Low-Energy Cosmic Neutrons Simulations for Smart Agriculture

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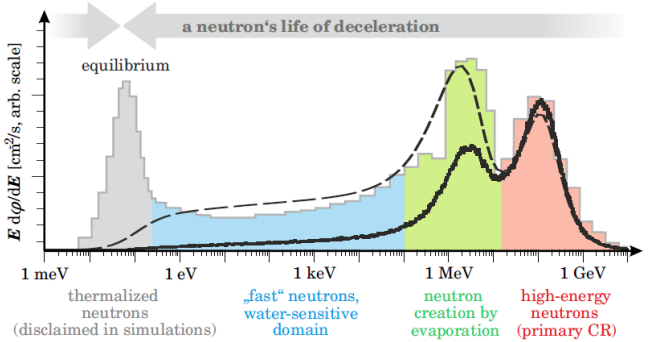
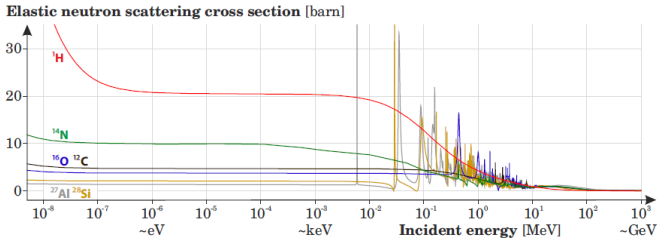
- **COSMIC-RAYS: Neutron Energy Spectra.**
  - High energy neutrons (red).
  - Neutrons created by evaporation (green).
  - Fast Neutrons (blue).
  - Thermalized neutrons (gray).



- **Neutron Interaction Probability.**



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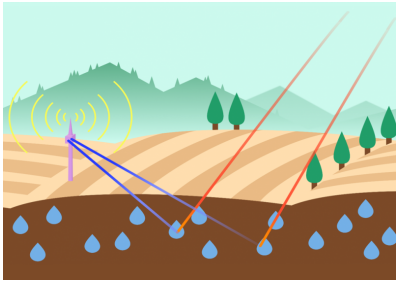
- **COSMIC-RAYS NEUTRON SENSING (CRNS)**
  - Climate-Smart agriculture practices
  - Sensor Monitor:
    - Popular detector gases (^3He, ^{10}B, ^6Li)
    - Lithium-6 foil (Li foil system).
- **URANOS**

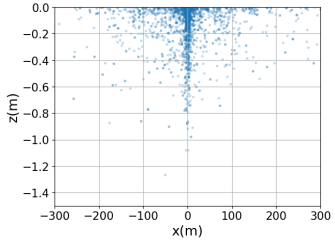
  Ultra Rapid Adaptable Neutron-Only Simulator:

  Intereface
  - Physical parameters.
    Soil humidity, altitude, latitude, soil porosity, air humidity.
  - Computational parameter.
  - Detector.

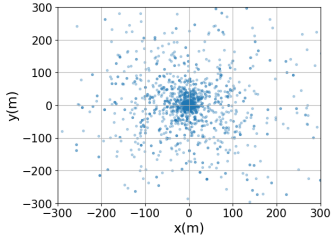


RESULTS

Depth in the soil moisture:

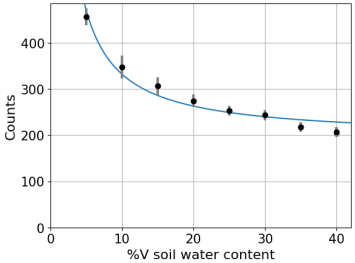


x-y plane view of neutron detection



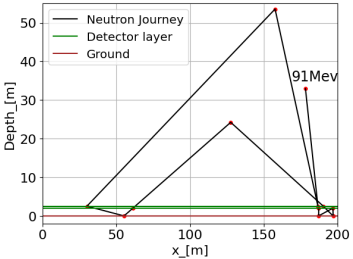
Soil moisture relation in URANOS:

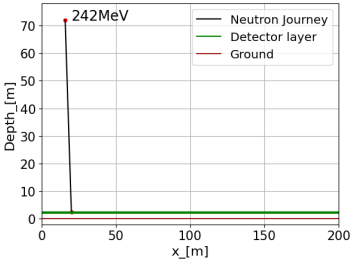
- Porosity 50%, near poles and at sea level.
- Inverse relation between counts and $\%V$ of humidity: $Counts = a + \frac{b}{\%Vwater}$
- $b = 1427.58$ $a = 187.49$



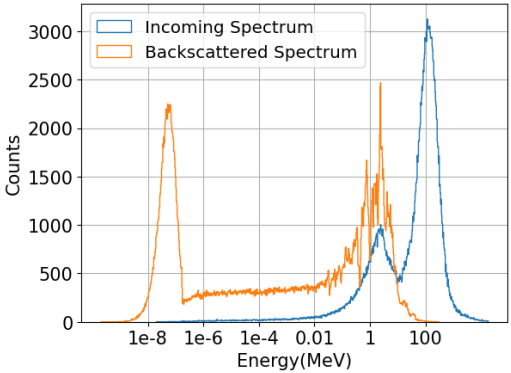
PARTIAL RESULTS

Neutron track (URANOS)



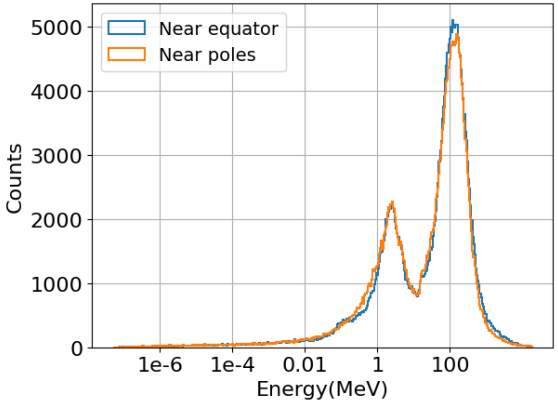


- Porosity 50%, near poles and at sea level, $10\% V$ soil water contain.



RESULTS

Dependence with geomagnetic field (Latitude):



Dependence with Altitude: