

SUPERNOVAE PHYSICS POTENTIAL OF CURRENT AND NEXT GENERATION NEUTRINO DETECTORS

Workshop Summary

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Basudeb Dasgupta, Brian Fields, Shan Gao, Eric
Grashorn, Shunsaku Horiuchi, Matt Kistler, Lutz
Koepke, Ranjan Laha, Amy Lien, Ondrej Pejcha,
Carsten Rott, Michael Smy, Tonia Venters, Dmitry
Zaborov**

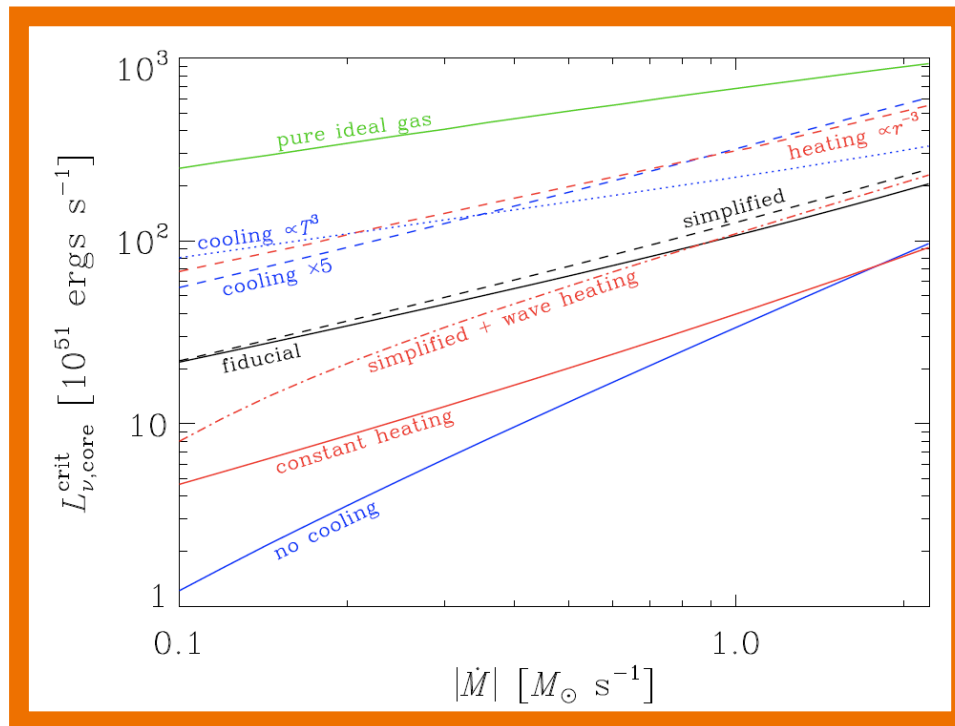
POINTS OF DISCUSSION

- SN theory
 - Talk by Pejcha.
- Neutrino oscillations
 - Talk by Dasgupta.
- SN neutrino detection
 - Talks by Koepke, Rott, Smy.
- SN neutrino astrophysics
 - Talks by Campbell, Horiuchi, Kistler, Lien.
- And of course “...the Earth as a neutrino star”
 - Talk by Fields.



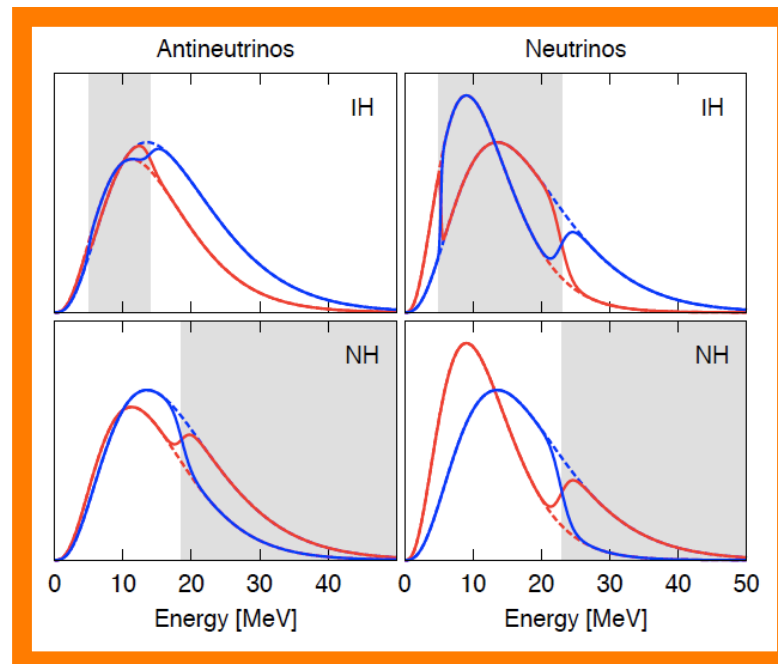
SN THEORY [PEJCHA]

