

Comprehensive assessment of cosmic-ray-neutron soil moisture measurements using

Bonner Sphere Spectrometers

based on Monte-Carlo simulations

5th Metrology for Meteorology and Climate Conference

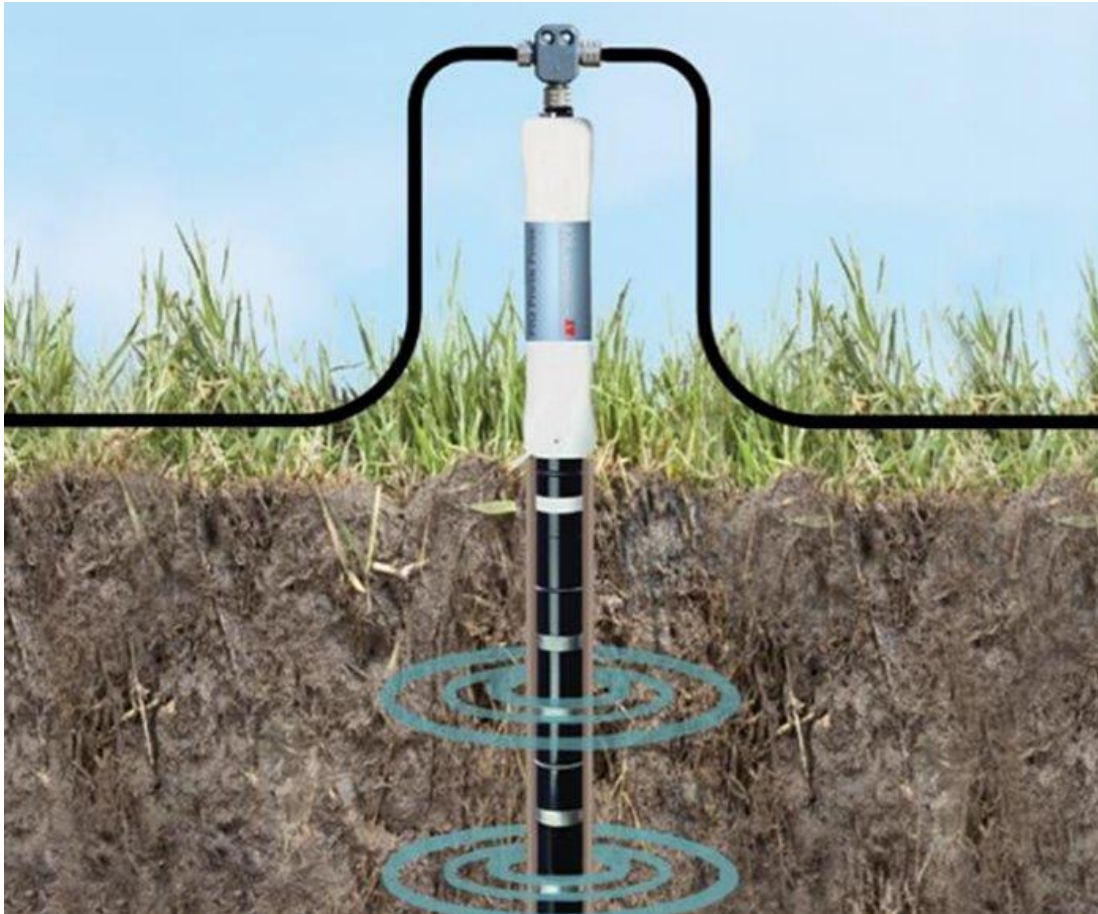
» Introduction to Soil Moisture Measurements

Point Probes

Remote Sensing

CRNS

» Point Probes



- + very precise
- Local
- Not representative

» Remote Sensing



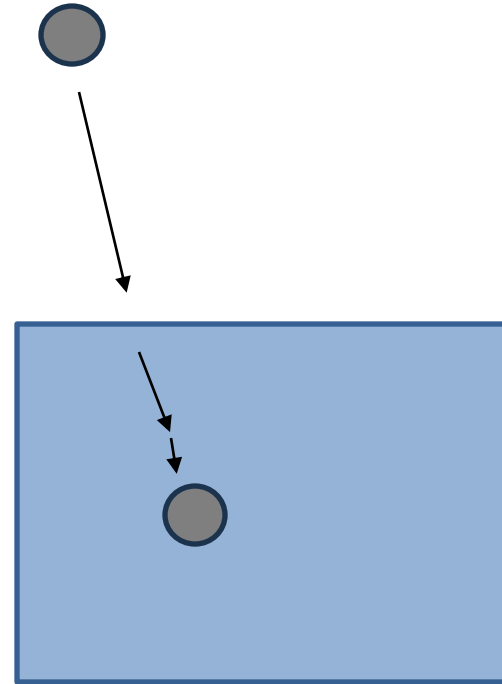
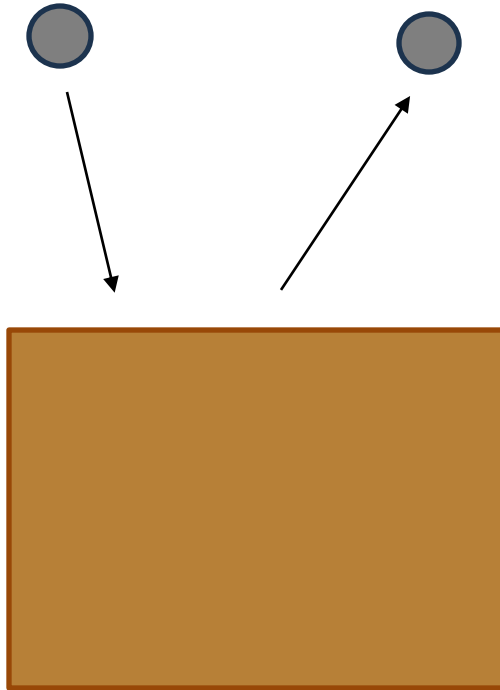
- + Low cost
- imprecise
- Biased
- Not optimal time to resolution ratio



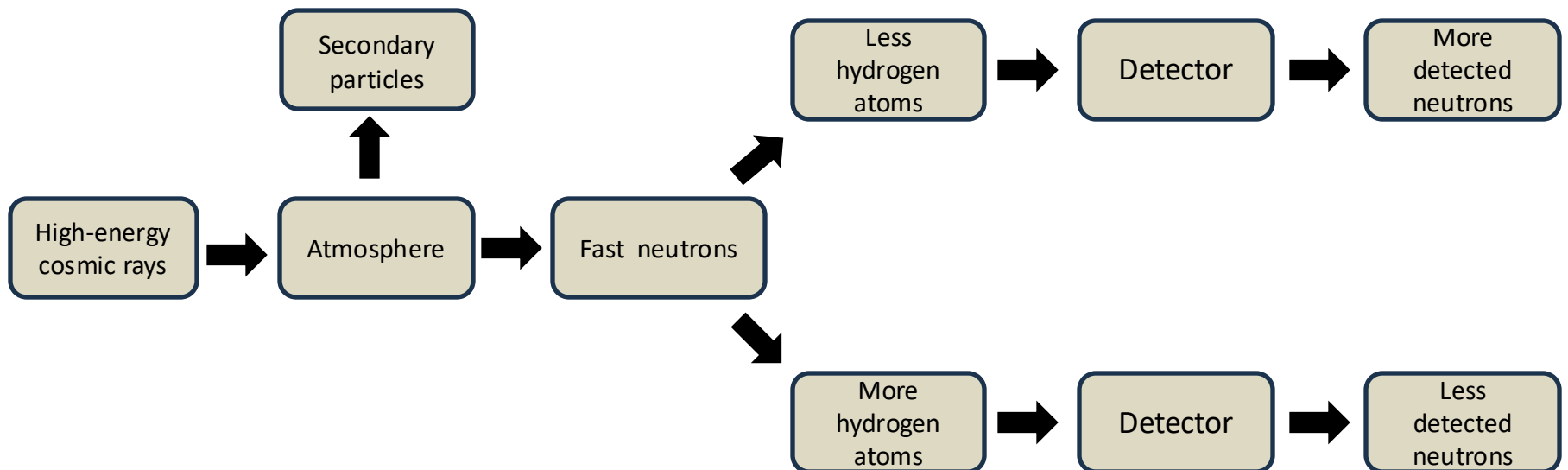
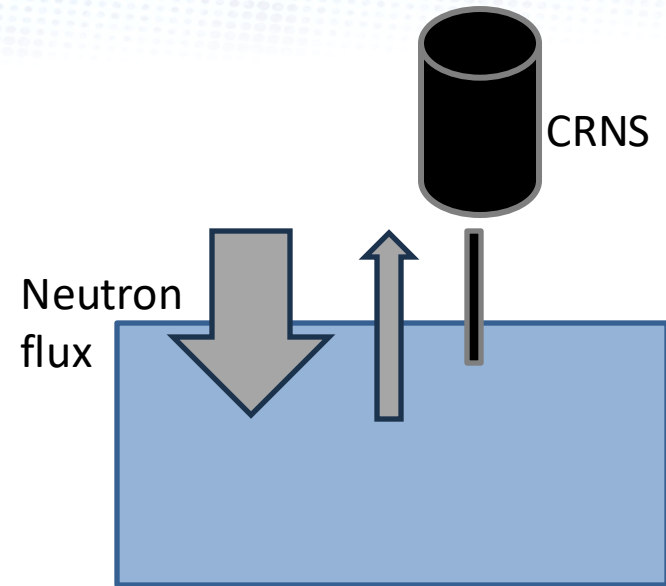
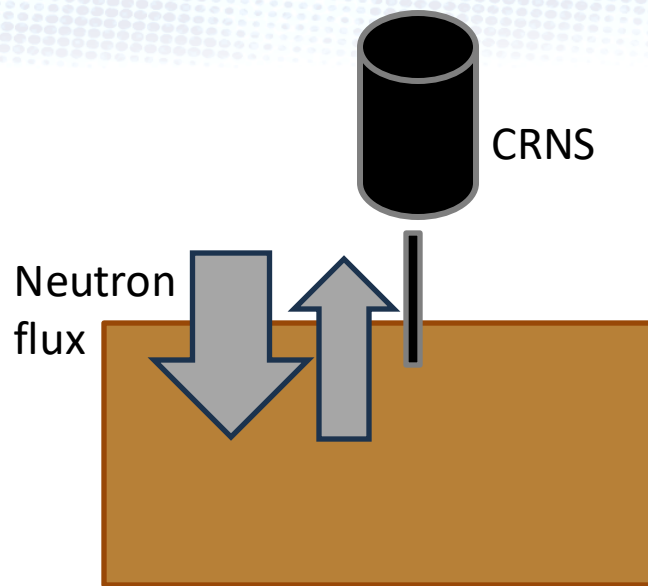
CRNS



