Environmental decoherence in atmospheric neutrinos with IceCube

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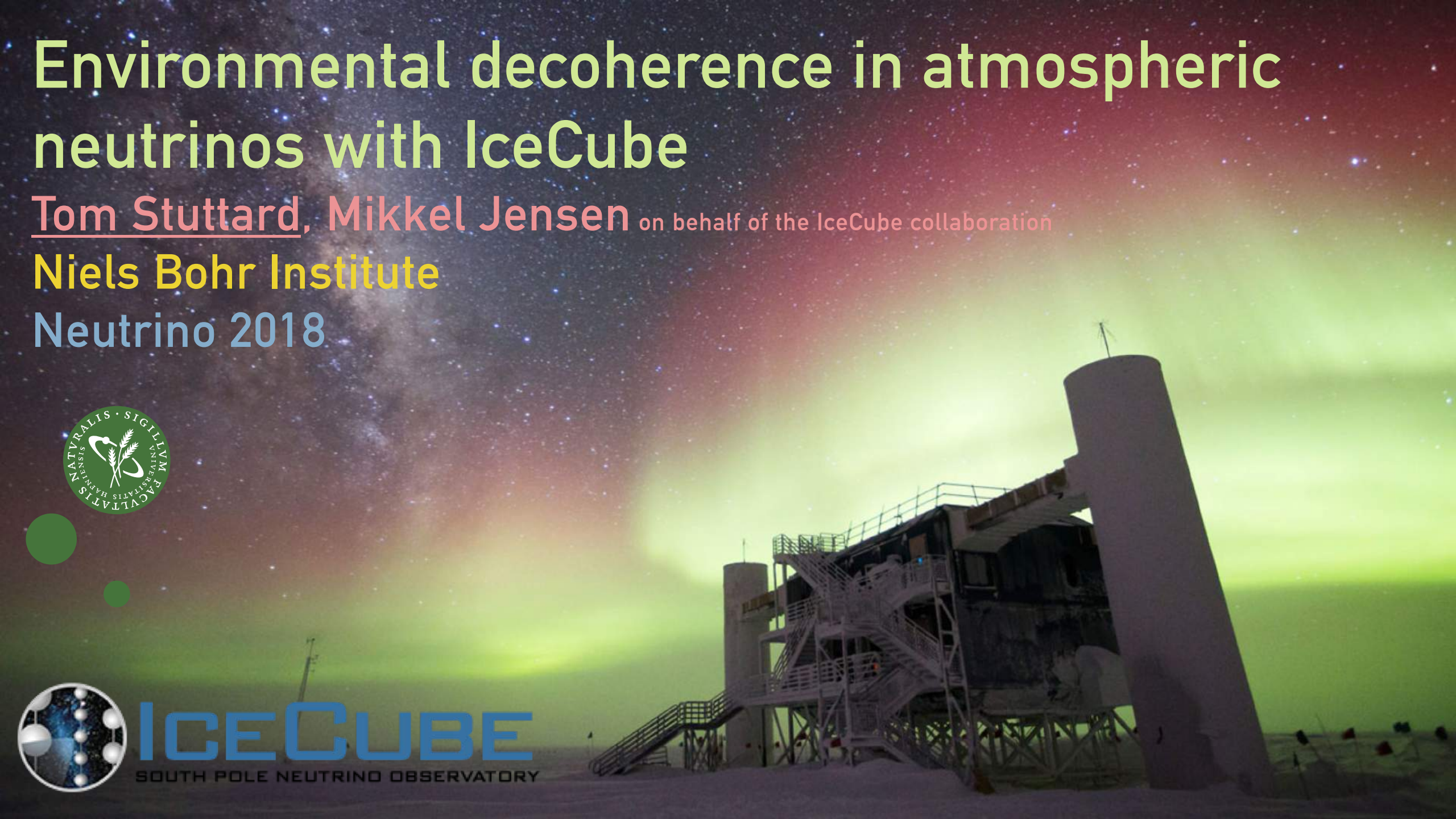
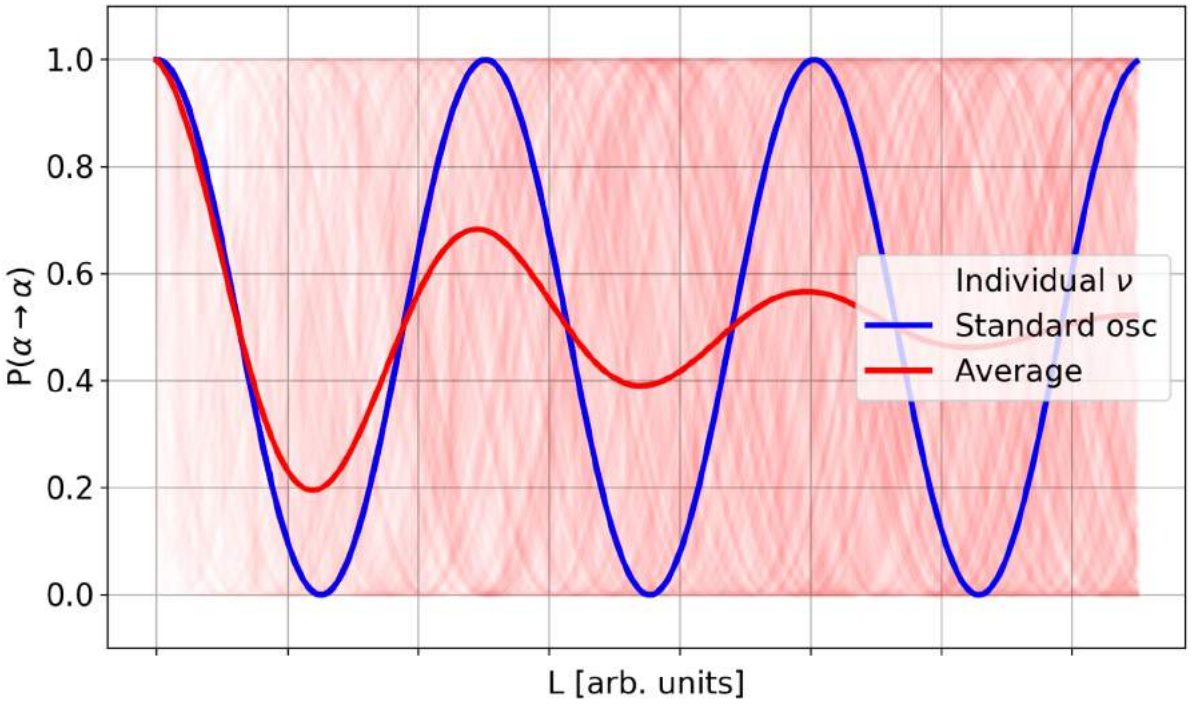


