Covariant Field Theory: For Brutes

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Motivation

- Our goal is to develop a covariant formalism for electromagnetism, i.e. write the laws we know of in an invariant form
- Should allow us to better understand the dynamics of a charged particle in an EM field
- This can be done in an "elegant" way, but we will do it the "brute force" way

Brute Force

Method

- 3D Hydro Models
- Uniform Grid
- Driving force for turbulence on box scale

Figure: 100 km box

Detonation of Pure He Run With C Seed Nuclei

[loopautostart]out$_s$*low.mkv out.png height* $= 0.7$

Detonation of 512^3 run with $\rho = 10^6 \frac{g}{cm^3}$ and He fraction $= 1.0$.

Slice Plots of Pure He Run

combined_512_10e6_1.0_new.png

Local Abundances of He and C

He4_v_C12.png

Conclusion

Table: A table of runs with the different resolutions, densities, helium abundances, and mean temperature at the time of detonation initiation, $T_{\rm det}$ (K).

Resolution	Density (g cm^{-3})	Helium Abundance	$T_{\rm det}$ (K)
512^3	10^5	0.1	8.28×10^8
512^3	10^5	0.25	8.75×10^8
512^3	10^5	1.0	None
512^3	10^6	0.1	7.80×10^8
512^3	10^6	0.25	6.30×10^8
512^3	10^6	1.0	1.06×10^9