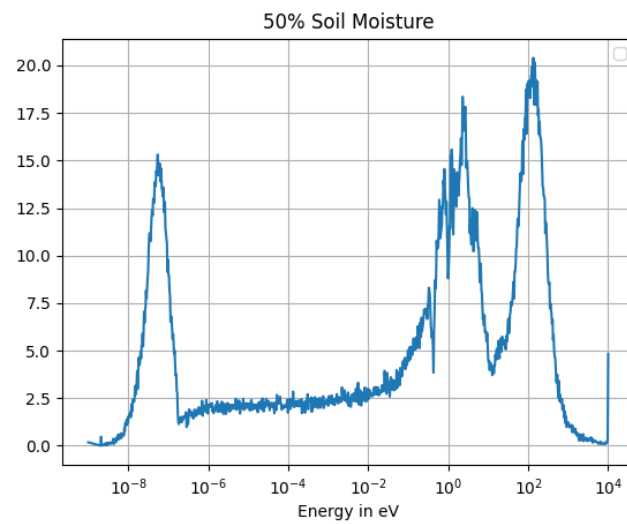
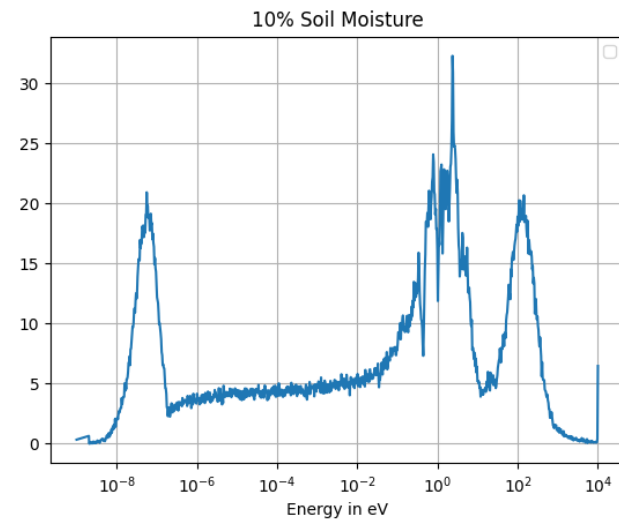
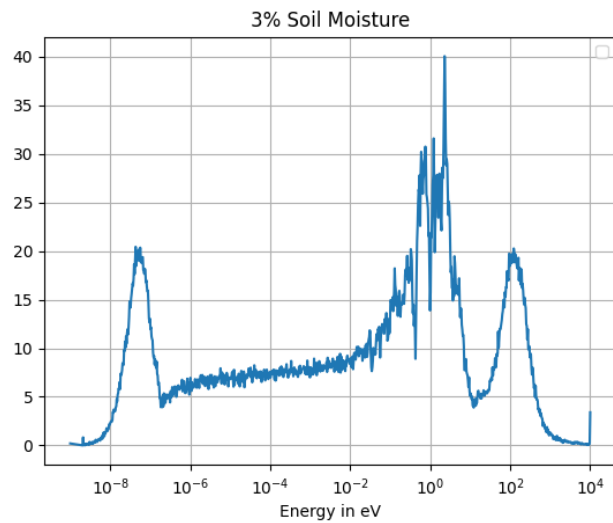
» What is CRNS