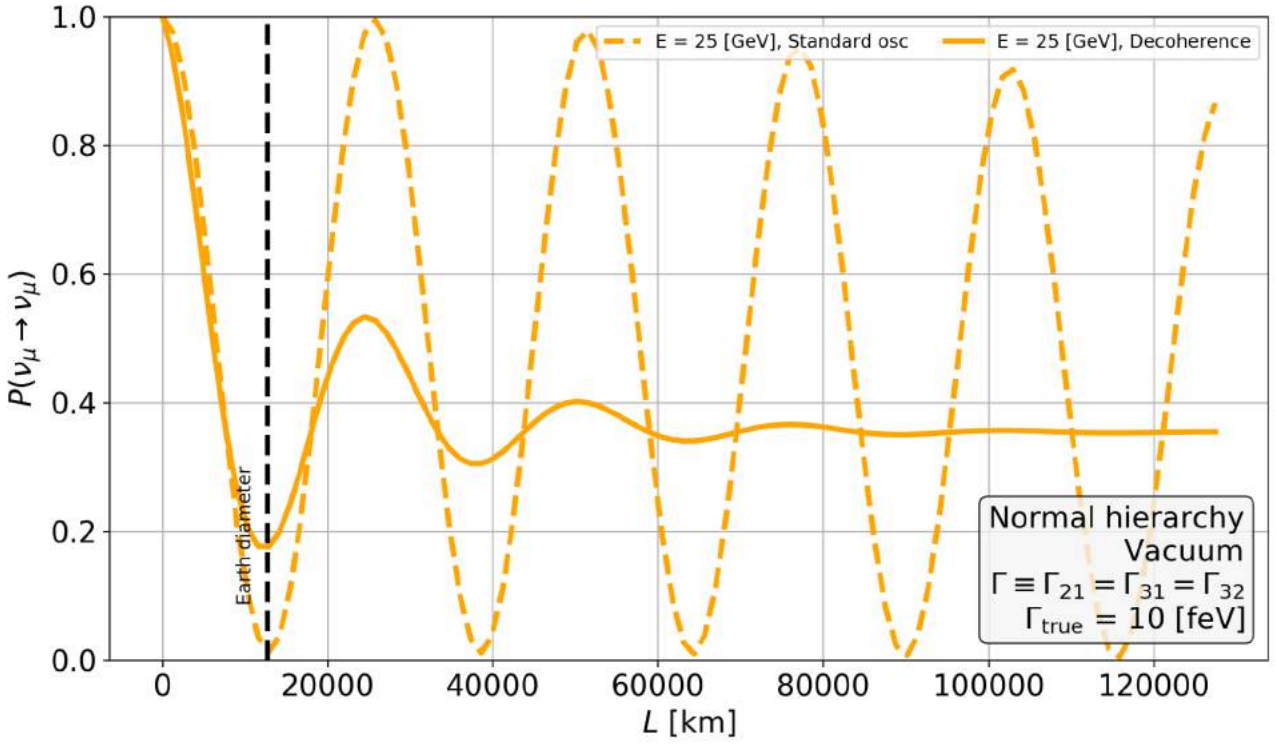
Environmental ν decoherence

- Weak coupling between neutrino and environment → **decoherence**
- **Damping** of oscillation probability over distance/time

Toy model, 2 flavor



Atmospheric ν_μ survival

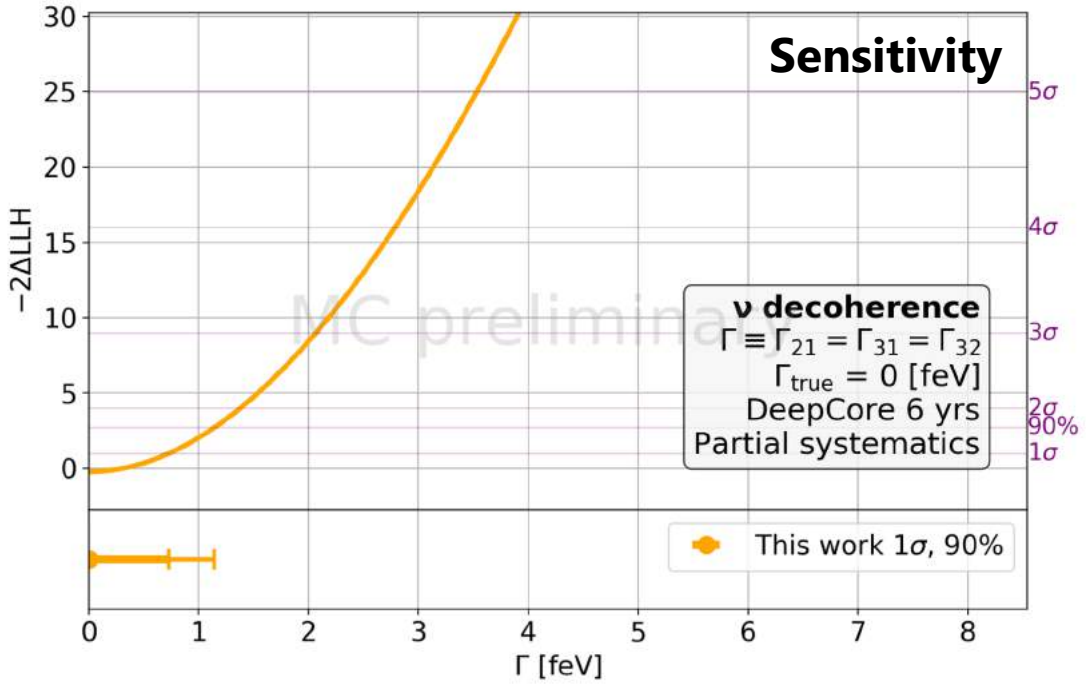


- Atmospheric ν_μ disappearance varies with **zenith angle** (and **energy**)

