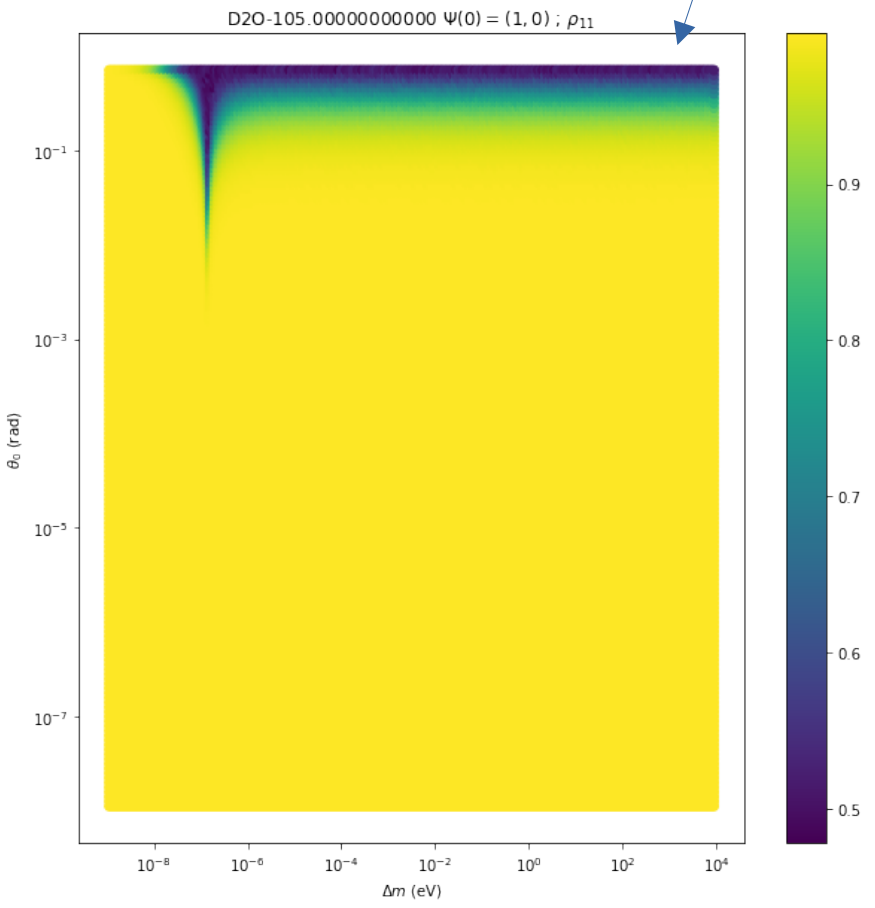
Parameter Map for D_2O in STEREO

ORNL n → n' Weekly Meeting Update
10-11-2022
Cary Rock

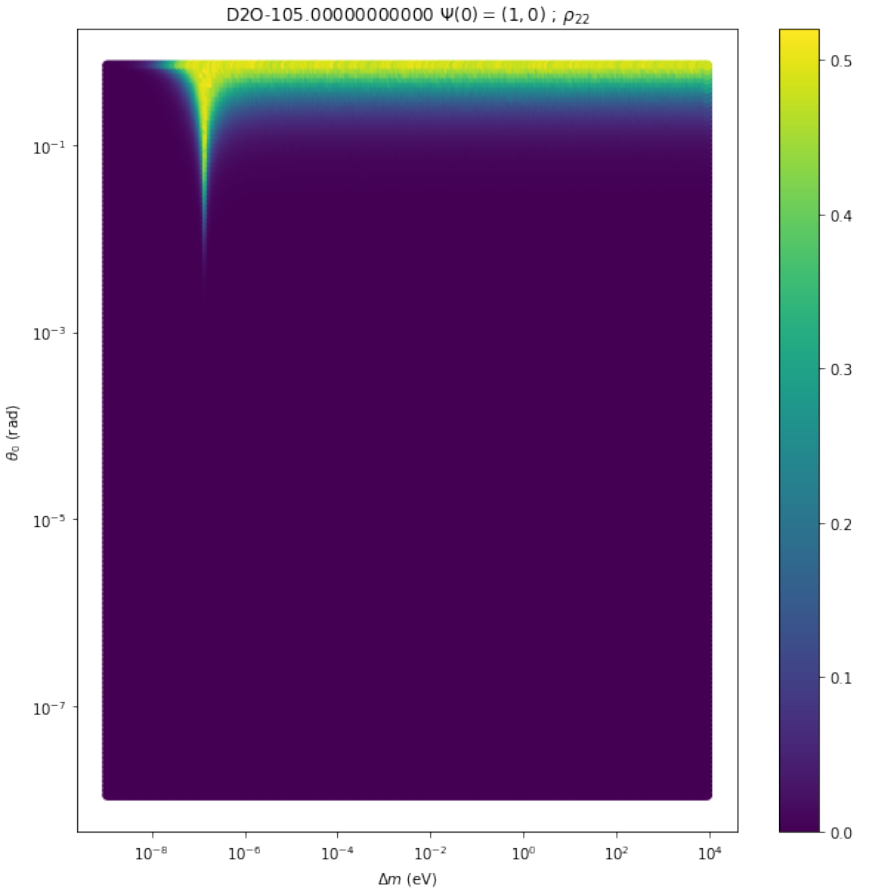
Large Mixing Angle

- A large mixing angle (e.g., θ ≈ 0.1 rad) indicates potentially observable disappearances of neutrons from reactors (which are not seen).



Large Mixing Angle, cont'd.

- Since these large angles predict missing neutron fluxes from nuclear reactors, they would be simple to test for (to be formal about it).
- Potentially half of the neutrons could go missing for a D_2O reactor – this would have already been detected due to missing fluxes.

