

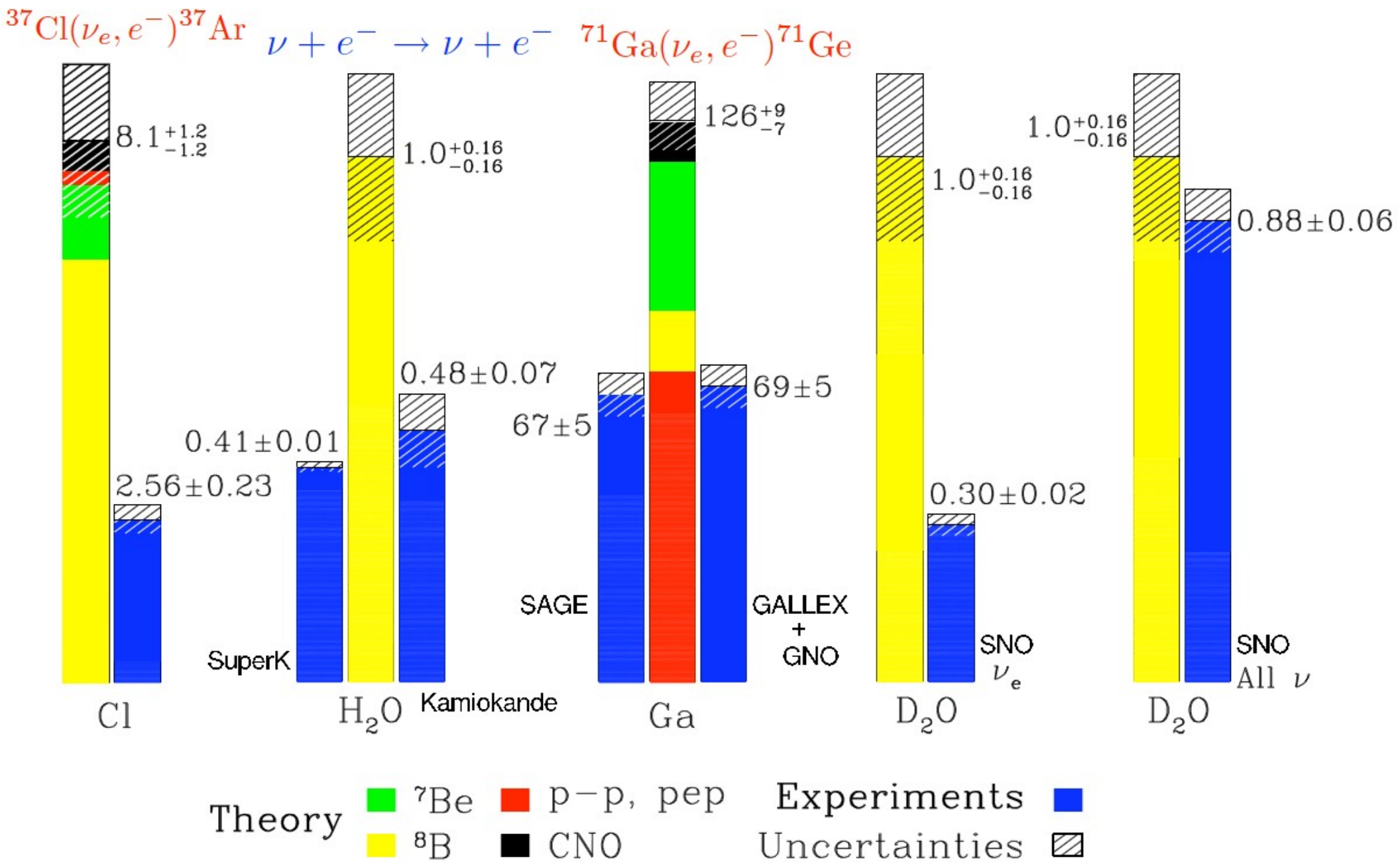
# Neutrinos from the Sun

REACTION	TERM (%)	$\nu$ ENERGY (MeV)
$p + p \rightarrow {}^2\text{H} + e^+ + \nu_e$	(99.96)	$\leq 0.423$
or		
$p + e^- + p \rightarrow {}^2\text{H} + \nu_e$	(0.44)	1.445
${}^2\text{H} + p \rightarrow {}^3\text{He} + \gamma$	(100)	
${}^3\text{He} + {}^3\text{He} \rightarrow \alpha + 2p$	(85)	
or		
${}^3\text{He} + {}^4\text{He} \rightarrow {}^7\text{Be} + \gamma$	(15)	
${}^7\text{Be} + e^- \rightarrow {}^7\text{Li} + \nu_e$	(15)	$\left\{ \begin{array}{l} 0.863 \text{ 90\%} \\ 0.385 \text{ 10\%} \end{array} \right.$
${}^7\text{Li} + p \rightarrow 2\alpha$		
or		
${}^7\text{Be} + p \rightarrow {}^8\text{B} + \gamma$	(0.02)	
${}^8\text{B} \rightarrow {}^8\text{Be}^* + e^+ + \nu_e$		$< 15$
${}^8\text{Be}^* \rightarrow 2\alpha$		
or		
${}^3\text{He} + p \rightarrow {}^4\text{He} + e^+ + \nu_e$	(0.00003)	$< 18.8$