- Simulations becoming more detailed.
- Multi-dimensional effects important.
- Semi-analytic estimates possible.



NEUTRINO OSCILLATIONS [DASGUPTA]

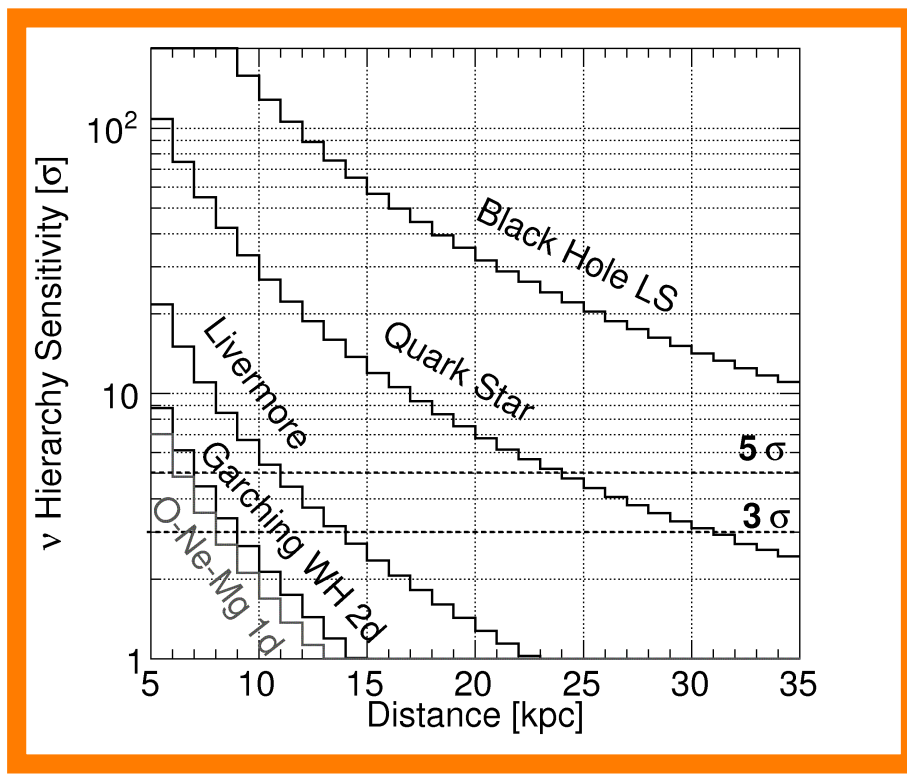
- Neutrino flavor conversion important.
- Nonlinear effects.
- Coming up with robust signatures needs guidance from simulations.



NEUTRINO DETECTION : I

ICECUBE [KOEPEKE]

- Great for measuring neutrino lightcurve.
- Synergy with Super-K.



NEUTRINO DETECTION : II

SUPER-K [SMY]

- Diffuse SN neutrinos @ Super-K : Search is on.
- New improved limit: $1.9/\text{cm}^2/\text{sec}$ at 90% c.l.
- Prospects of Gd doping of Super-K. Gd to be put in test tank within a few weeks!