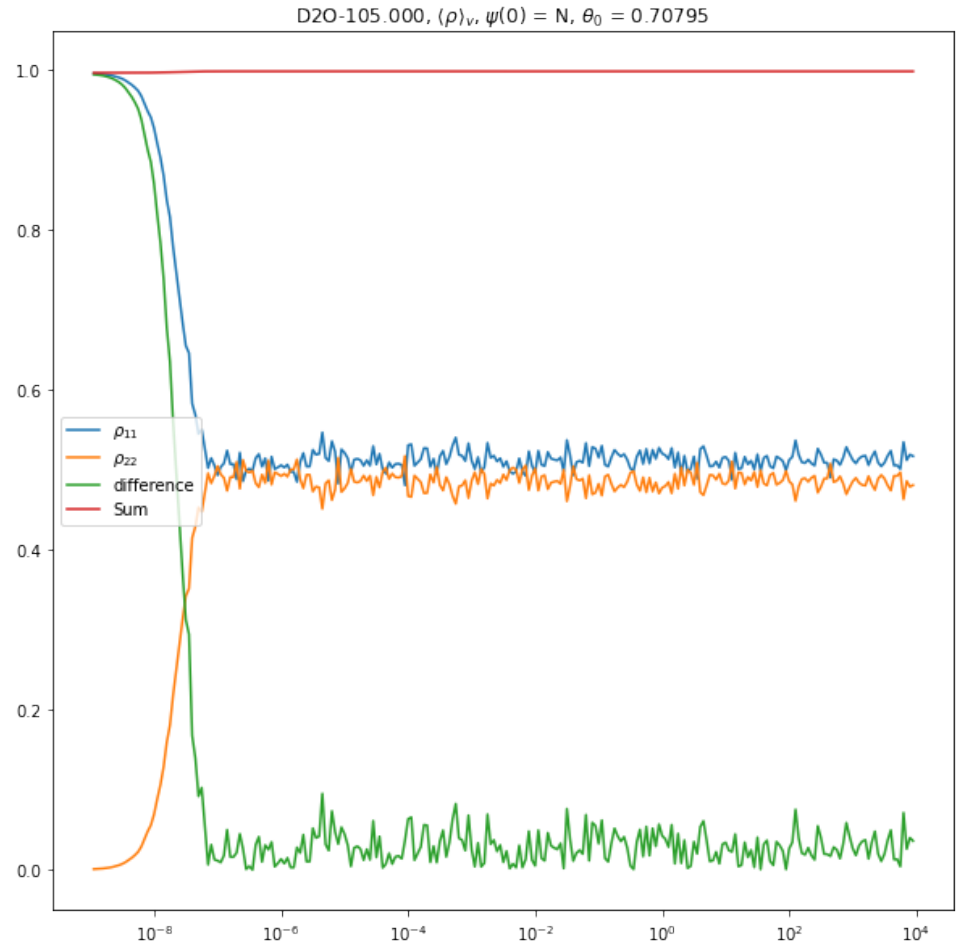


Final Plots

- For θ = 0.70795:

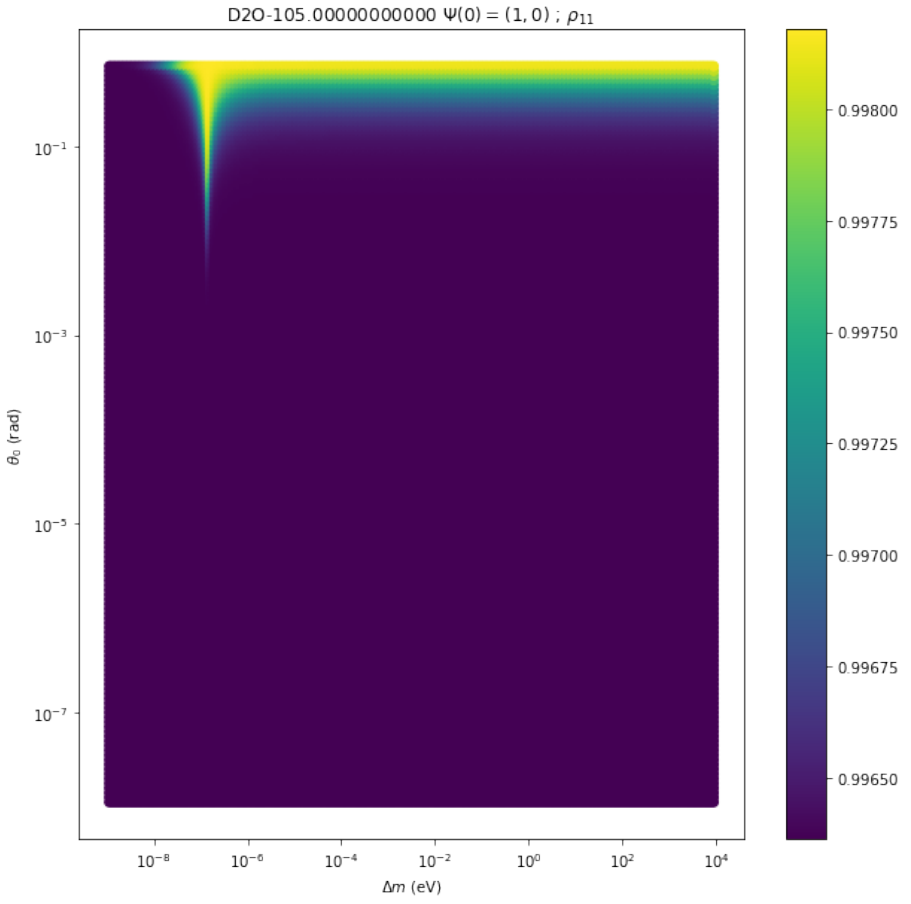
  The difference is the absolute difference,

  $| \rho_{11} - \rho_{22} |$



Final Plots, cont'd.

- Sum of probabilities of ρ_{11} and ρ_{22}:



Simulation Method

- The simulation uses density matrix formulation written by Kamyshkov, Ternullio, Varriano, Berezhiani.
- Pros: Fast, straightforward
- Cons: Ignores the phase of the particle at the “ends” of materials when feeding into next material

STEREO Analysis Method

- Start with Lindblad result (another density matrix), modify based on probability of capture, detection, solid angle, etc.
  - Simple assumptions about calculations make this quick to compute.
- Assumes materials along the way do not contribute significantly to mirror neutron oscillation.
  - Code is being written to compare this method with the KTVB formalism.