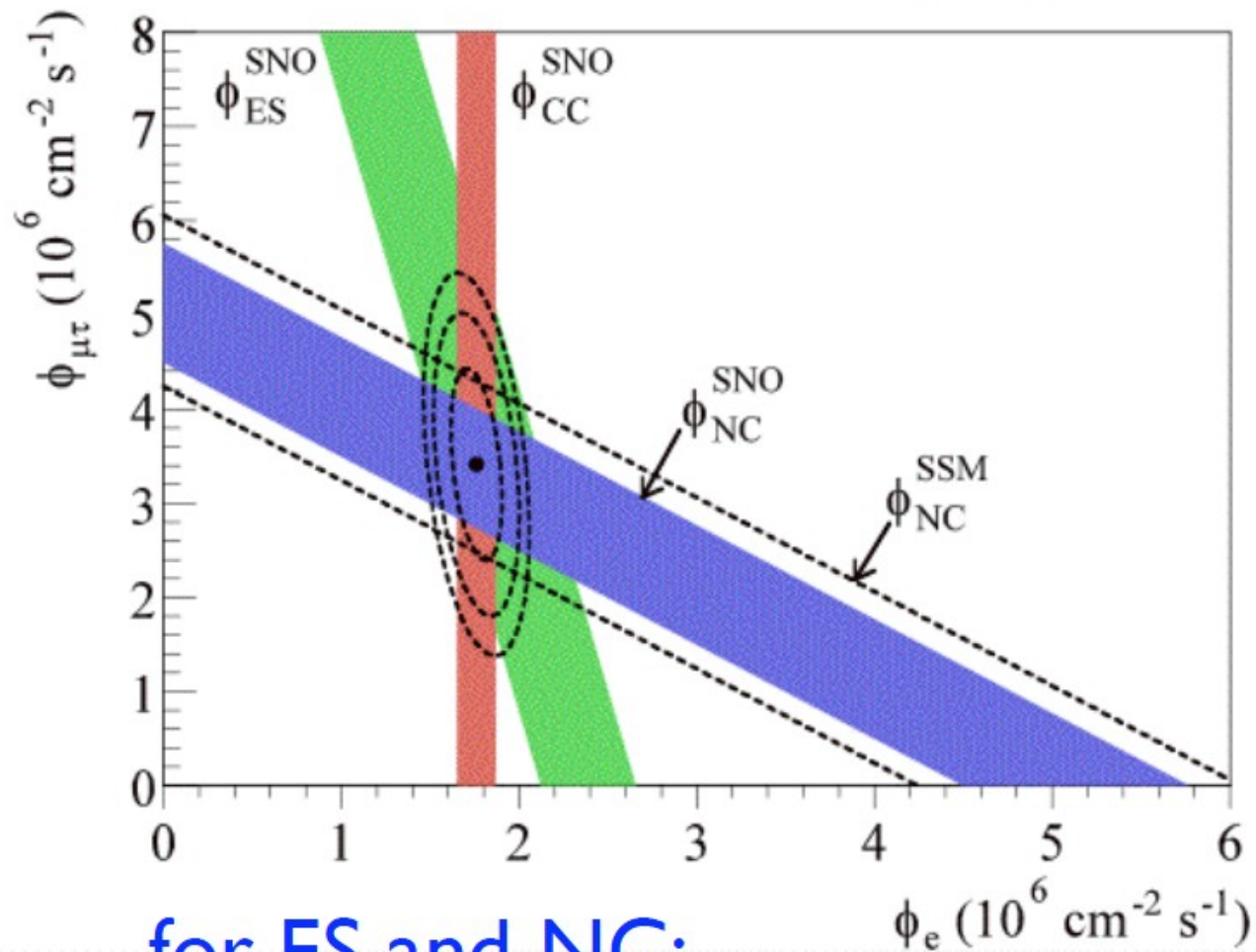
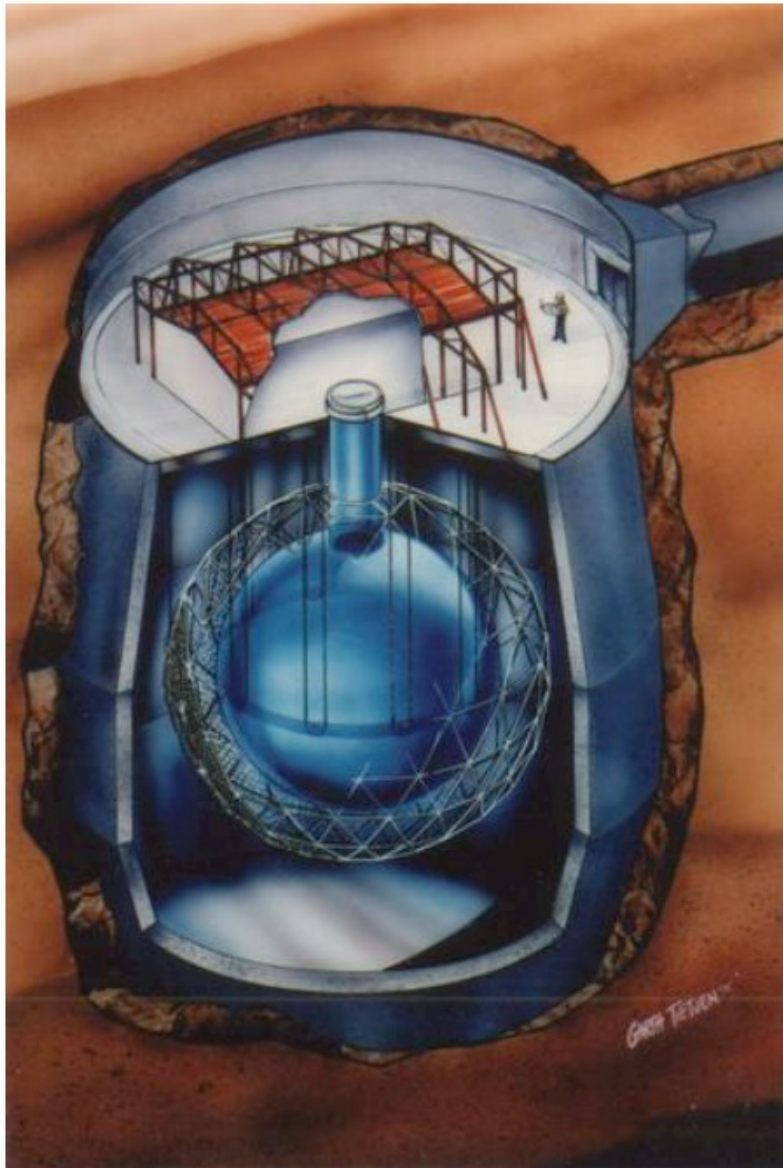
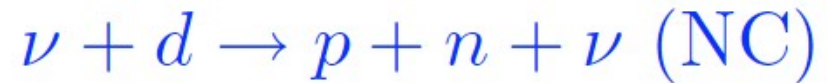
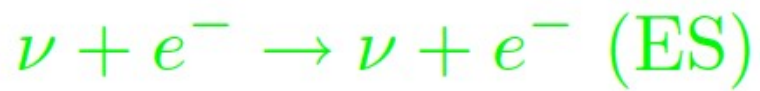
Neutrino terminations from BP2000 solar model. Neutrino energies include solar corrections: J. Bahcall, Phys. Rev. C, 56, 3391 (1997).