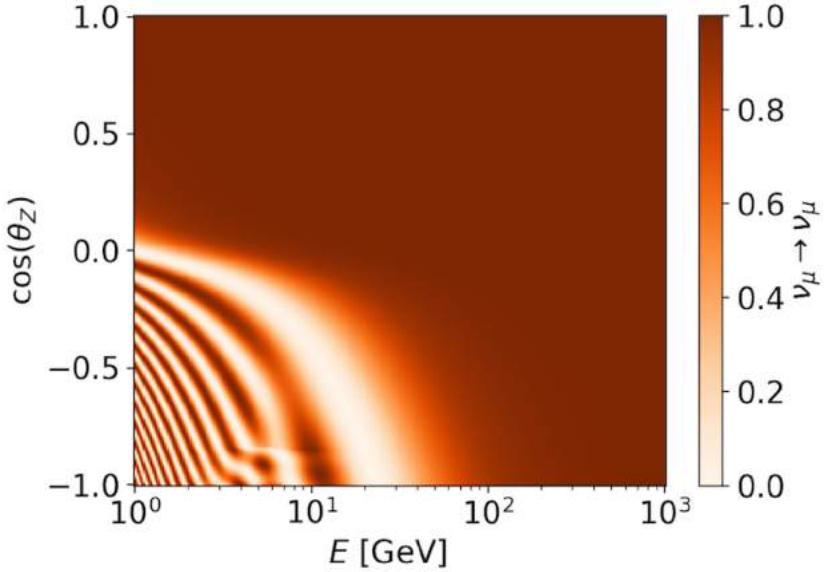
ν decoherence in IceCube

- DeepCore/IceCube analyses underway
  - Microphysics-independent model

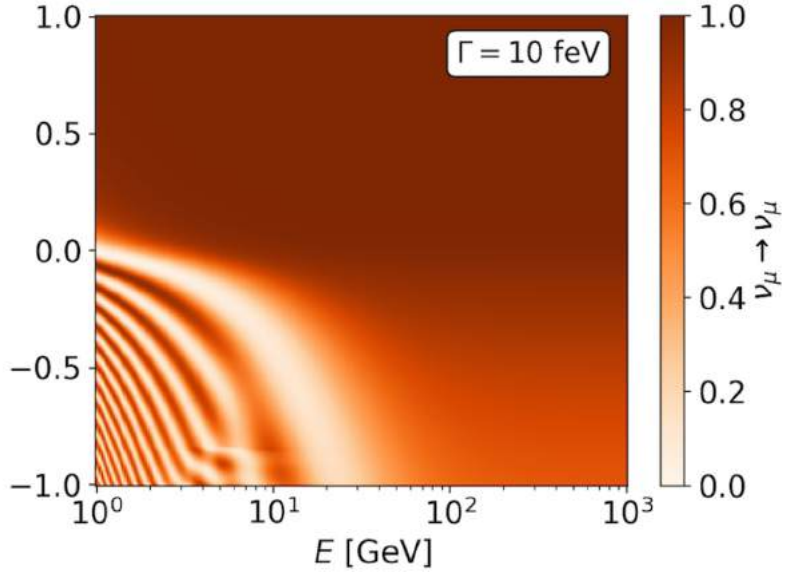
$$\dot{\rho} = -i[H, \rho] - \begin{pmatrix} 0 & \rho_{12}\Gamma_{21} & \rho_{13}\Gamma_{31} \\ \rho_{21}\Gamma_{21} & 0 & \rho_{23}\Gamma_{32} \\ \rho_{31}\Gamma_{31} & \rho_{32}\Gamma_{32} & 0 \end{pmatrix}$$



Standard oscillations



Decoherence



Difference