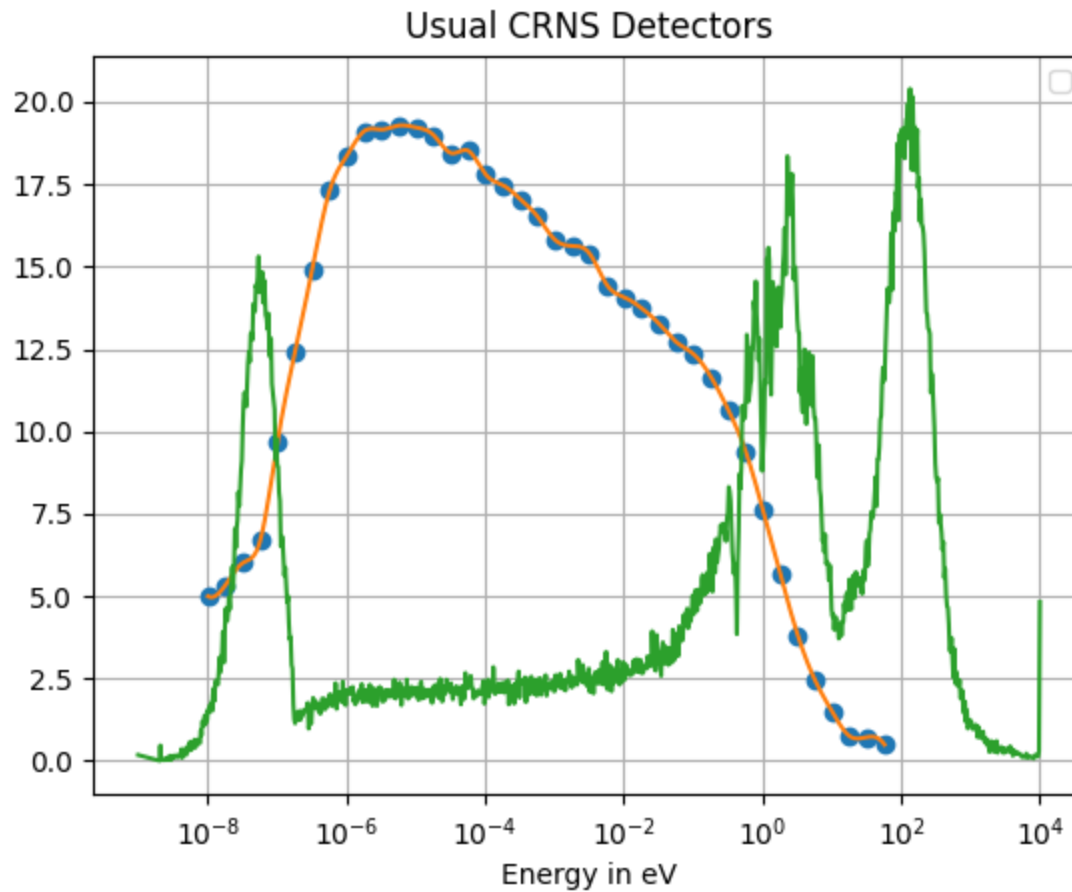
>> What is CRNS



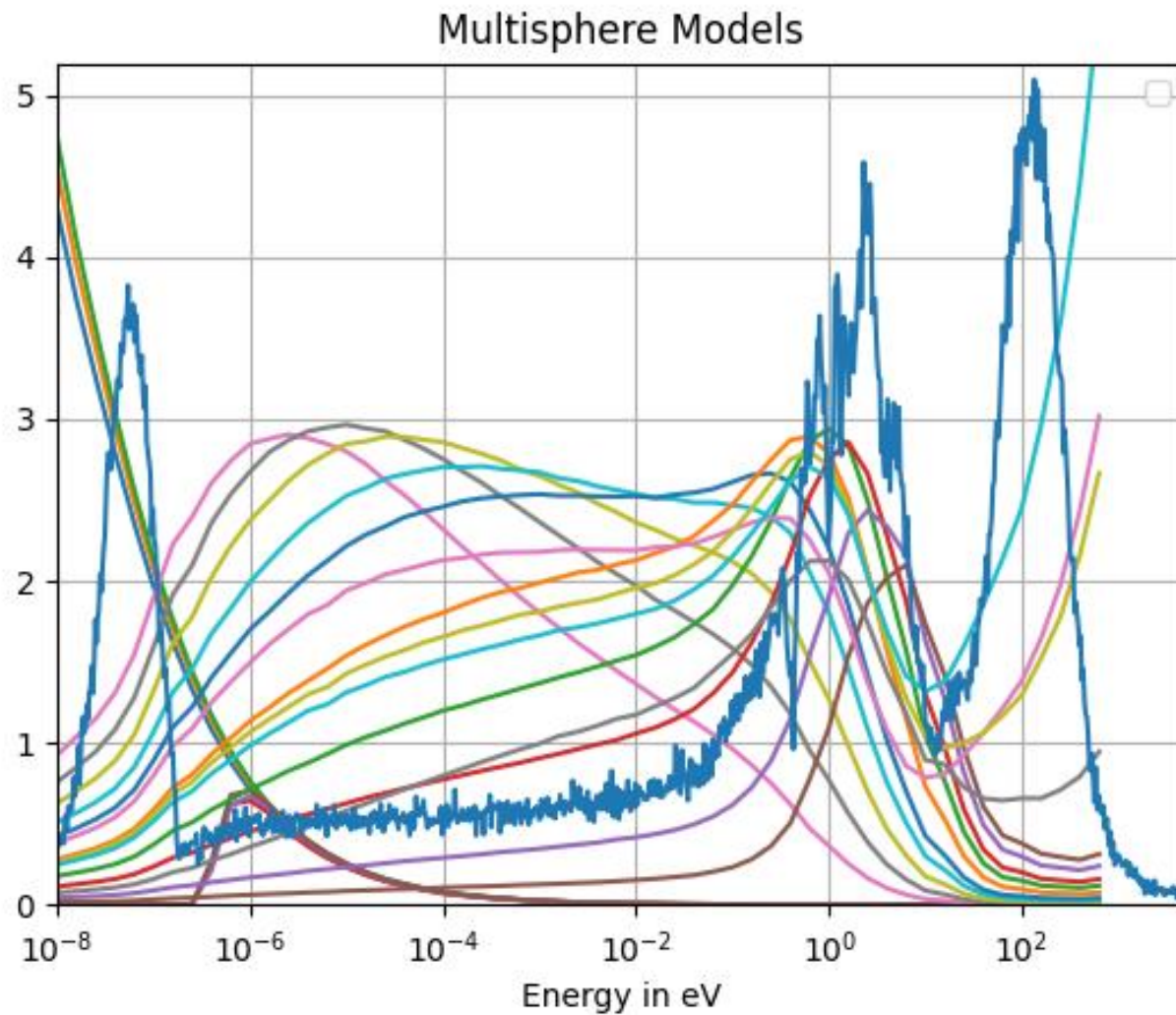
» What is CRNS



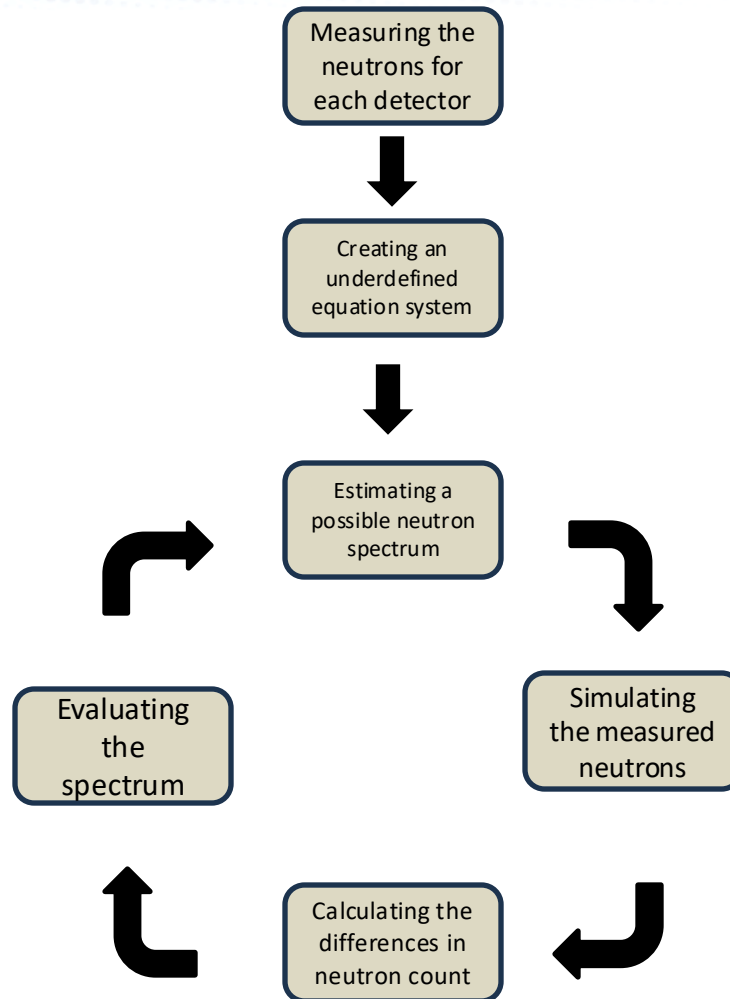
» Problem



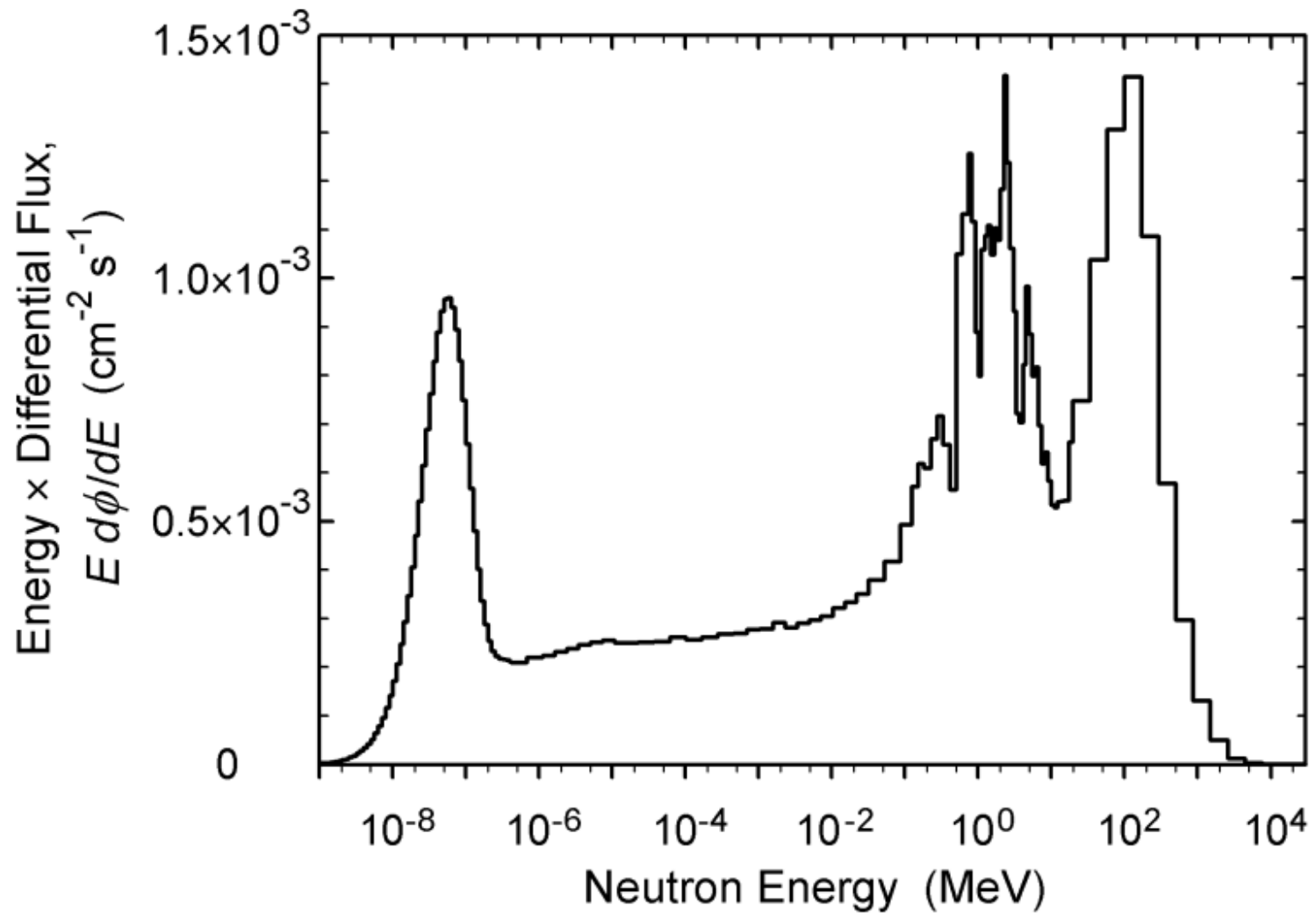
» Pathway: Bonner Sphere Spectrometer



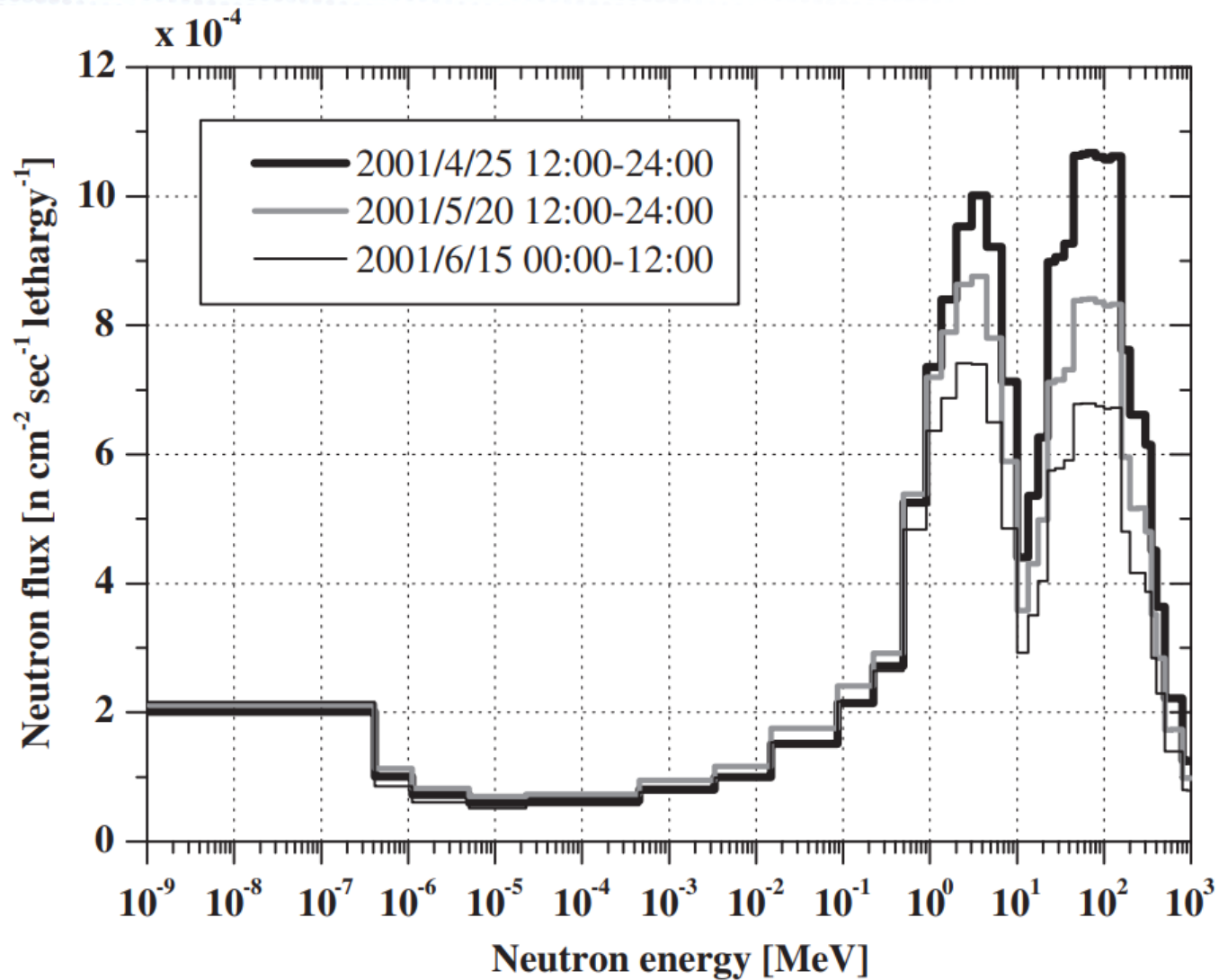
» Unfolding



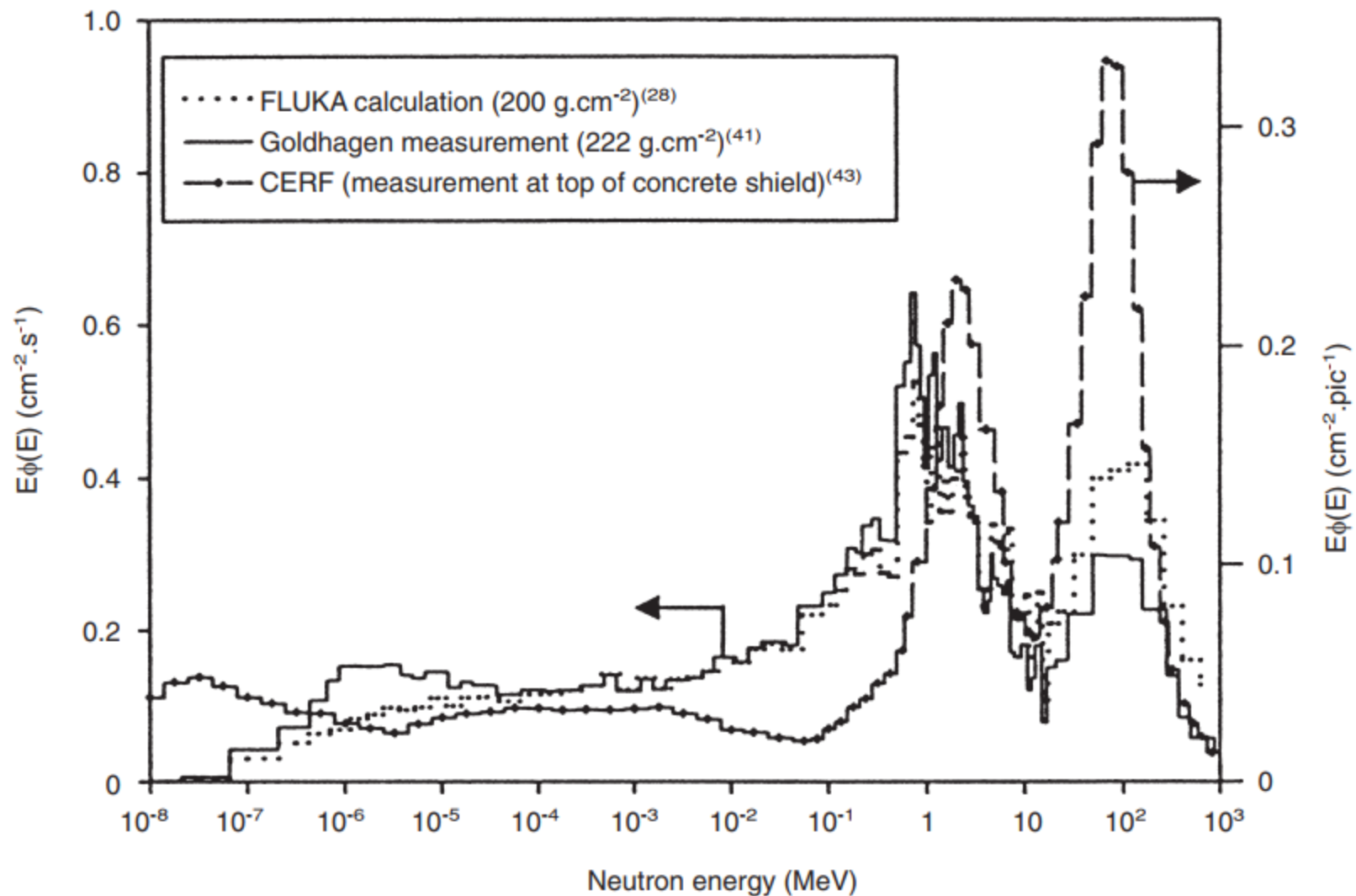
» Examples of BS unfolding in literature



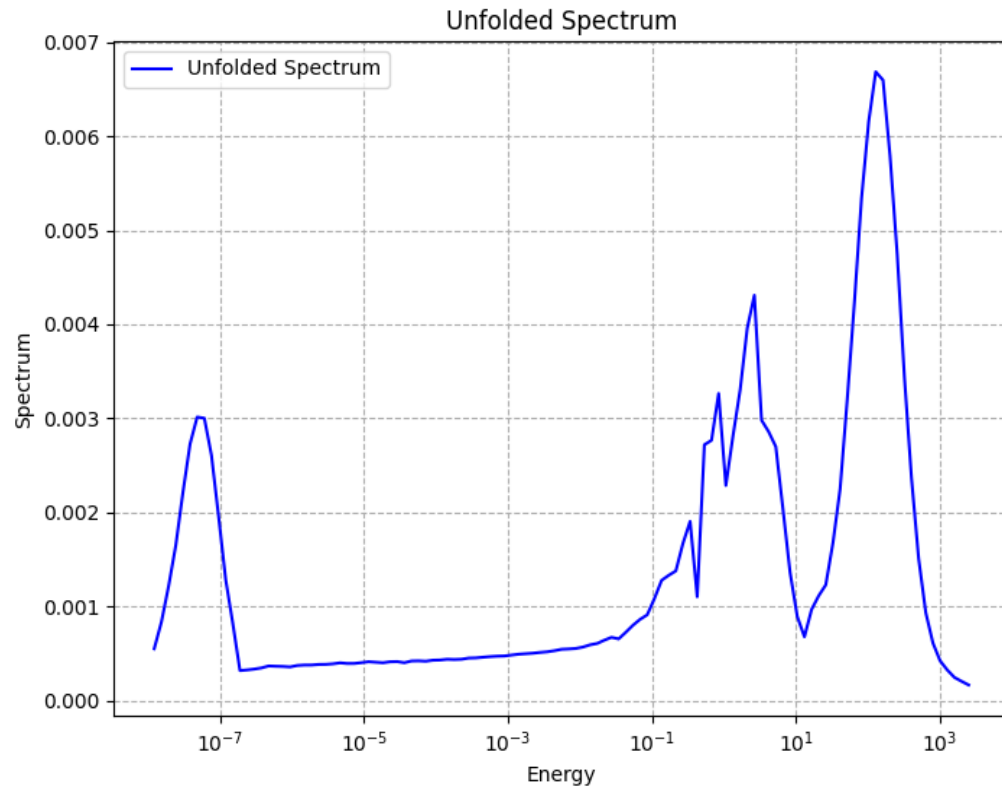
» Examples of BS unfolding in literature



» Examples of BS unfolding in literature

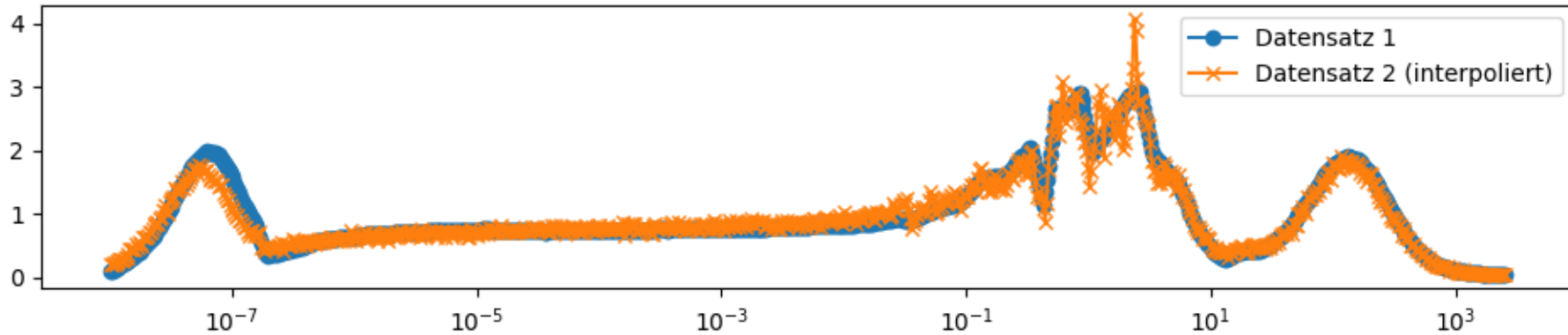


» Results + Analysis

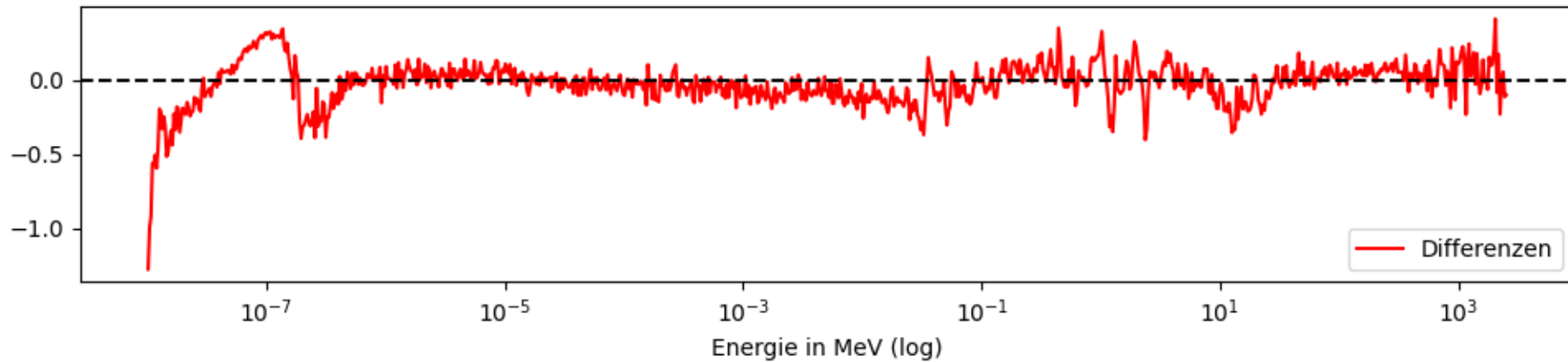


» Results + Analysis

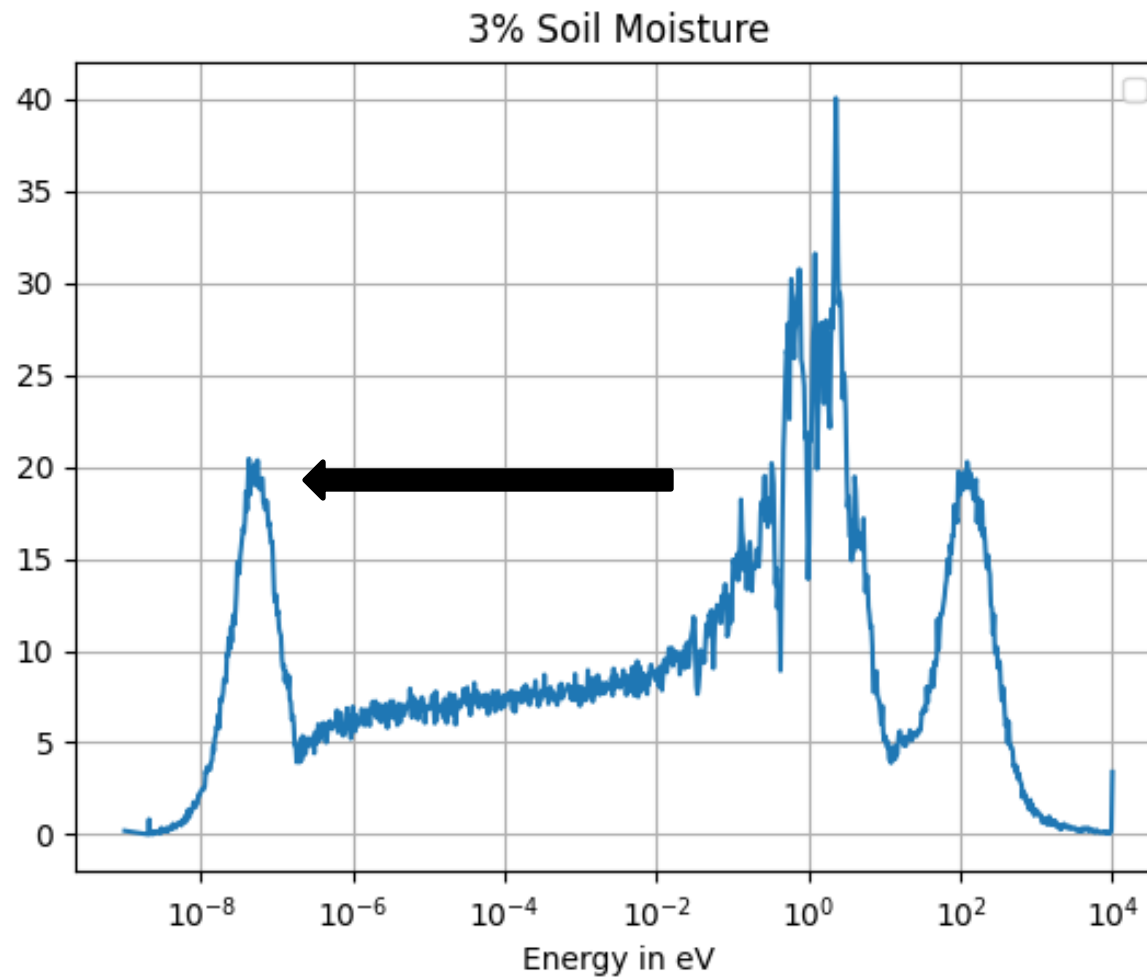
Vergleich der Datensätze (logarithmische x-Werte)



