

Lunar Crater Age Comparison to Neutron Flux

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Purpose and Motivation

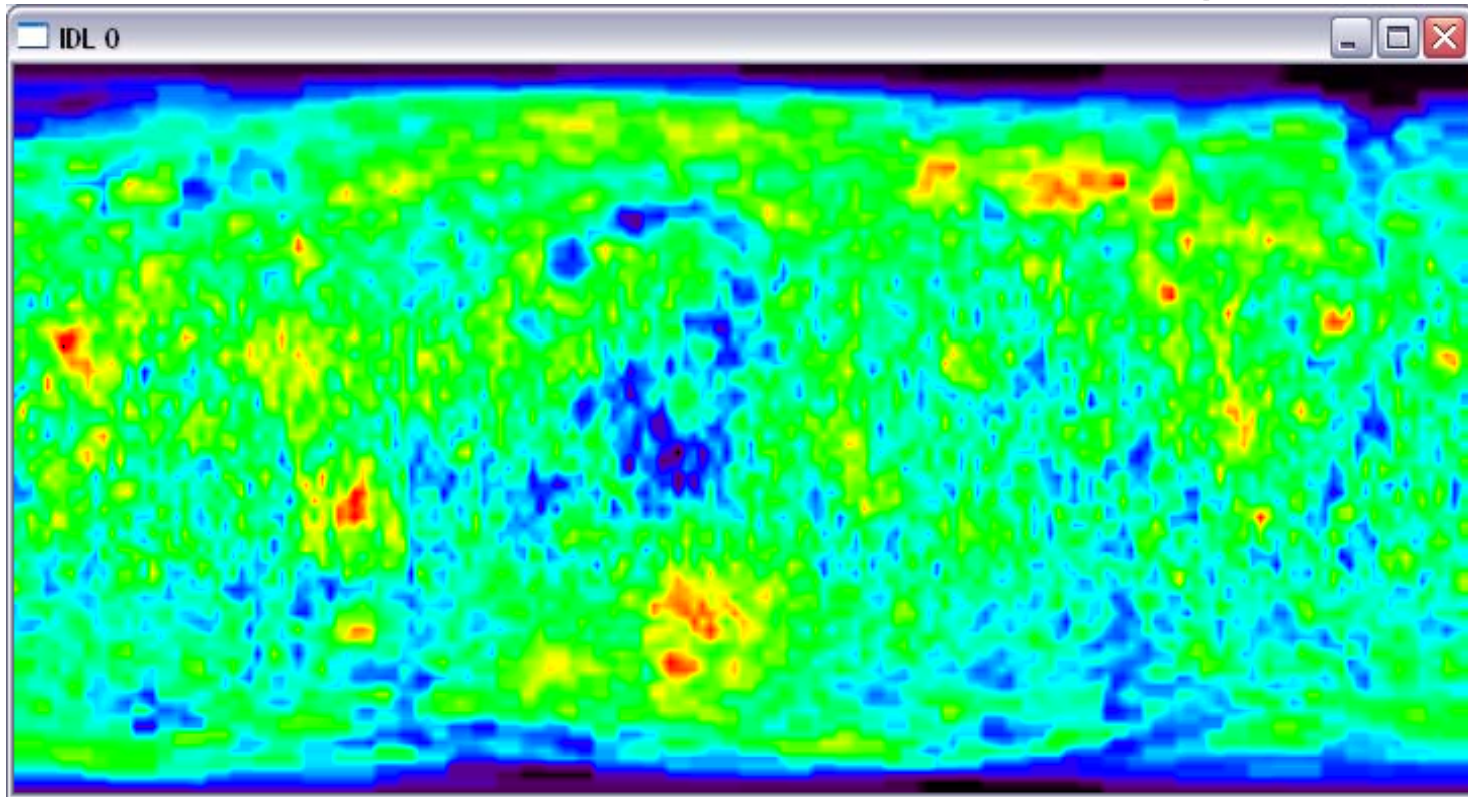
- Find an independent way to measure crater age
- Current methods depend on cratering models/relative information
- New studies only suggest age correlations for the youngest craters on the moon
- The only absolute data we have on crater age comes from Apollo