NEUTRINO DETECTION : III

FUTURE DETECTORS [ROTT]

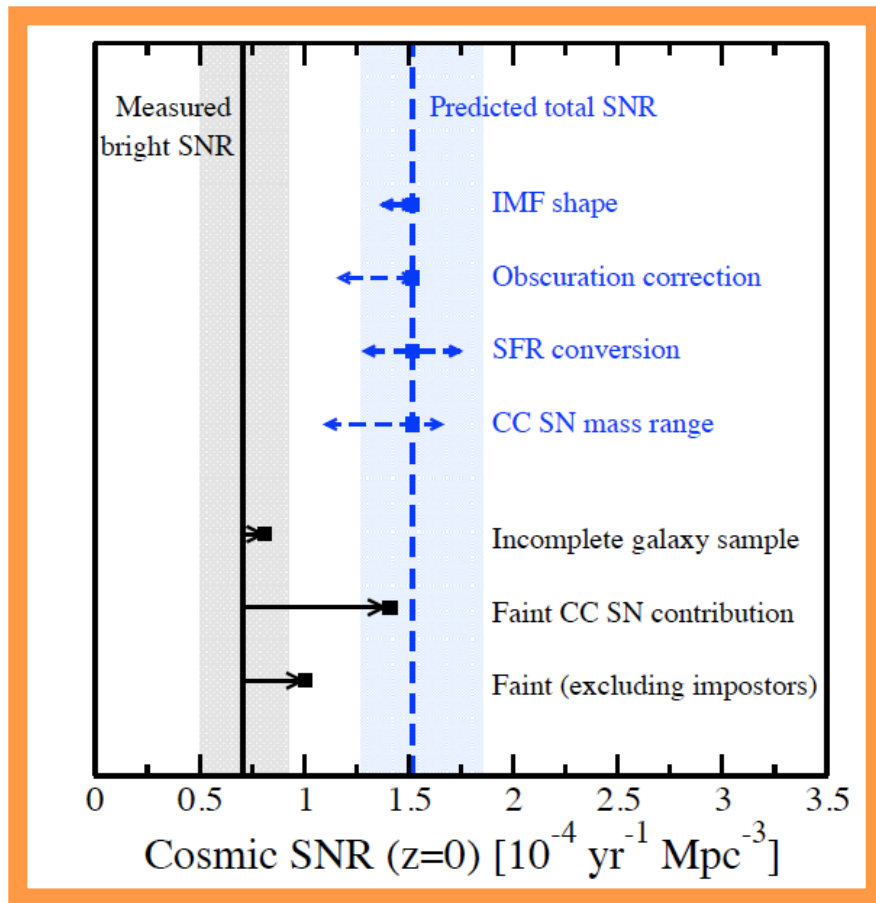
- Need photo-detectors cheaper than PMTs.
- PINGU : Phased, Denser, ...



SN NEUTRINO ASTROPHYSICS : I

SN RATE [HORIUCHI]

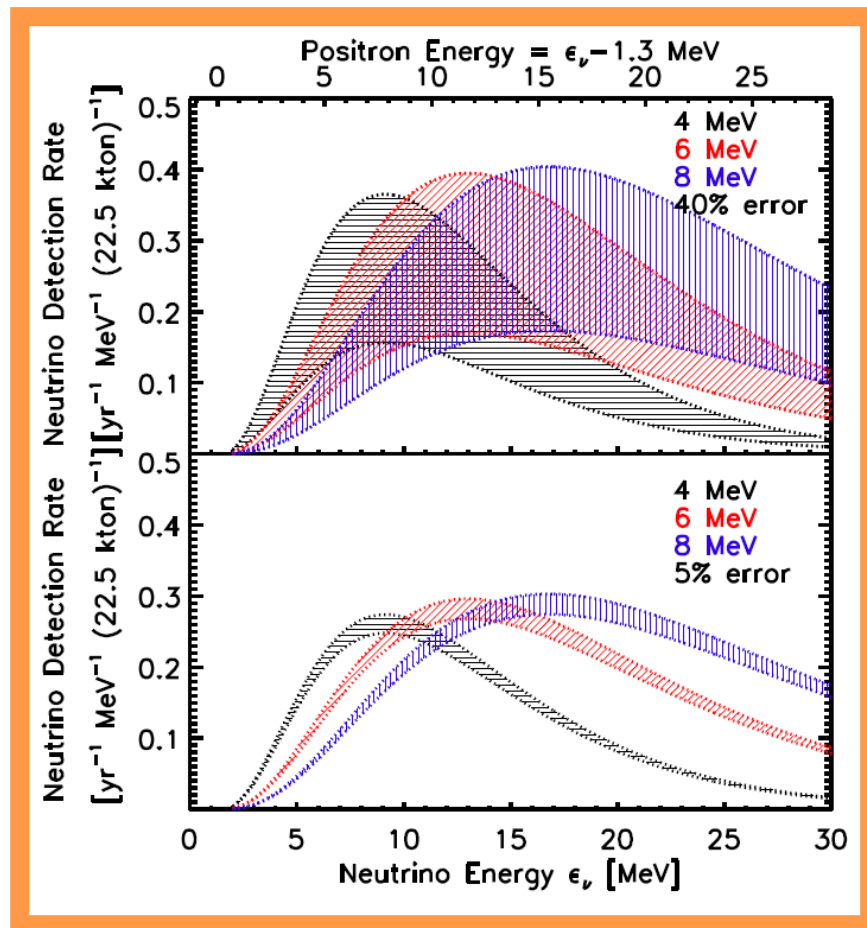
- Is the SN rate consistent with star formation?