Residuen



» Results + Analysis

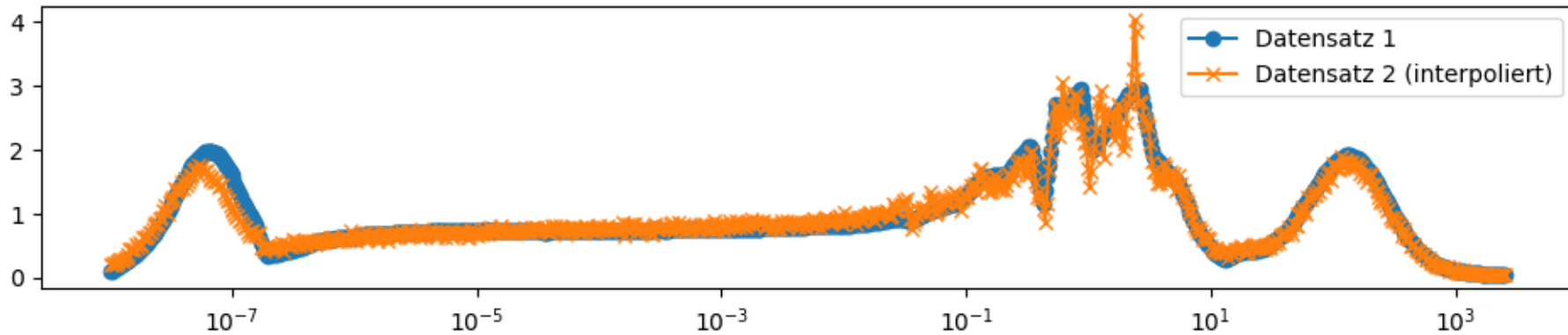


» Results + Analysis

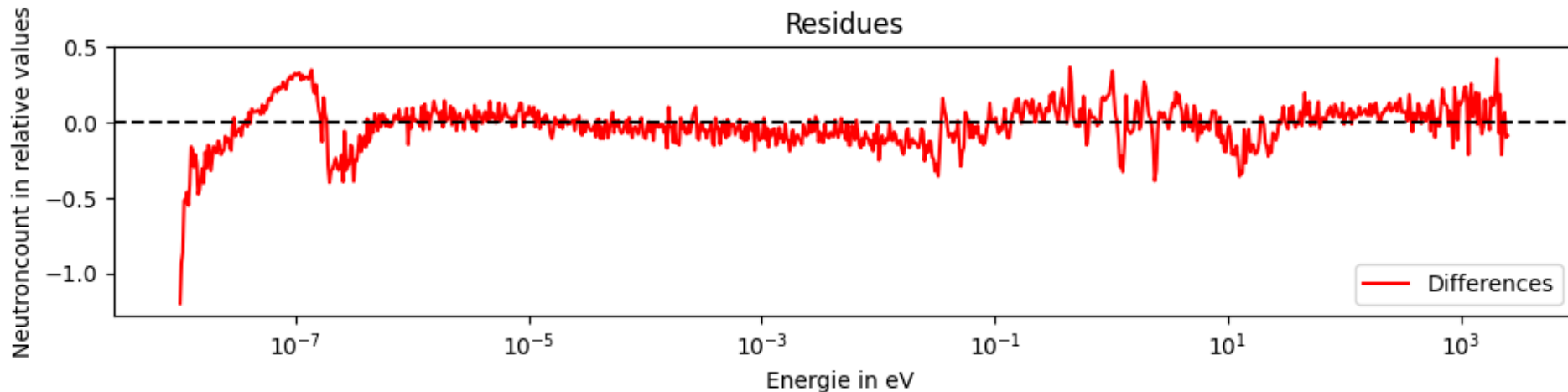
Actual Soil Moisture	Calculated Soil Moisture
50%	66%
10%	8.76%
3%	2.54%

» How do small changes effect the unfolding

Comparisson of the neutron count

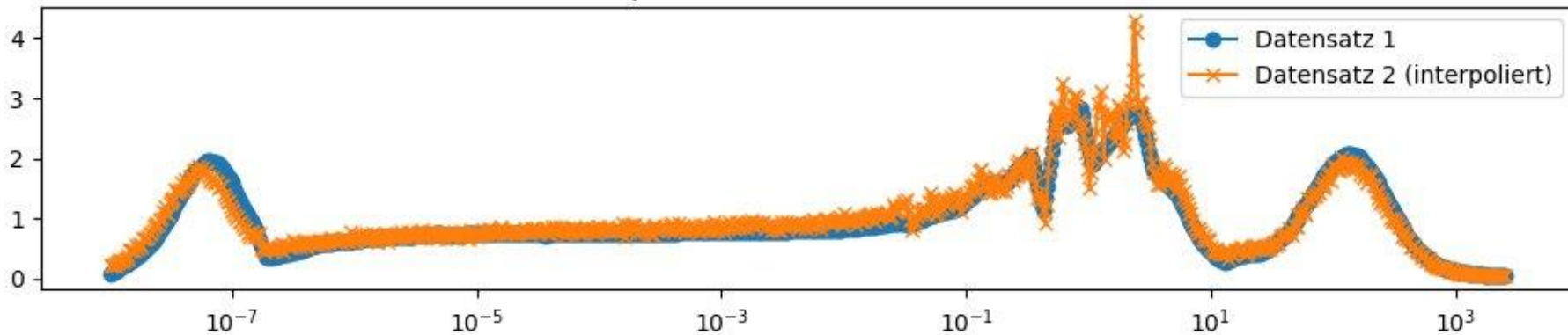


Residues

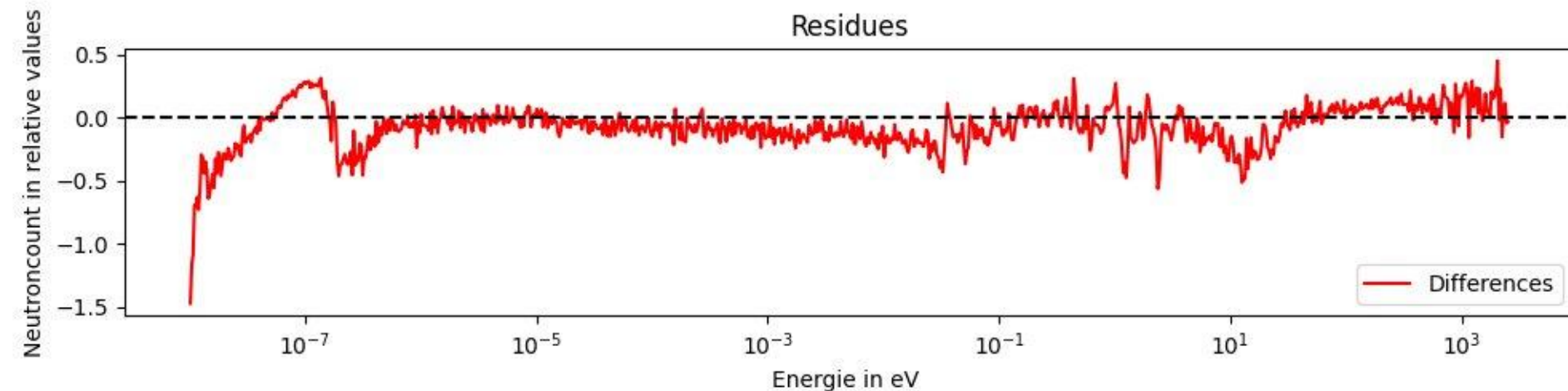


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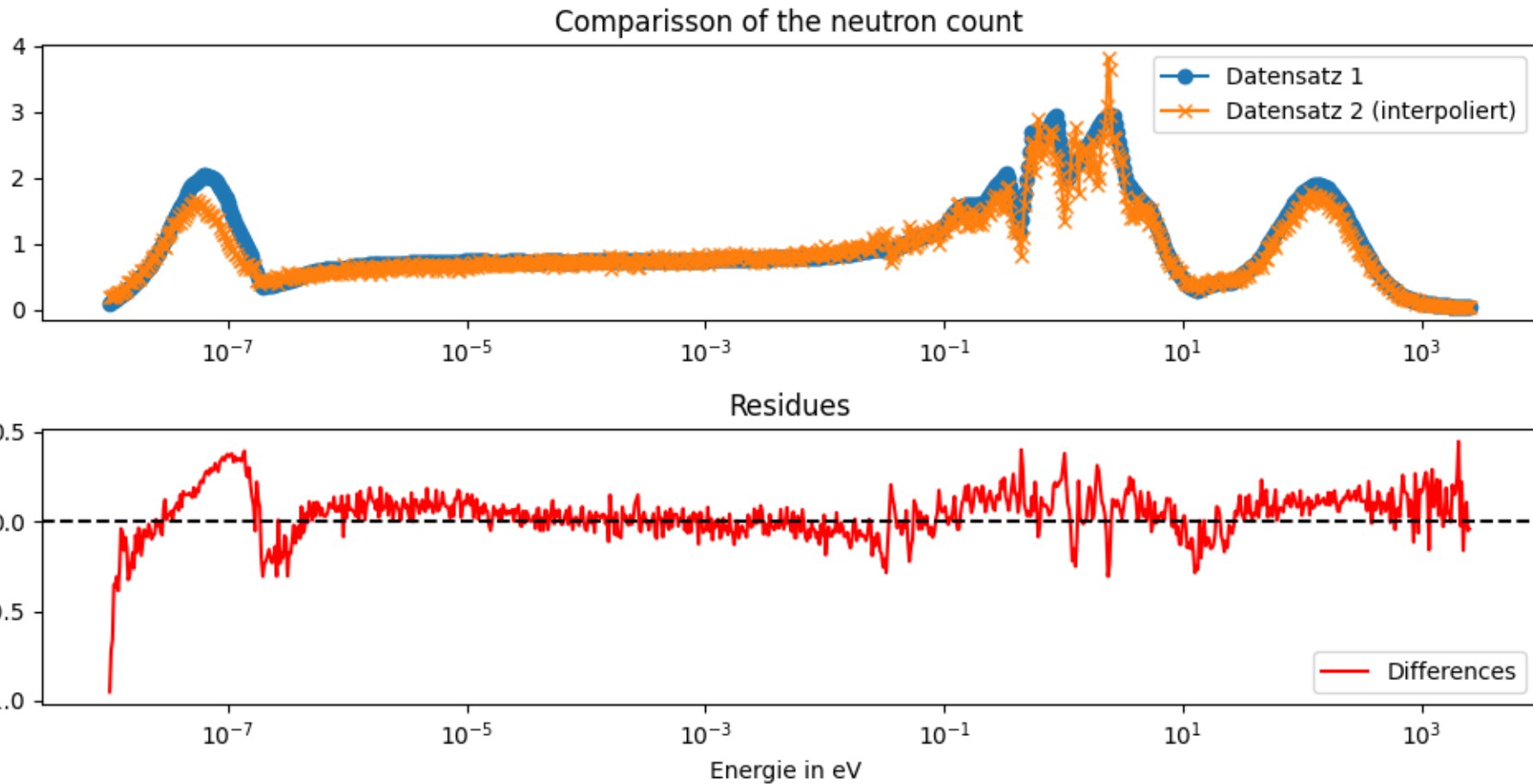
Comparisson of the neutron count