# Total Rates: Standard Model vs. Experiment

Bahcall–Serenelli 2005 [BS05(OP)]



# Sudbury Neutrino Observatory (SNO)

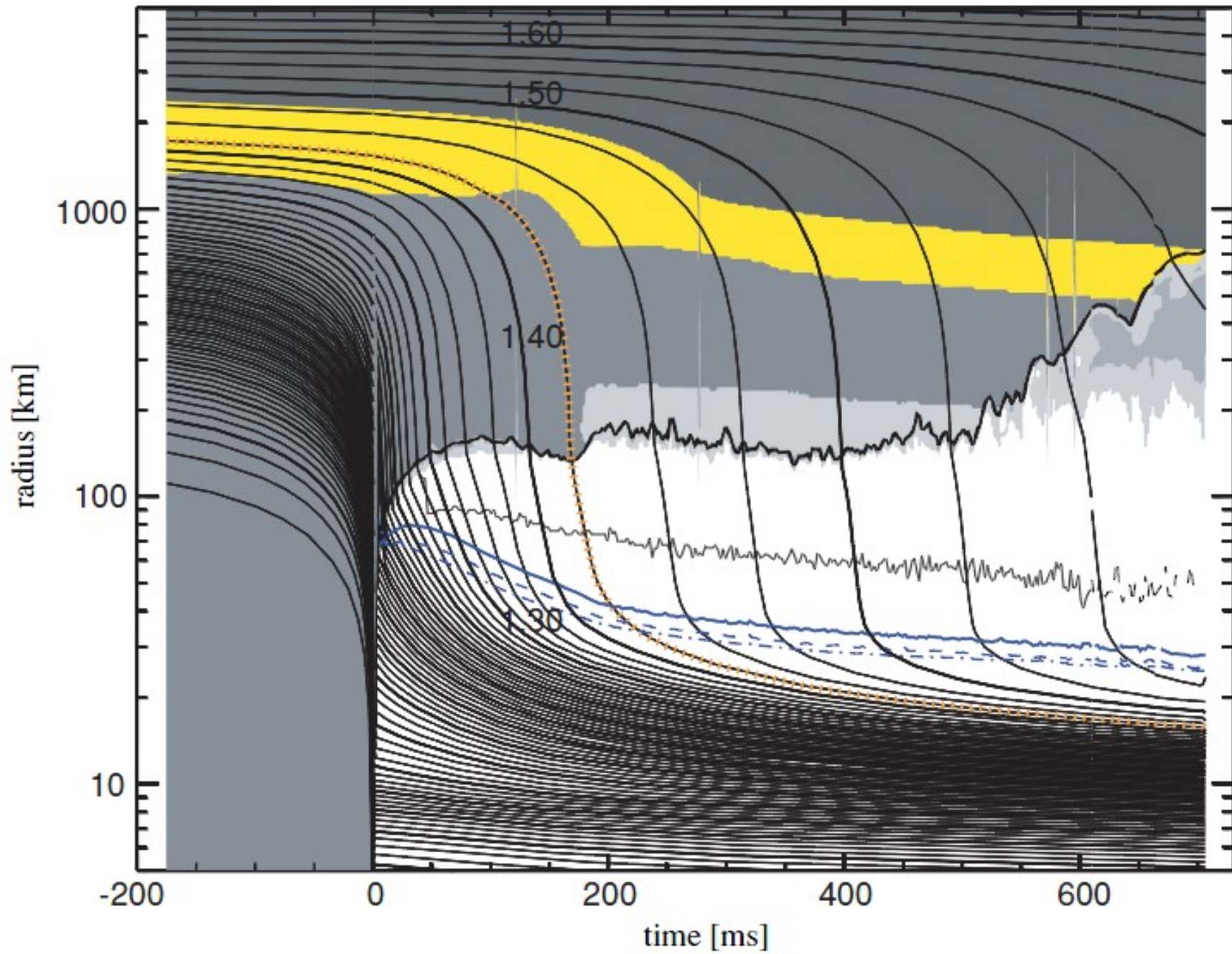


for ES and NC:

