Thermal Modeling of Near-Earth Asteroids

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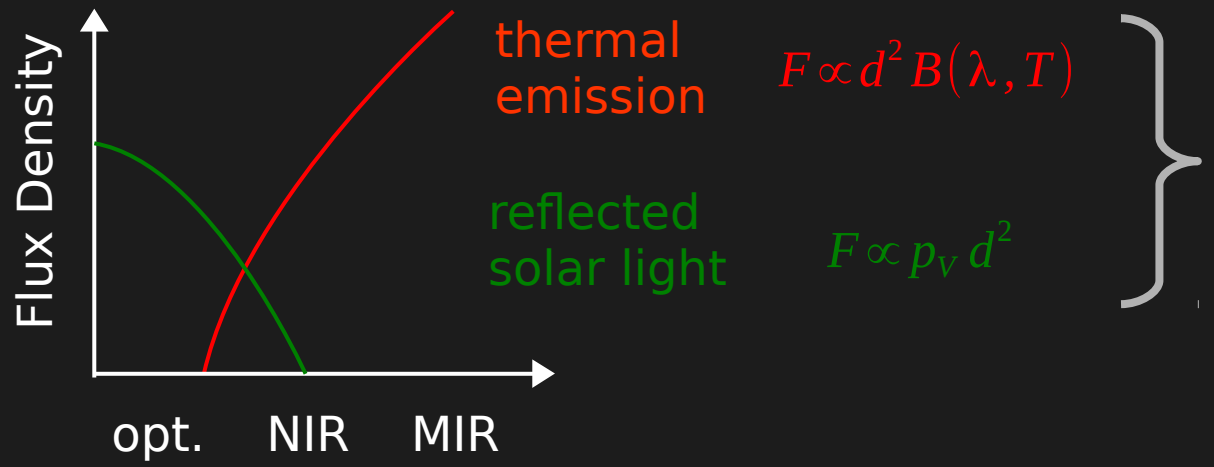
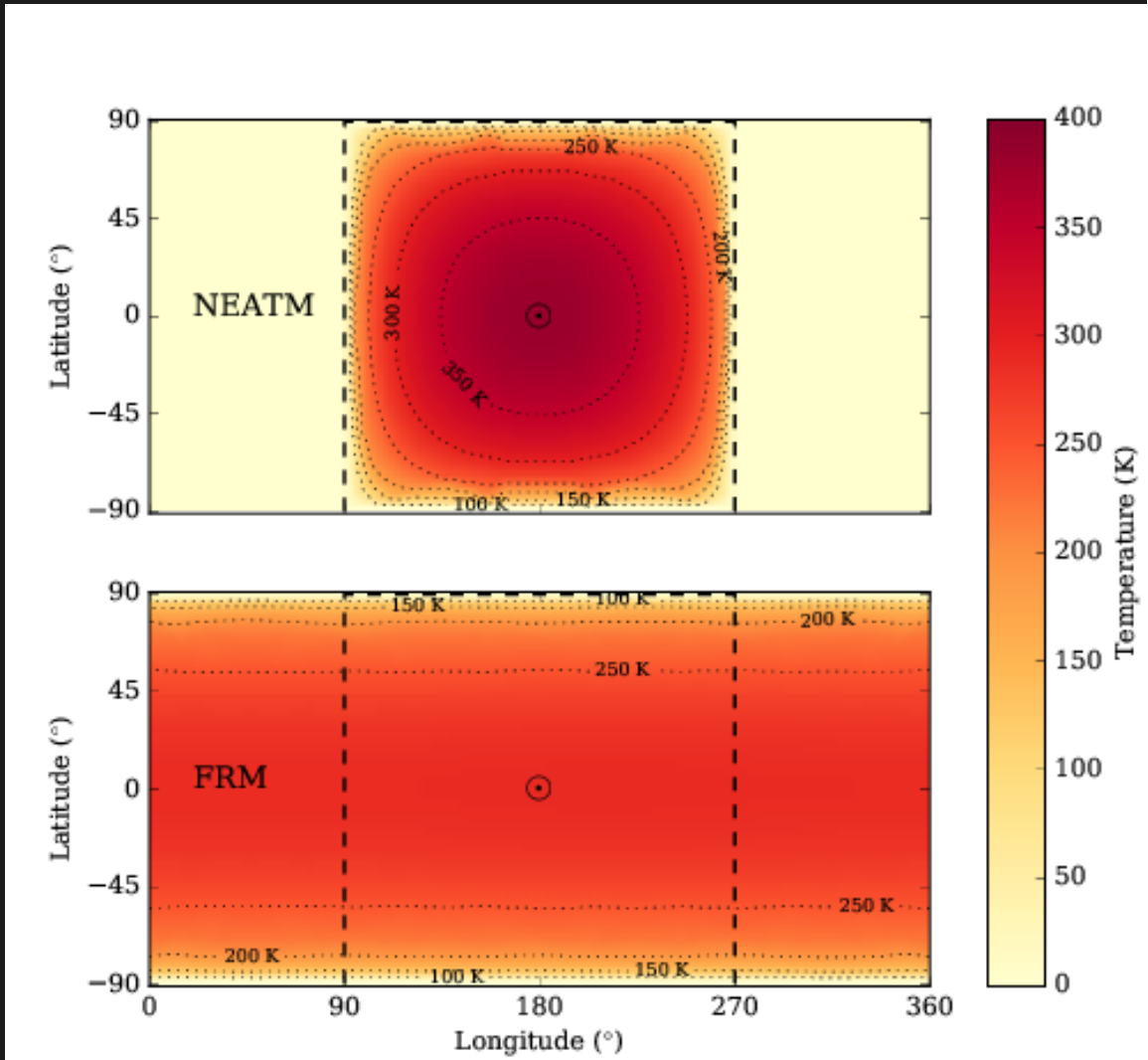
Thermal Modeling?