Residues

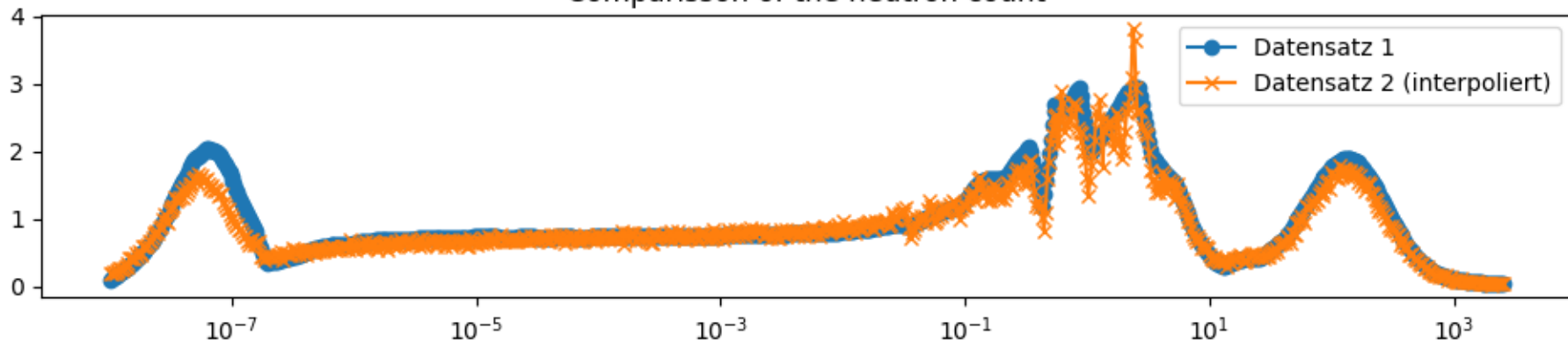


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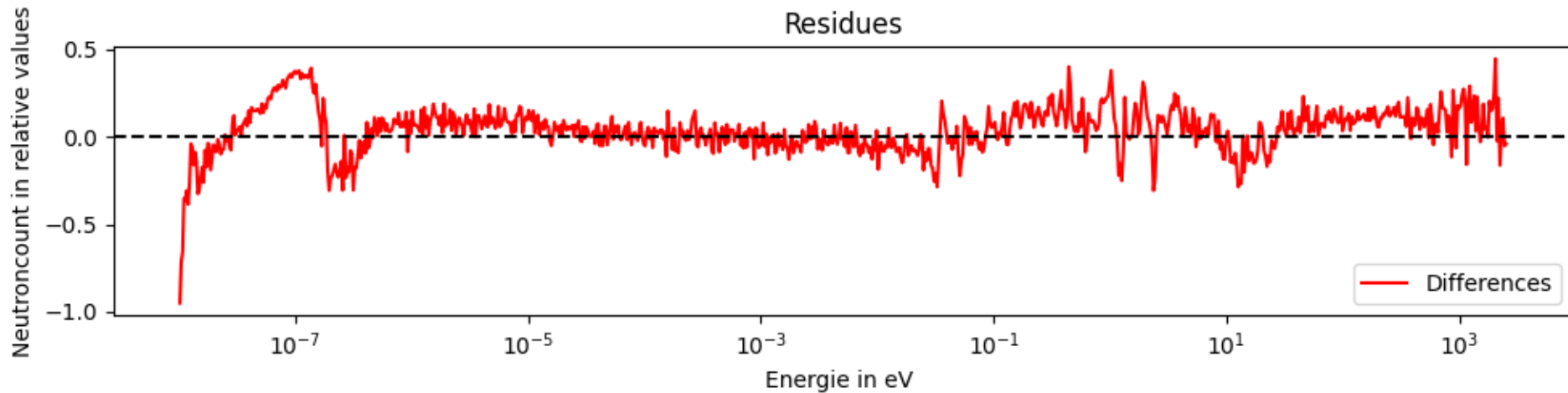


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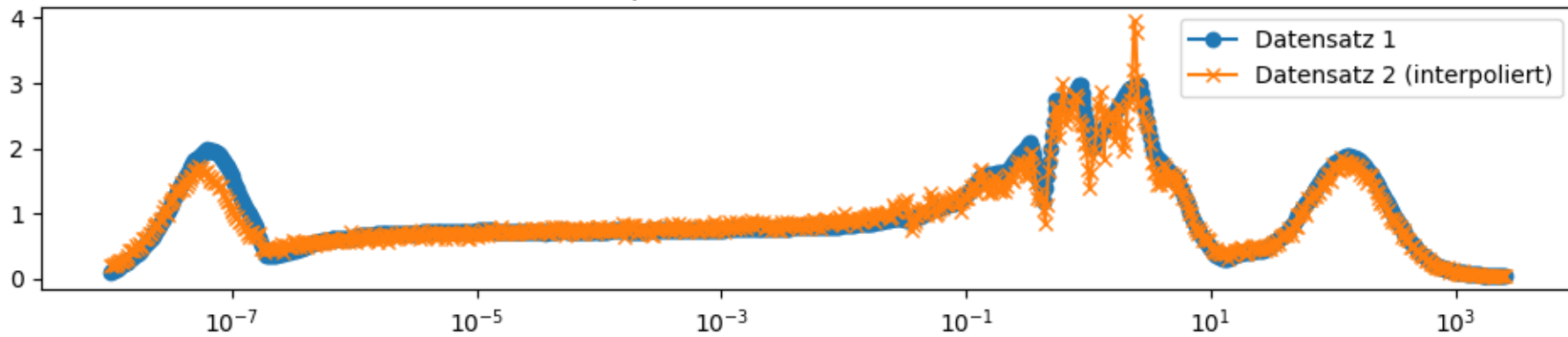


Residues

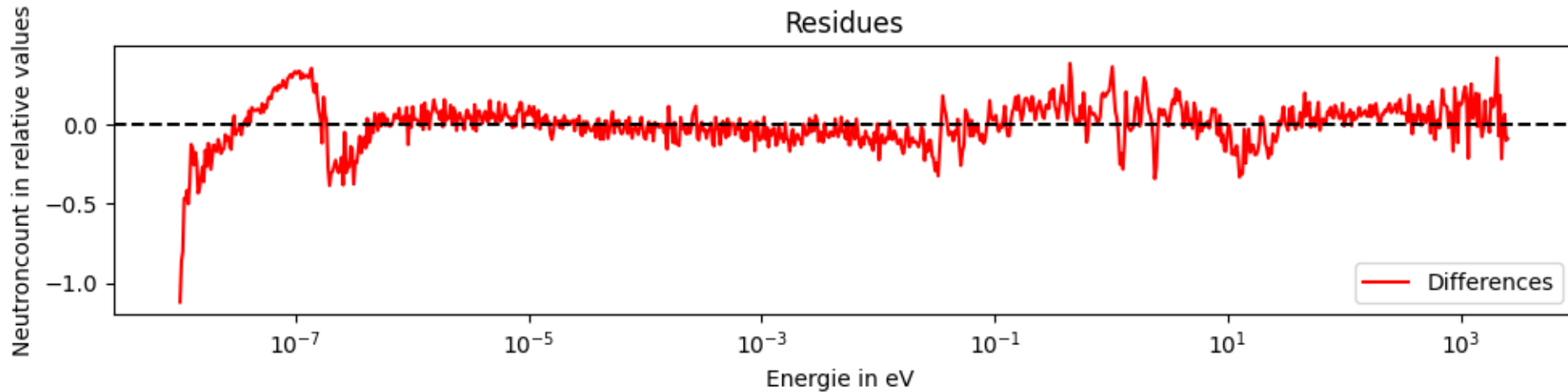


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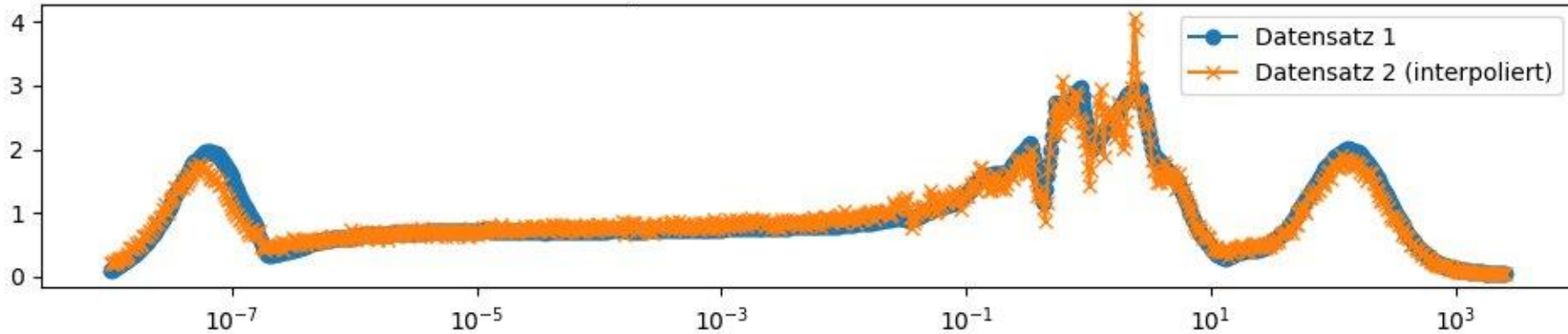


Residues

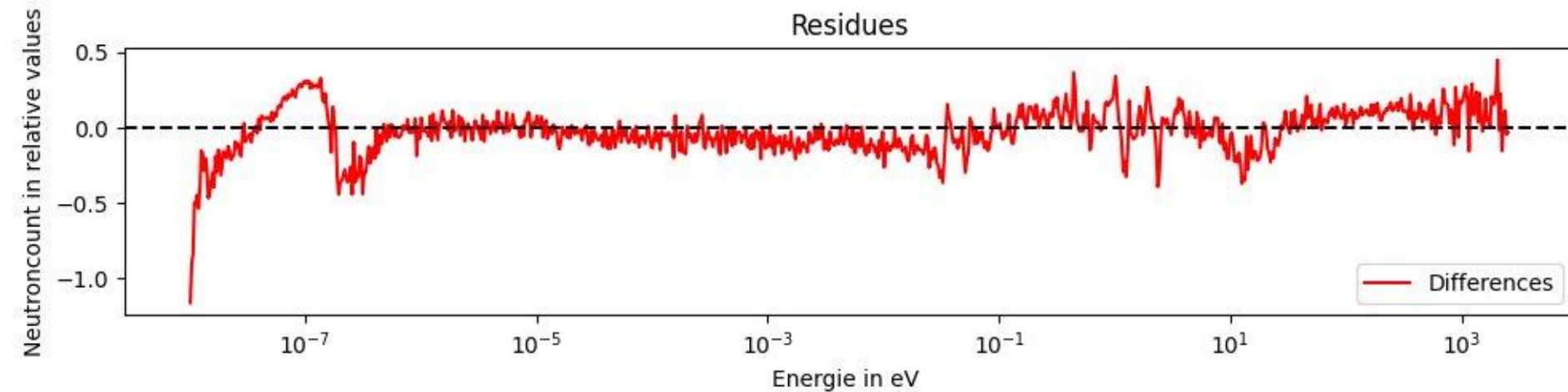


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Comparisson of the neutron count

