Estimating Oscillation Parameter Sensitivities for LBNE with GLoBES

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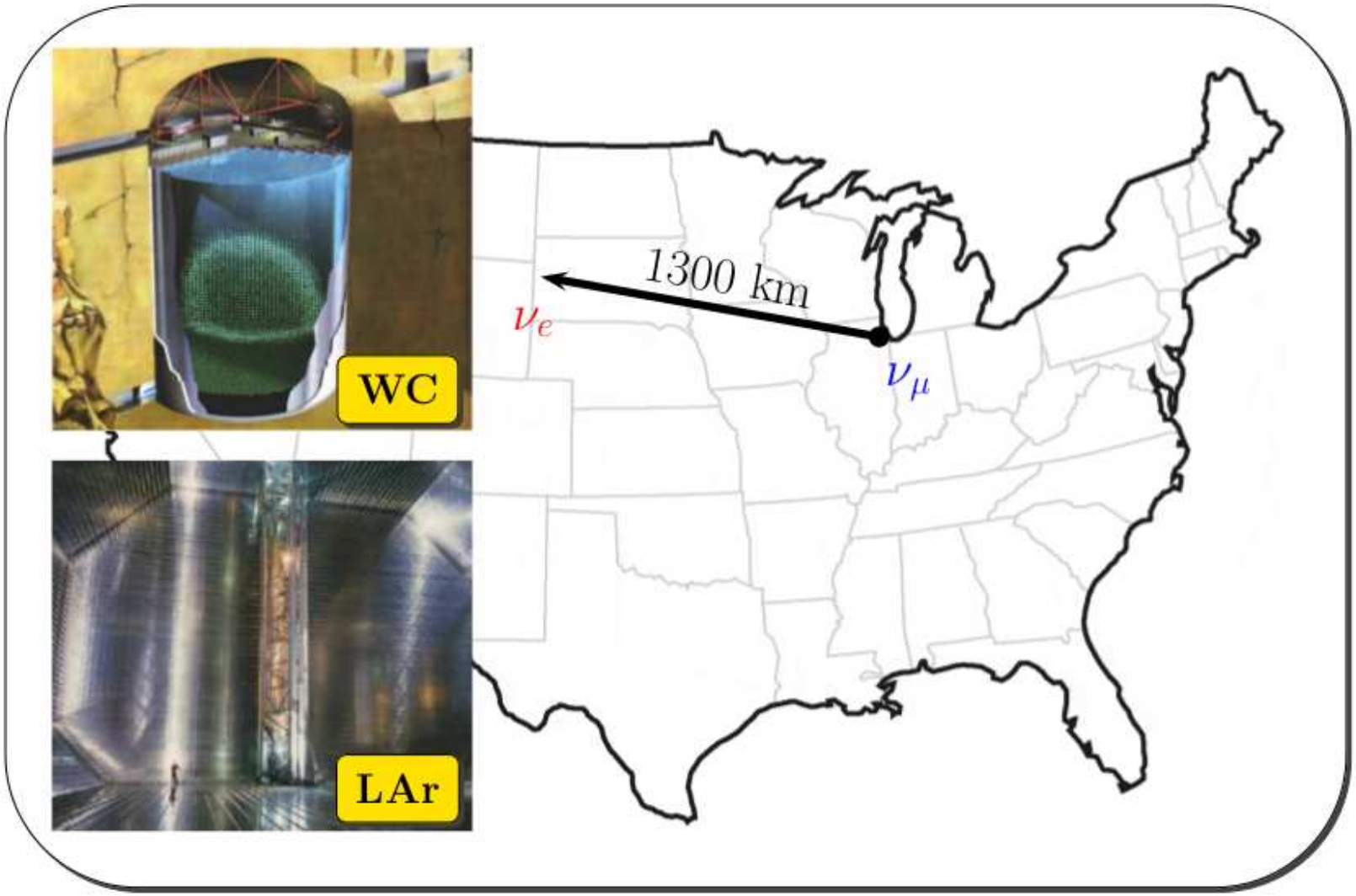
7/19/2011

Long-Baseline Neutrino Experiment (LBNE)