Crater Age and Neutrons

- How are crater ages related to neutron counts?
- Neutrons are produced by cosmic rays
- Neutrons are moderated by hydrogen
- Current theories predict hydrogen implanted into the soil
- Sources for hydrogen include solar wind, comets
- Young craters should have lower hydrogen due to less exposure time (low hydrogen=higher neutron counts)

Epithermal Neutrons

- Studies¹ on maps such as the one below look for increased neutron fluxes in young craters



1. [Johnson Et. Al. 2002]

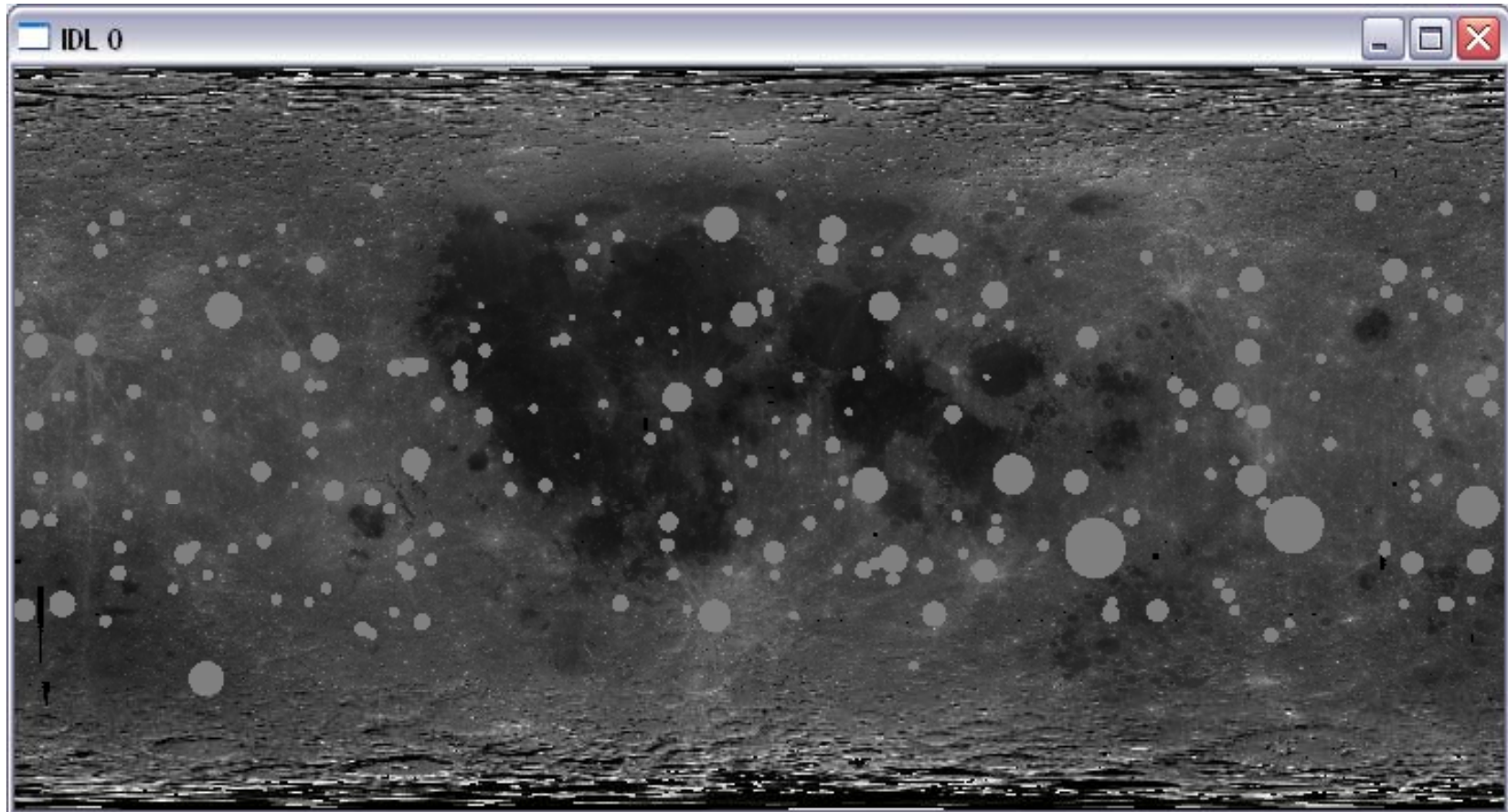
Low  High

Methods

- Crater maps created from the Lunar Impact Crater Database
- Crater ages were divided into 6 epochs
- Neutrons from craters were integrated by epoch
- Neutrons counts compared by averaging
- Create maps to relate neutron count to crater age