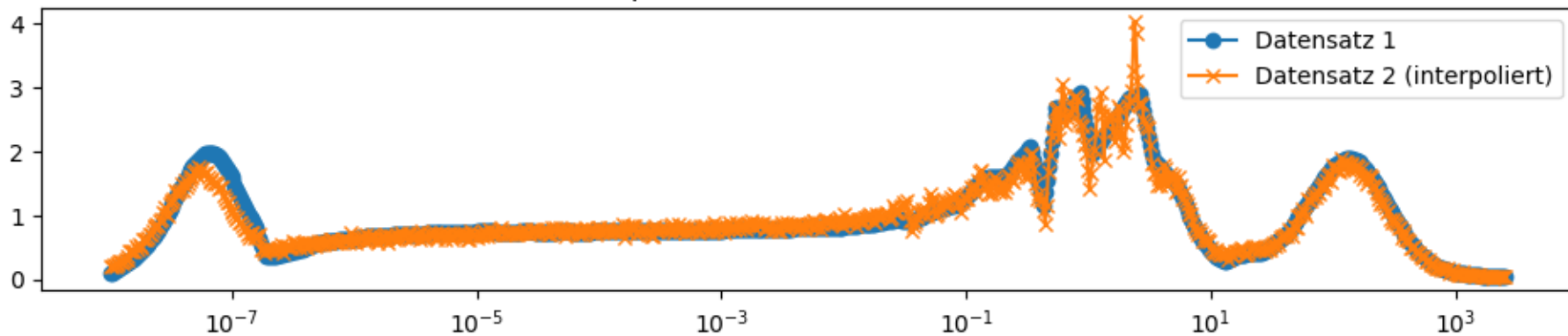


Residues

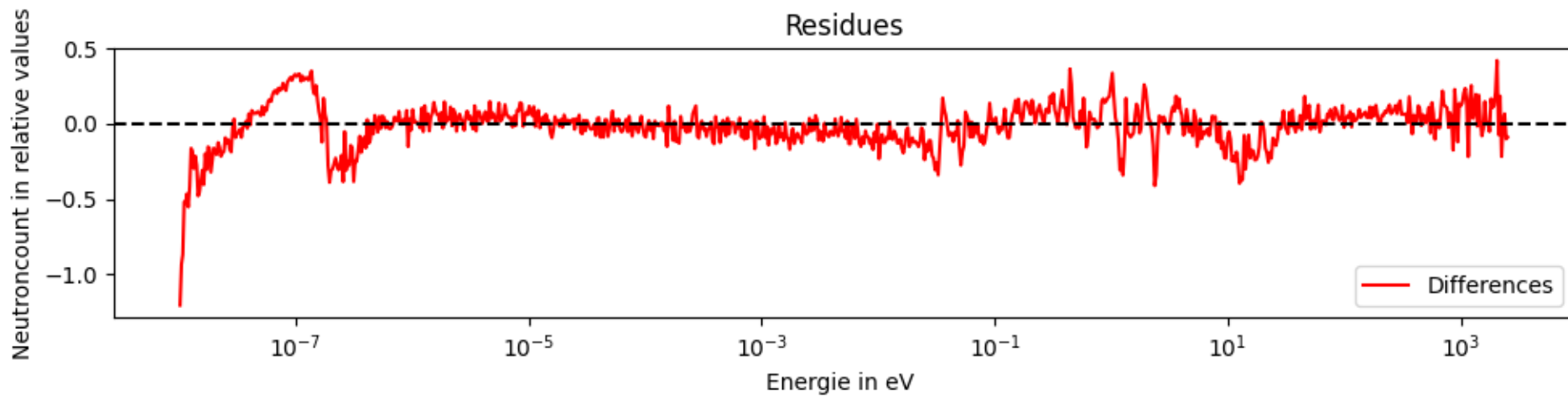


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Comparisson of the neutron count

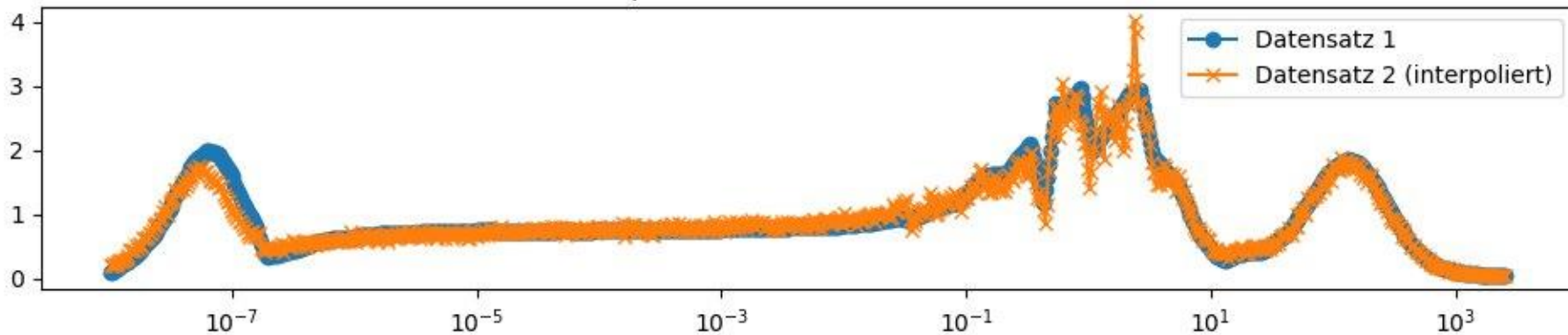


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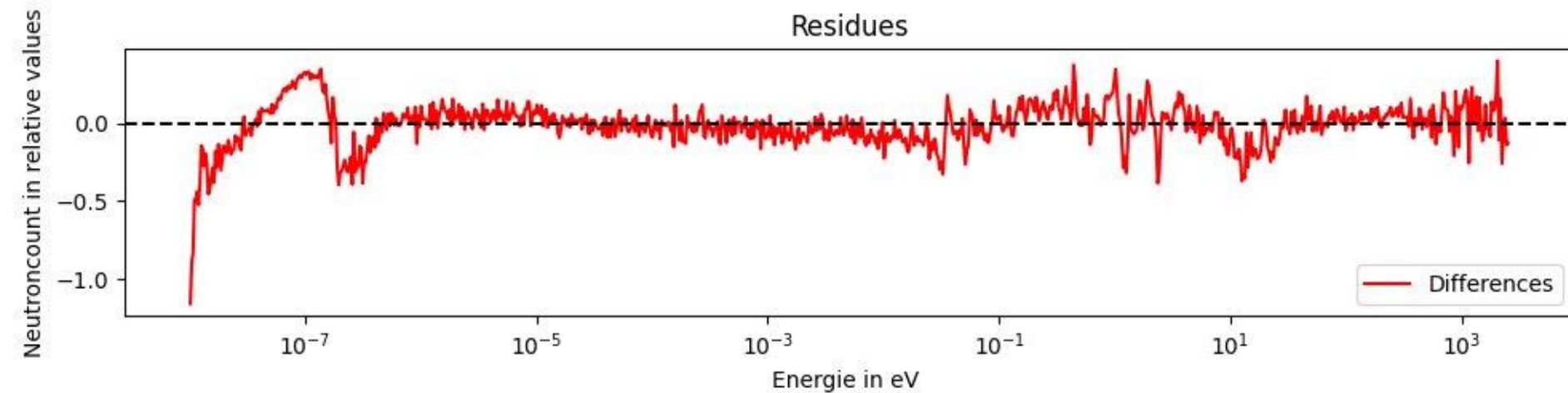


» How do small changes effect the unfolding

Comparisson of the neutron count

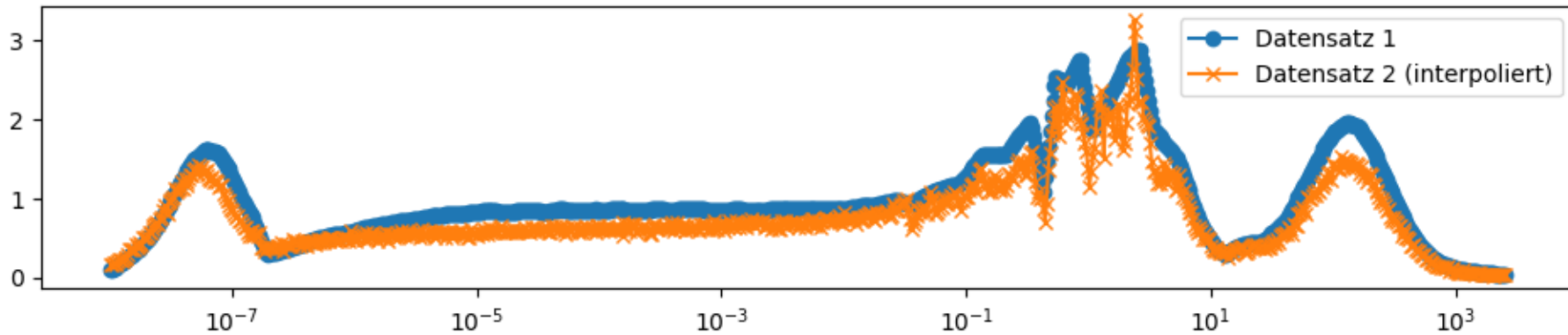


Residues

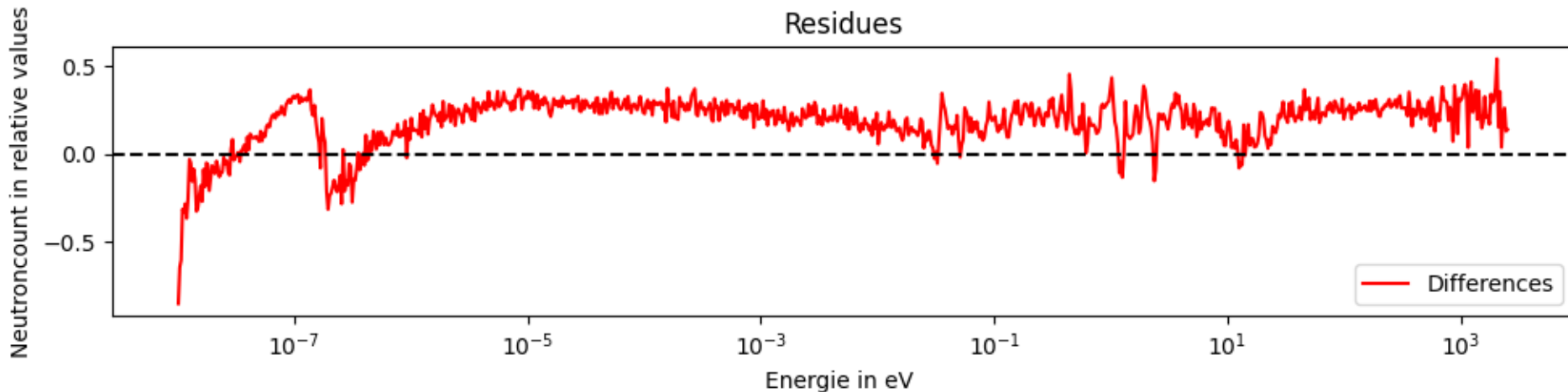


» How does sphere size effect the unfolding?

