Progress Report for TG-AST140008

During our 2020-2021 allocation we have primarily work on analysis of results and writing papers. Four papers from the *cores* project are in preparation. One paper for the *supernovae* project has been published as (Hristov et al. 2021).

The first paper in the *cores* project examines the initial conditions and collapse rate of star forming clouds. This paper will be submitted in April of 2022. We find that the cores do not always have a phase where the velocity is subsonic, as was originally expected; and the collapse is slower than free-fall in all but the largest objects, which are substantially faster.

The second paper, to be submitted by the Summer of 2022, is an examination of a new analytical formulation of the distribution of energy in isothermal turbulence. This study needs a few more simulations to ensure the trends happen at higher Mach numbers, but is otherwise nearing completion.

The third paper, to be submitted by Summer 2022, examines the behavior of magnetic fields during the collapse. It is found that the ratio of magnetic field strength to density decreases as a function of time by the act of turbulence alone.

The fourth publication, to be completed by August 2022, is an examination of the full suite of forces acting on collapsing gas.

We concluded the *supernovae* project this year, with the results published in (Hristov et al. 2021). We find the surprising result that many Type Ia spernovae require very large (10^6G), magnetic fields to reproduce the late-time light curves observed.

References

Hristov, B., Hoeflich, P., & Collins, D. C. 2021, ApJ, 923, 210