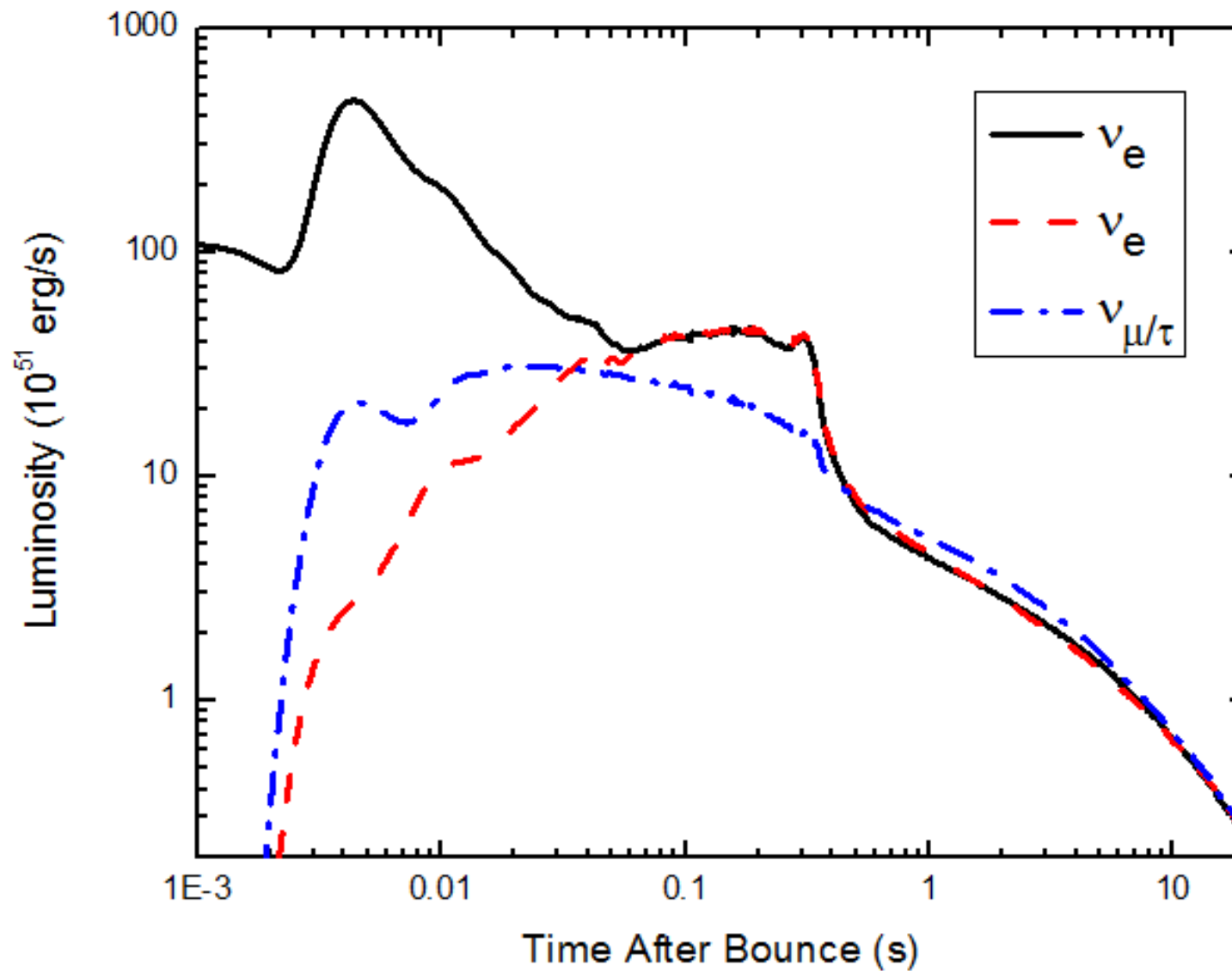
$$\phi_{\mu\tau} \langle \sigma \rangle_{\mu\tau} + \phi_e \langle \sigma \rangle_e = R_{\text{det}}$$



# CCSNe (15M, Janka 2008)



# Neutrinos from Supernovae



# Neutrinos from Supernovae

