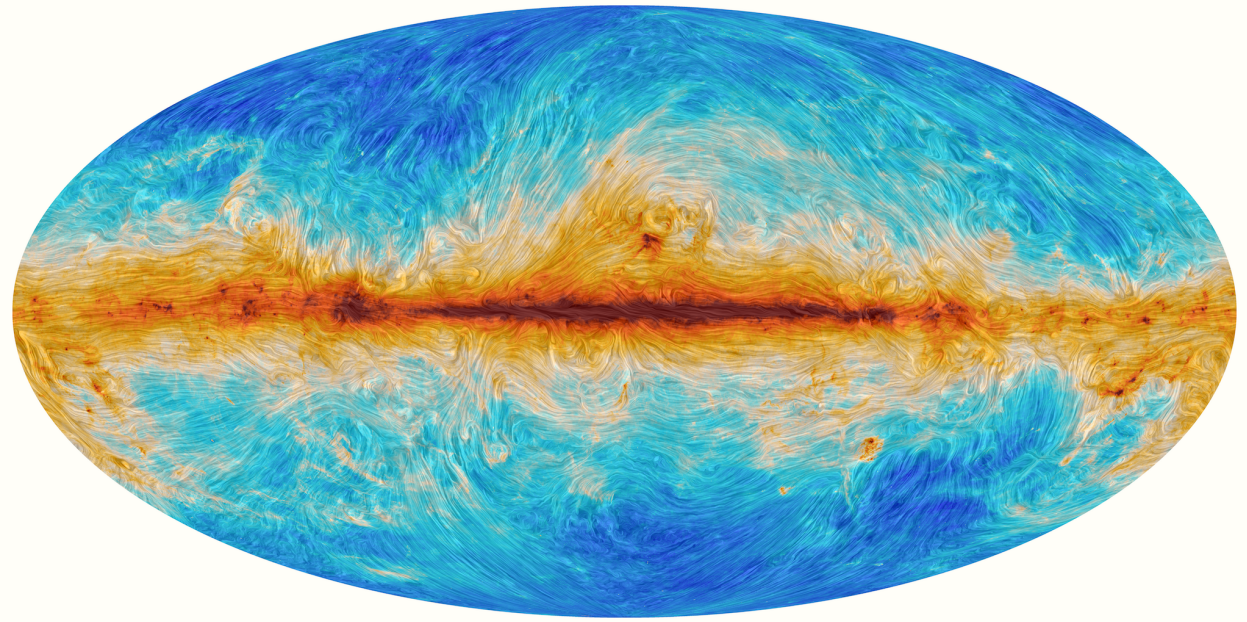

Figure 1: The large scale magnetic field of the galaxy as seen by the Planck satellite. The color field shows dust emission at 353GHz. The image is smeared along the direction of the magnetic field. (Planck Collaboration et al. 2015)

2.3 Background: Galaxies

The *galaxies* project will simulate magnetic field generation in Milky Way sized galaxies. It is well know that the Milky Way has a large scale magnetic field of roughly $\sim 6\mu$G, where 1G is about the strength of a refrigerator magnet. This can be seen in Figure 1

2.4 Background: Foregrounds

Several big turbulence simulations. Probably a scaling study. Filaments.

3 Computational Method

We will use Enzo.

SF: Enzo + Particles
Galxies: Chemistry and SF and all that stuff
CMB: Enzo + MHD
Turb: Enzo + PPM

4 Simulation Plan

Here we will outline the simulations to be performed for each of the projects.

4.1 Simulations: Turbulent Energy

Lots of big PPM runs.

4.2 Simulations: Star Formation

Big tracer runs.

4.3 Simulations: Galaxies

Really, this is "get something off the ground."

4.4 Simulations: Foregrounds

Big magnetic simulations.

5 Access to Other Computational Resources

Local Computing Environment The astrophysics group at Florida State University has a small cluster with 300 cores. This machine is useful for testing and debugging, but not large enough for the proposed simulations. Florida State University also maintains a research cluster, but it is also insufficient for this research.
Other supercomputing resources. The PI of the current proposal does not presently have access to other supercomputing resources.

6 Personnel

The PI of this project is Dr. David C. Collins, an Associate Professor in the Florida State University Department of Physics. Dr. Collins has more than fifteen years of experience working using high performance computing platforms for research in computational astrophysics. He is also a lead developer of the code Enzo, which has a long history of simulation success.

Three PhD students will be working on the projects. Luz Jimenez Vela will be responsible for the *cores* project. Branislav Rabatin is responsible for both the *turbulence* and *foregrounds* projects. Jacob Strack is responsible for the *galaxies* project.

References

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