Nuclear Weak Interactions in Core-Collapse Supernovae

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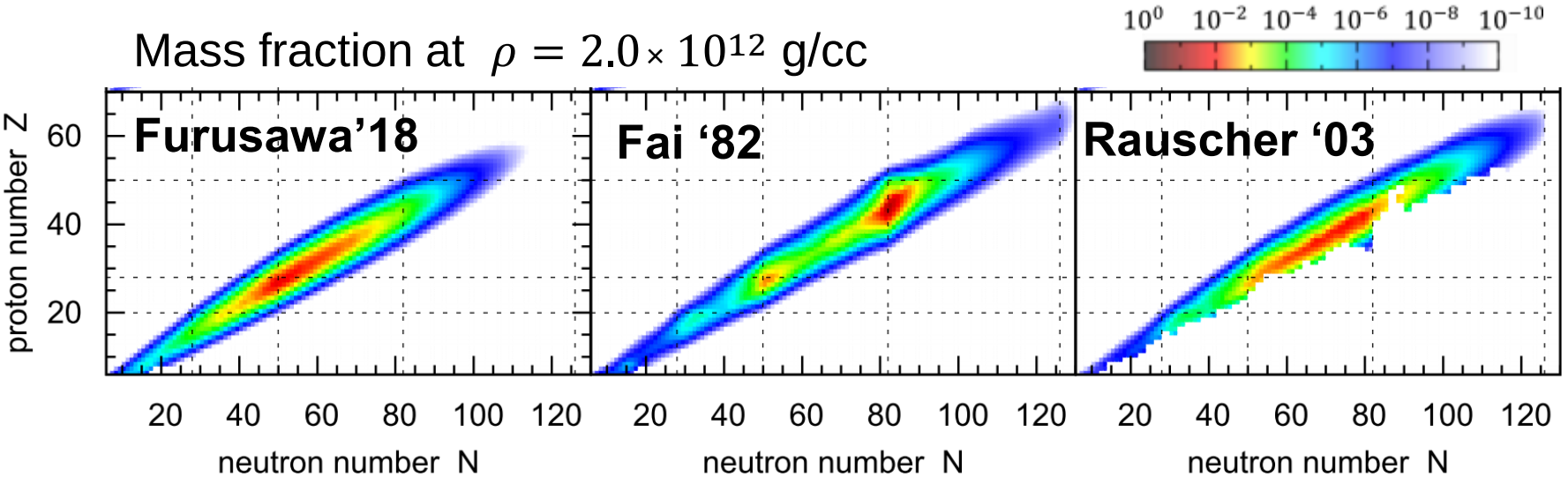
Nuclear Weak Interactions Change Supernova Dynamics

- Electron capture, $(N,Z)+e^- \leftrightarrow (N+1,Z-1)+\nu_e$ &
- Neutrino scattering, $(N,Z)+\nu \quad \leftrightarrow (N,Z)+\nu$ at $\rho \sim 10^{11-12}$g/cc

Which Nuclei Appear? What Determines It?

- **Nuclei with (N,Z)=(40-80,25-40)**
- Sensitive to **choice of partition functions** (finite temperature models)

Mass fraction at $\rho = 2.0 \times 10^{12}$ g/cc



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●Systemtatical 1D Supernova Simulations of $11.2\ M_{sun}$

- **Softer Equation of State (EOS)**

⇒ More compact proto-neutron star

⇒ **More electron-antineutrinos**

- **Higher Electron Capture (EC) rates**

⇒ Less compact stellar structure & More neutrino absorptions

⇒ **Less electron-neutrinos**