

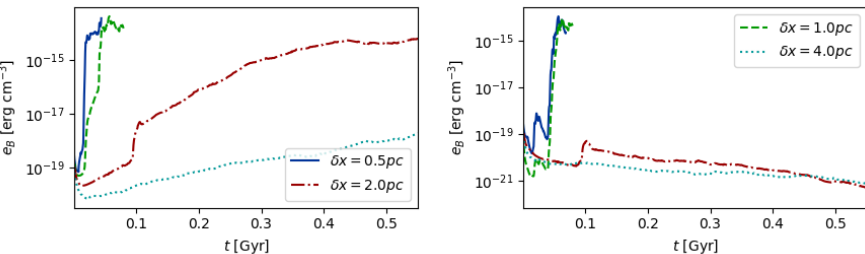
# Small scale dynamo in ISM - surprising hot dynamo

July 29, 2020 – Pencil Code, Glasgow

# Experimental setup

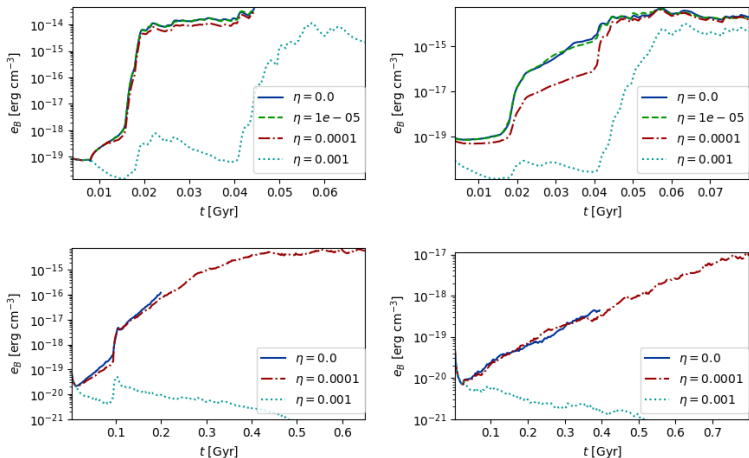
- ▶ 3D periodic ISM 1 ppcc 200 pc on each side
- ▶ SN rate comparable to solar neighbourhood  $0.1 - 10 \sigma_{\odot}$
- ▶ Energy: radiative cooling and UV-heating, hyperdiffusion and shock diffusion
- ▶ Induction: hyperdiffusion and  $\eta \in [0, 0.05] \text{ kpc km s}^{-1}$
- ▶ Momentum: hyperdiffusion and shock diffusion  $\nu = 0$
- ▶ Continuity: shock diffusion
- ▶ Resolution 0.5, 1, 2 and 4 pc

# Magnetic energy growth rates



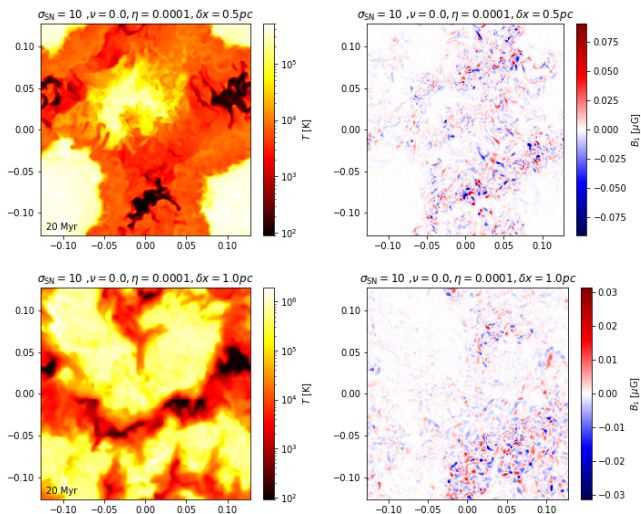
**Figure:** The volume averaged magnetic energy density for models with resolution between 0.5 pc and 4 pc are plotted over time. Resolution dependant hyper-resistivity, hyper-viscosity and shock-capturing viscosity apply for numerical stability. Resistivity,  $\eta = 10^{-4}$  kpc km s<sup>-1</sup> in panel **(a)** and  $10^{-3}$  **(b)**, is also included.

# Magnetic energy growth rates



**Figure:** For each resolution the effect of  $\eta$  is compared, **(a)** 0.5 pc, **(b)** 1 pc, **(c)** and **(d)** 2 pc, and **(e)** and **(f)** 4 pc. All models have supernova rate  $0.2\sigma_{\text{SN}}$ , except **(d)** and **(f)**, which have  $\sigma_{\text{SN}}$ .  $\sigma_{\text{SN}} \simeq 50 \text{ kpc}^{-3} \text{ Myr}^{-1}$  is the solar neighbourhood equivalent random SN frequency.

# Growth in warm/hot gas



**Figure:** Slices for resolution of 0.5 pc and 1 pc sampled from the kinematic dynamo state.

# No correlation