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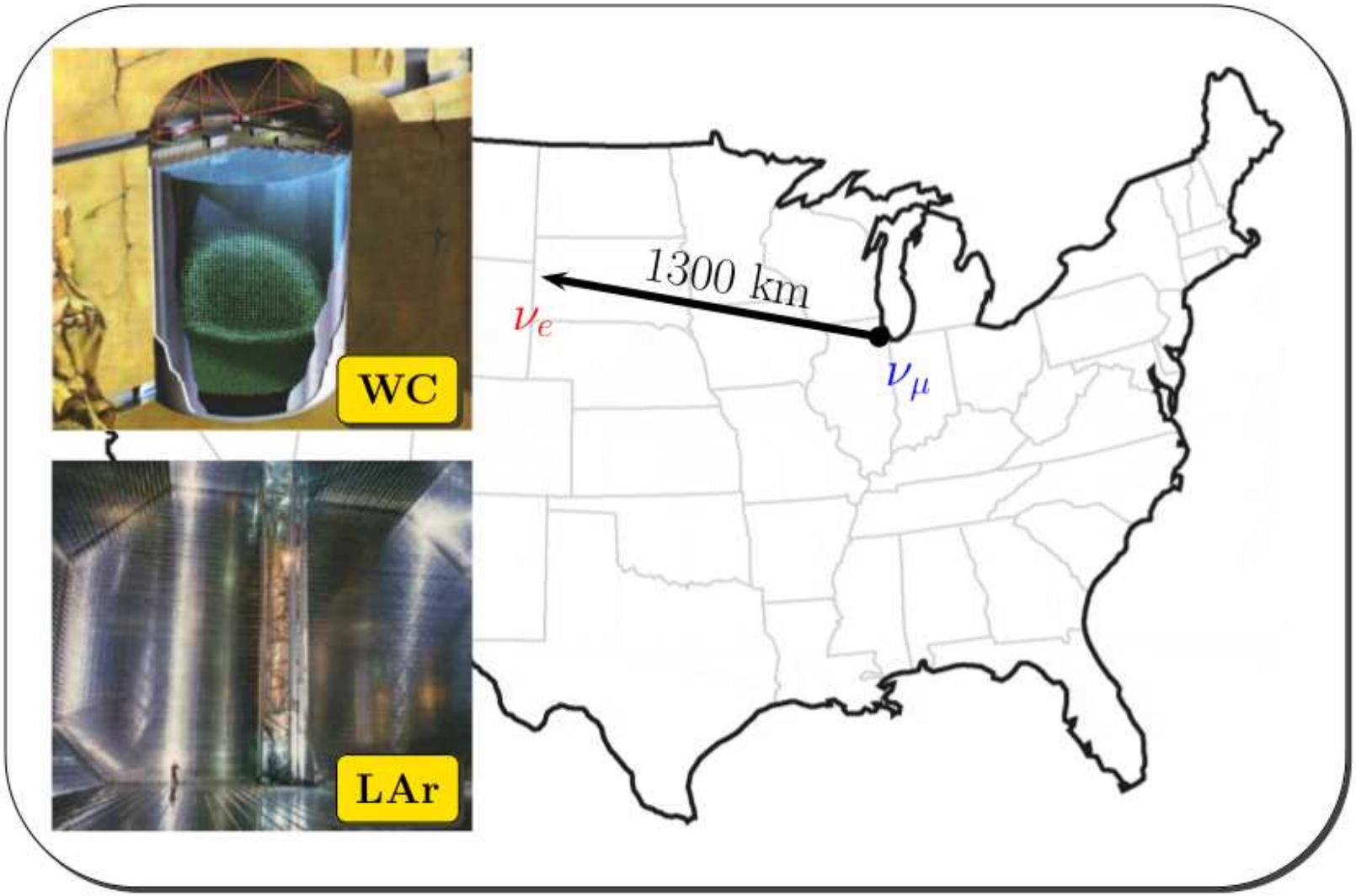
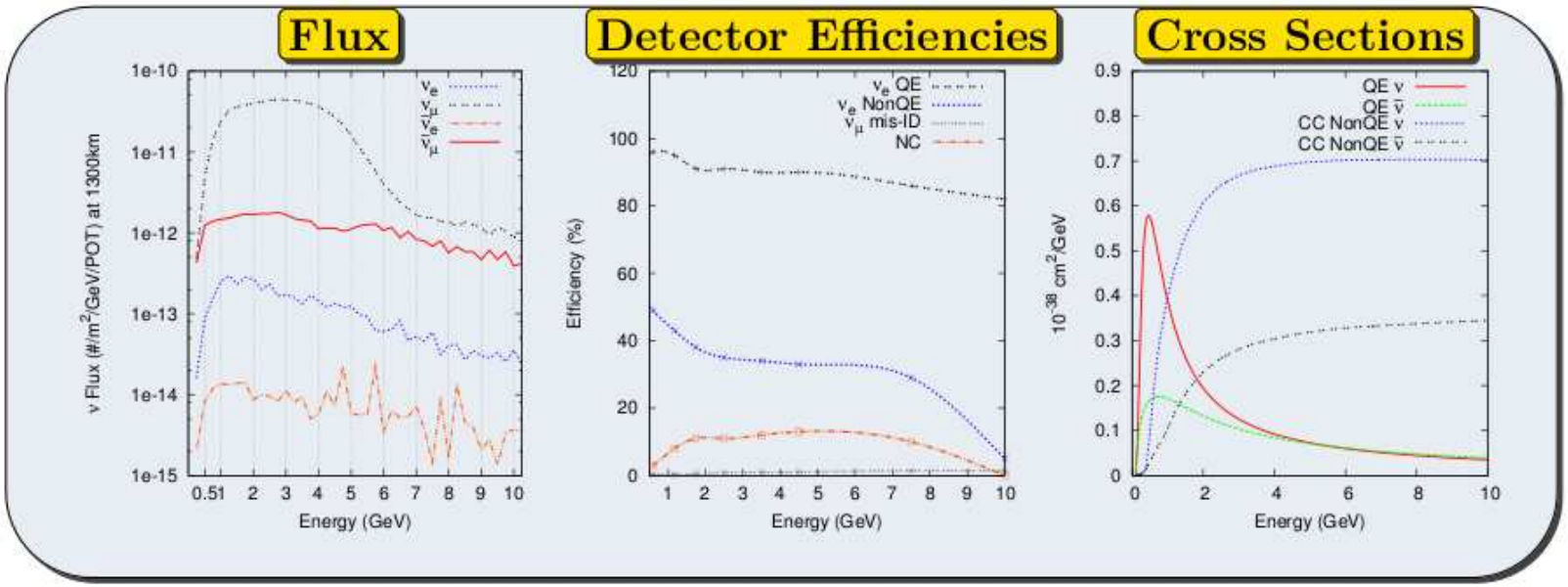