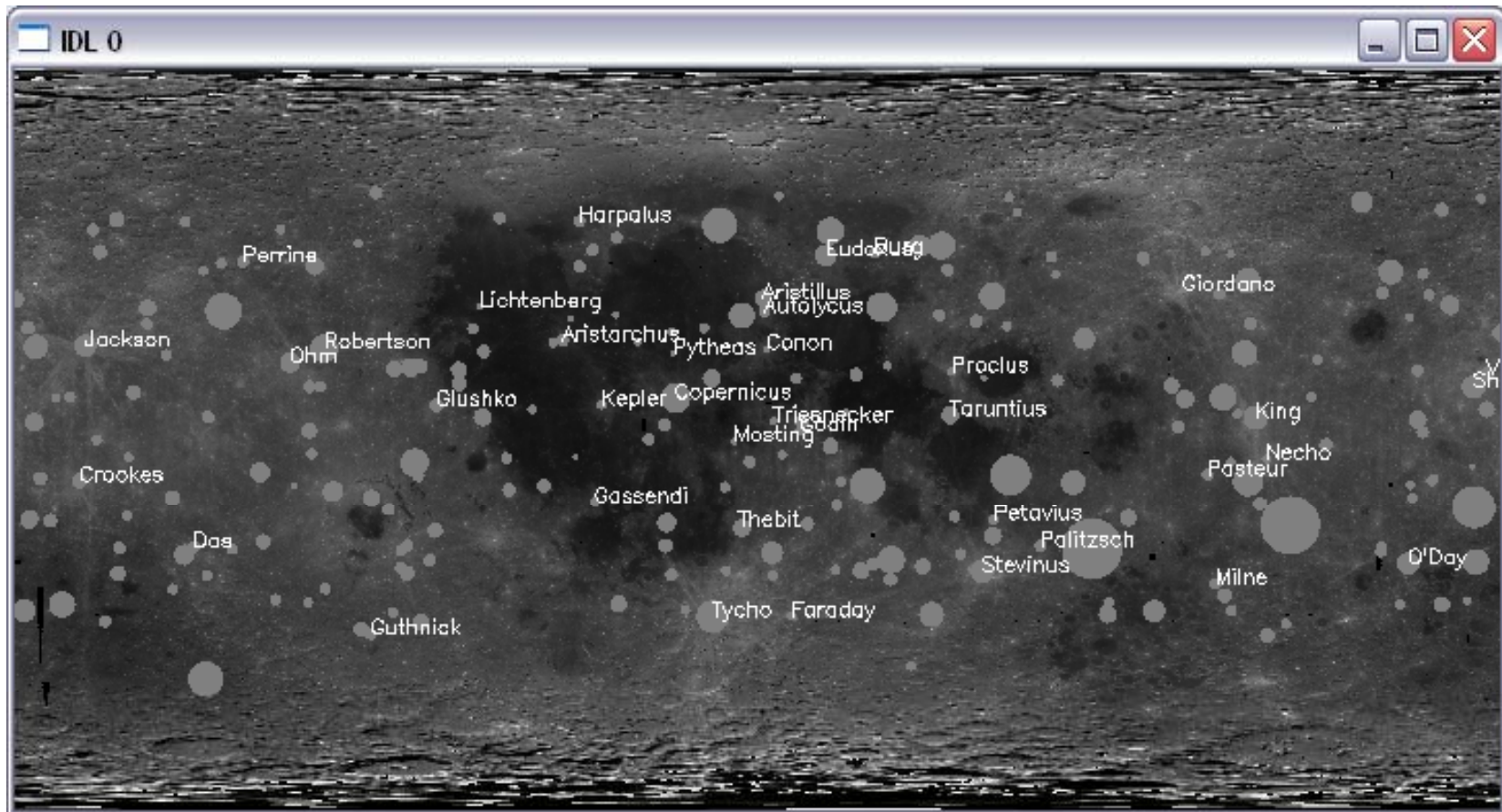
Crater Definitions

- Craters are defined by latitude, longitude, and radius of continuous ejecta



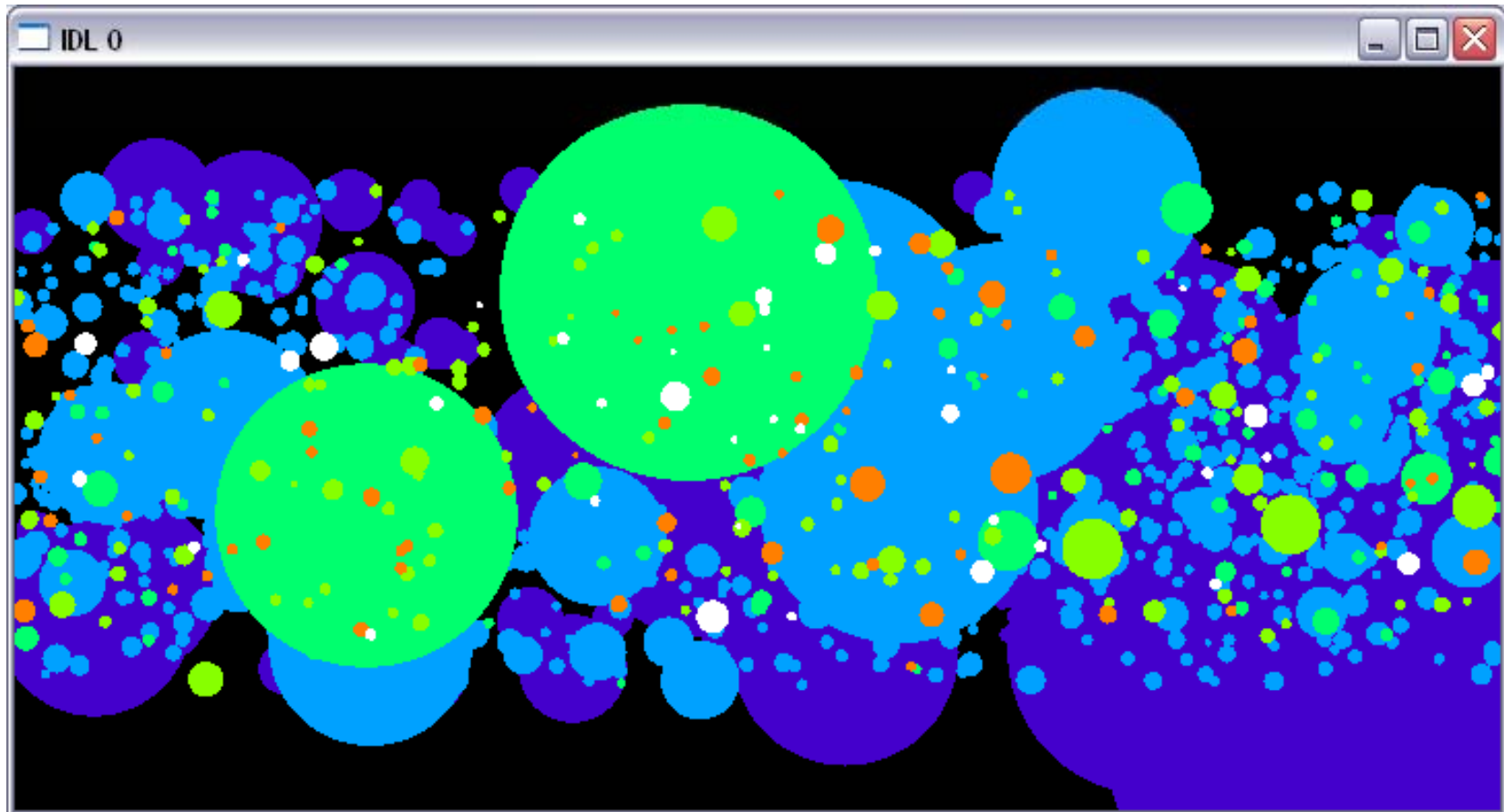
Crater Names

- This screen was used to confirm the crater location



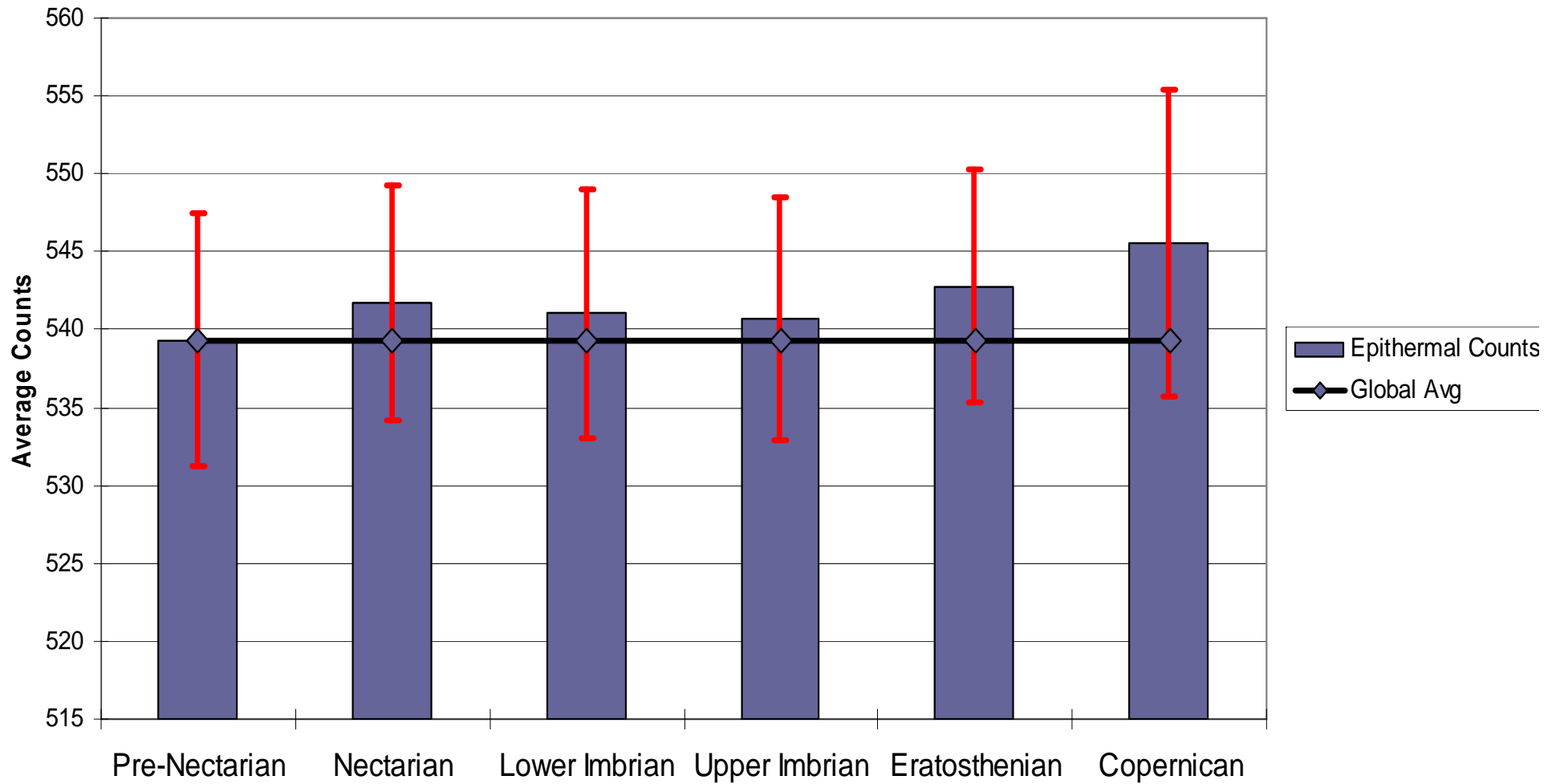
Crater Layering

- Was used to place younger craters over older craters



Results

Epithermal Neutron Counts Vs. Epoch



Future Work

- Subdivision of crater ages within epochs would refine the technique
- The Lunar Exploration Neutron Detector will return higher resolution neutron maps
- LEND maps will allow smaller craters in the youngest category to be studied
- These young craters are the best places to look for increased epithermal neutrons

Future Work

- This summer, the Lunar Reconnaissance Orbiter returned to the moon



It works!

I didn't jiggle it



Conclusions

- It may be possible to show a trend with better statistical certainty
- We can use LRO to improve the uncertainty
- Independent measure of crater age provides us with knowledge about the moon's crater history

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