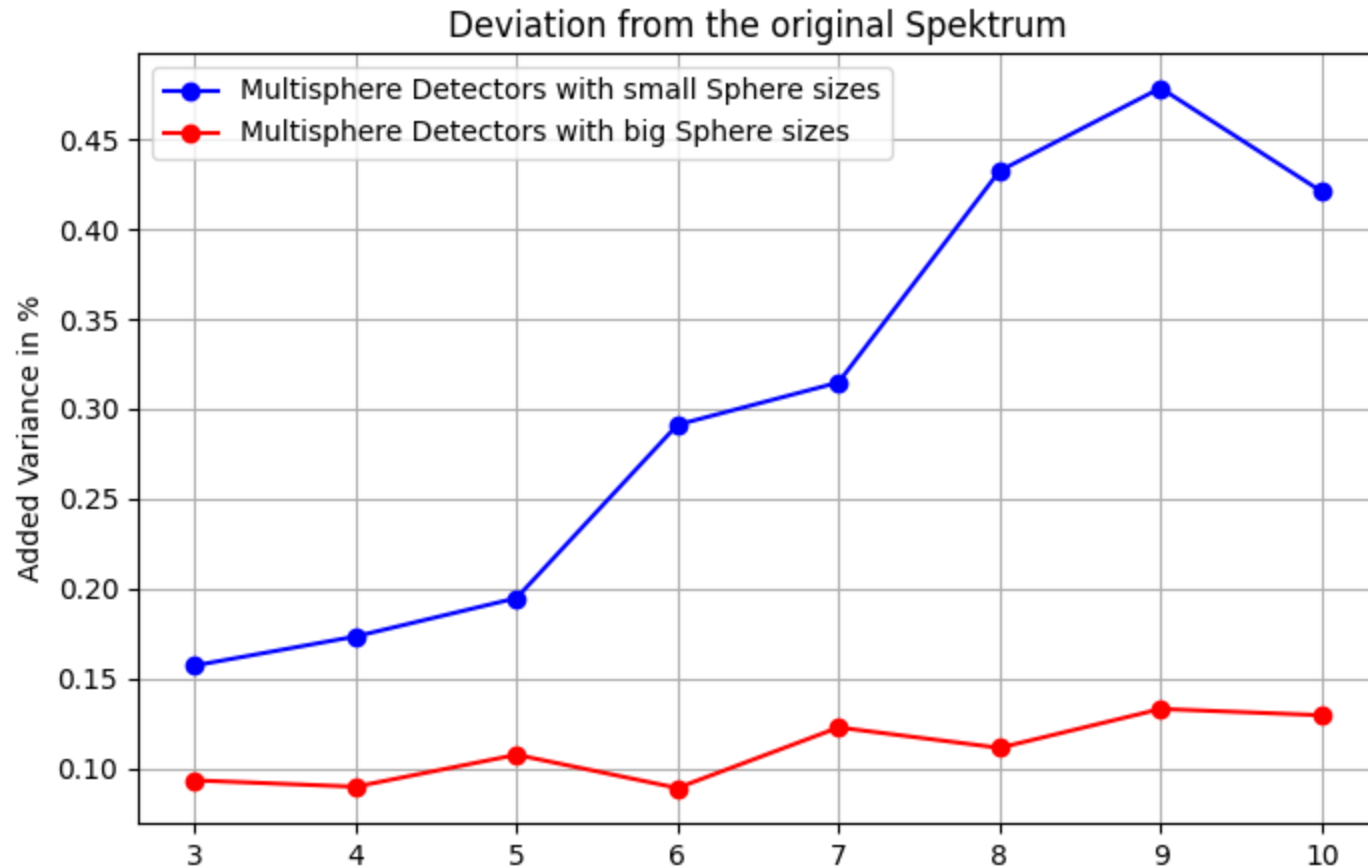
Comparisson of the neutron count



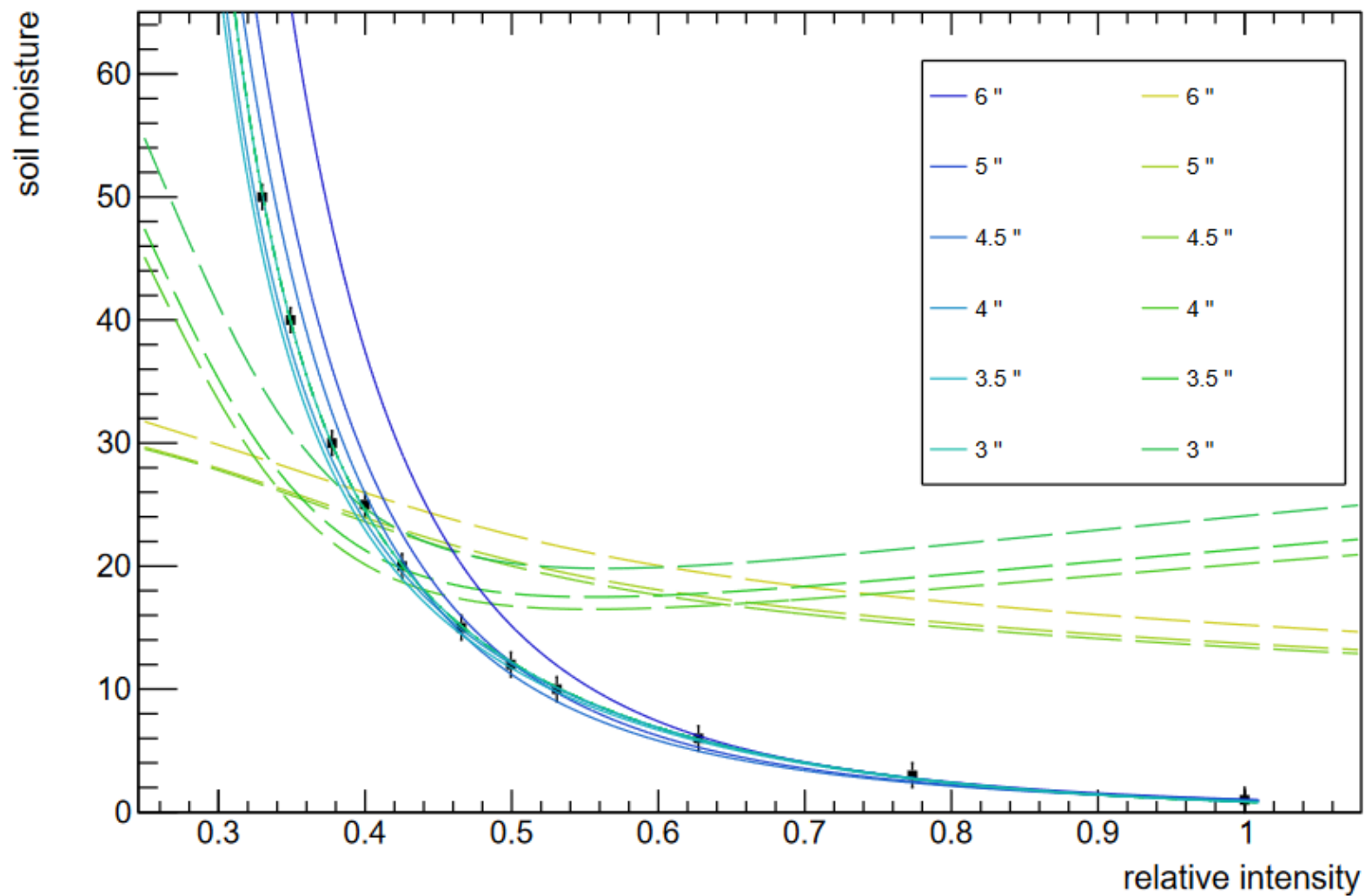
Residues



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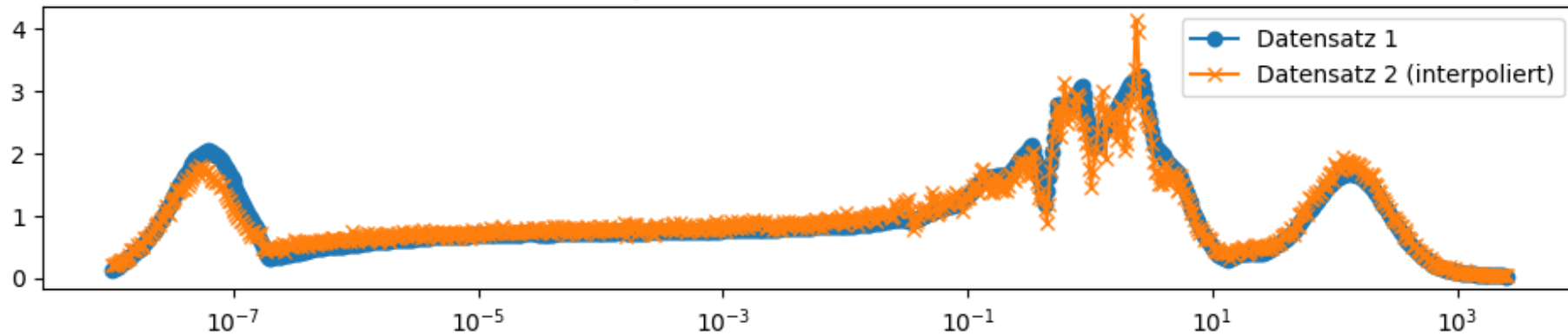


» Analysis

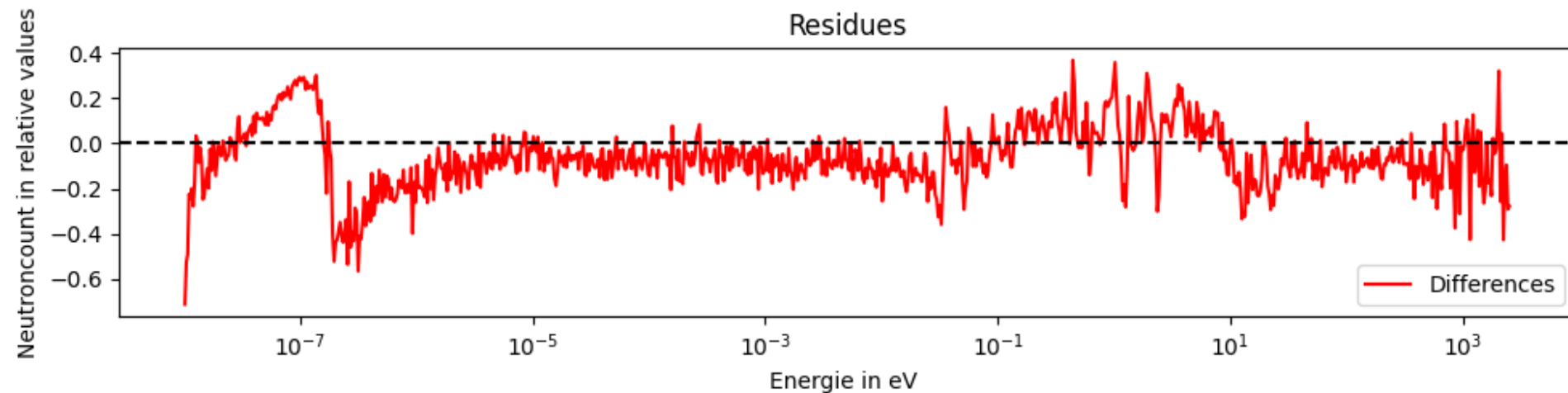


» Outlook: Potential Reduction of spheres

Comparisson of the neutron count



Residues



» Outlook: Potential Reduction of spheres