- Primary Goal: Measurement of $\sin^2(2\theta_{13})$, δ_{CP}, and $sgn(\Delta m^2_{32})$

General Long-Baseline Experiment Simulator (GLoBES)

- GLoBES is a C-library for describing neutrino experiments
- Flux, cross-sections, detector efficiencies and response functions provided to GLoBES via external input files



- Minimizes $\Delta\chi^2$ for the appropriate hypothesis (e.g. $\sin^2(2\theta_{13}) \neq 0$) incorporating oscillation parameter correlations and systematics

Estimating Sensitivities with GLoBES

- Compute $\Delta\chi^2$ for each point on a grid of simulated "true" δ_{CP}-$\sin^2(2\theta_{13})$ values compared to each null hypothesis:
  - $\sin^2(2\theta_{13}) = 0$
  - $\delta_{CP} = 0, \pi$
  - $sgn(\Delta m^2_{32}) = -$ (for normal mass hierarchy)
- Plot the $\Delta\chi^2 = 9$ contours for each null hypothesis to get the non-zero θ_{13}, CPV, and MH sensitivities

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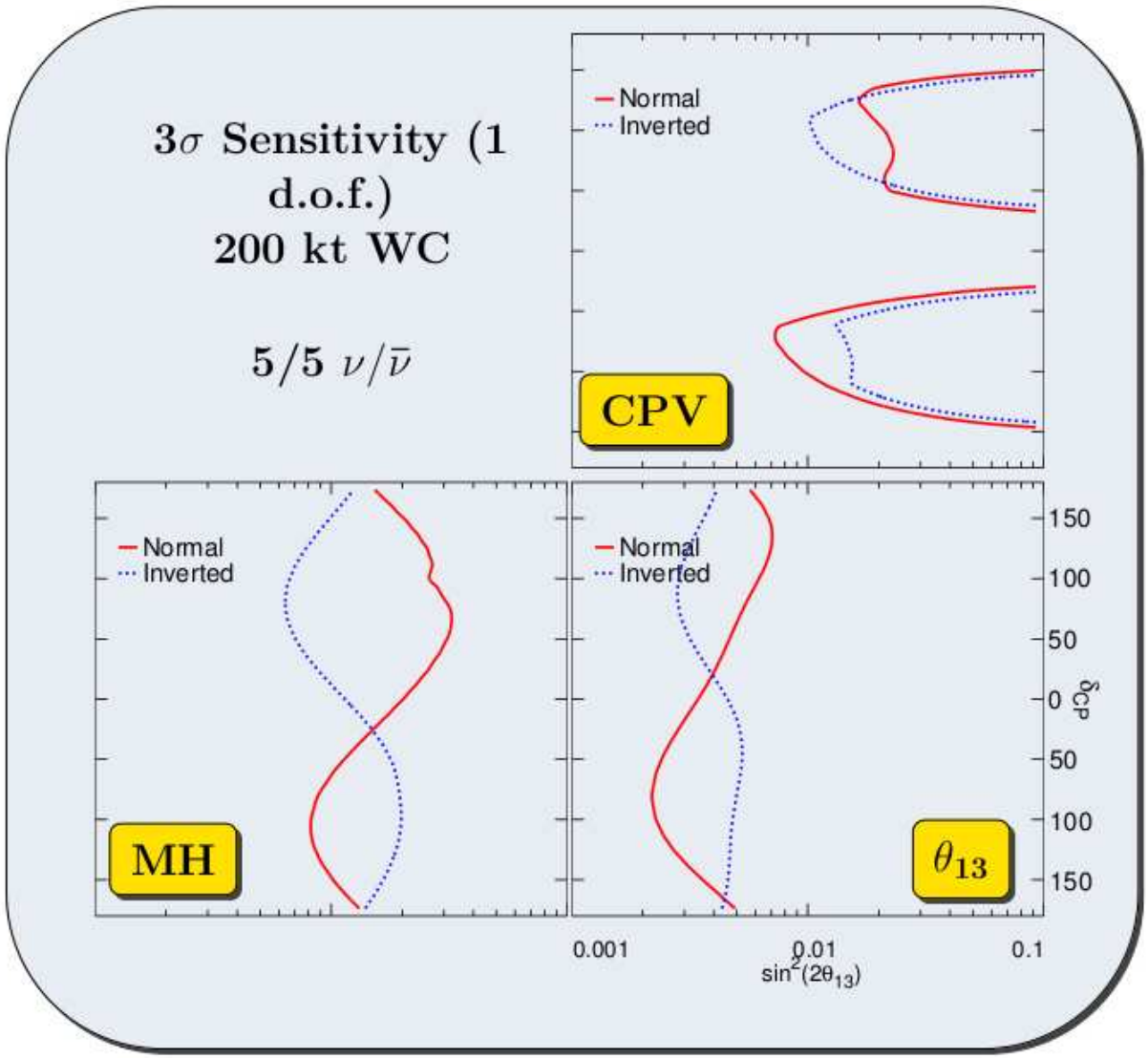

Conclusions

- The Long-Baseline Neutrino Experiment is being designed for maximal sensitivity to the neutrino oscillation parameters $\sin^2(2\theta_{13})$, δ_{CP}, and $sgn(\Delta m^2_{32})$
- GLoBES facilitates the estimation of sensitivities to these parameters
- We are using GLoBES to estimate sensitivities for LBNE
- Example studies:
  - What is the optimal distribution of ν and $\bar{\nu}$ running times?
  - What is the contribution of flux at the second oscillation maximum to the sensitivities?
  - Will systematics limit the sensitivity of the experiment?