SN NEUTRINO ASTROPHYSICS : II

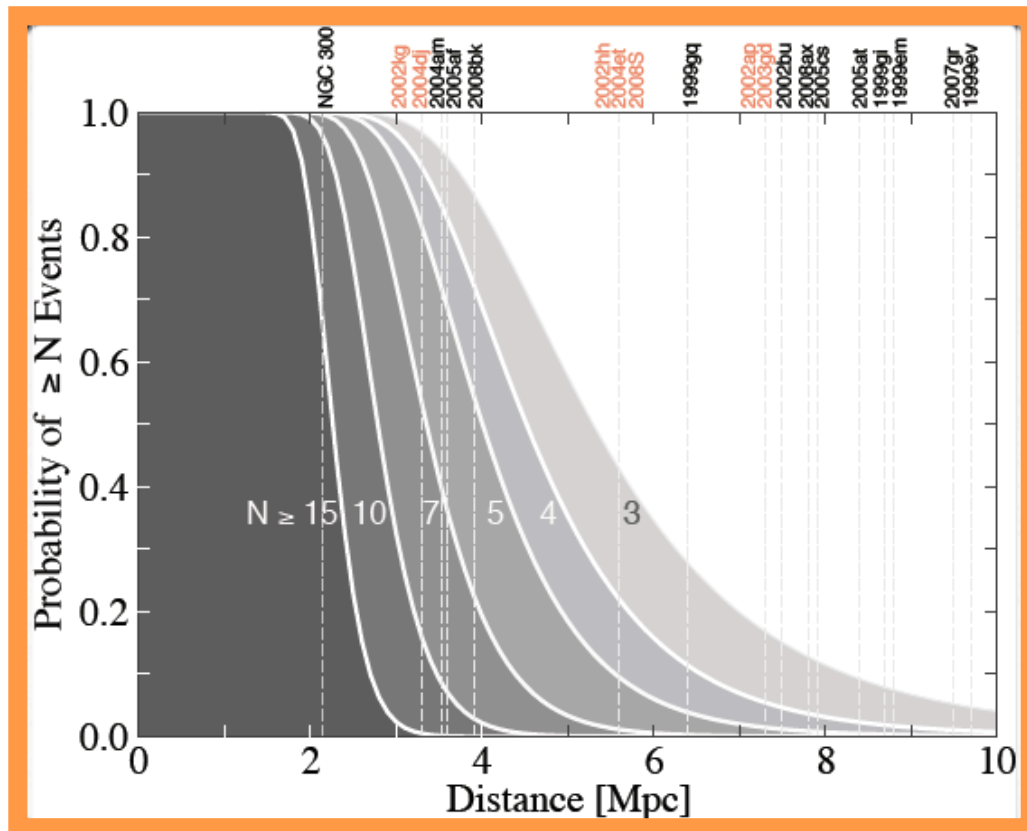
LSST + DSNB [LIEN]

- Using DSNB data together with LSST.



SN NEUTRINO ASTROPHYSICS : III 5 MEGATON DETECTOR [KISTLER]

- Potential of a 5 Mton experiment.



SN NEUTRINO ASTROPHYSICS : IV

DSNB FROM INVISIBLE SN [CAMPBELL]

- Some fraction of SN not visible.
- Possible to probe total and average energies for the neutrinos with ~ 5 MT yr data.