- prime method to estimate asteroid diameters and albedos:
  >100k Main Belters + >2k Near-Earth Asteroids



NEATM vs. FRM

- two important thermal model ideas:
- **Near-Earth Asteroid Thermal Model**
  - Slow rotation
  - Low thermal inertia
- **Fast-Rotating Model**
  - Fast rotation
  - High thermal inertia

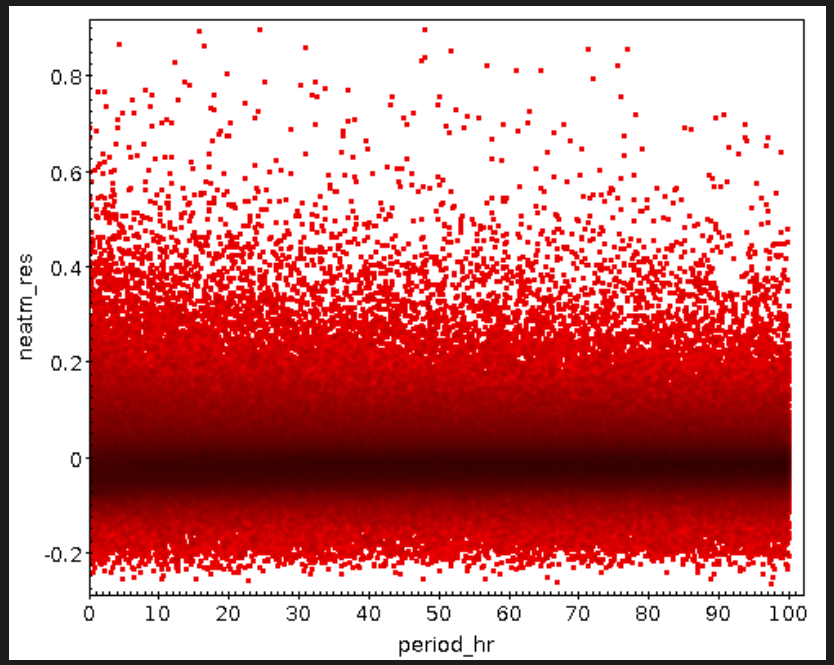


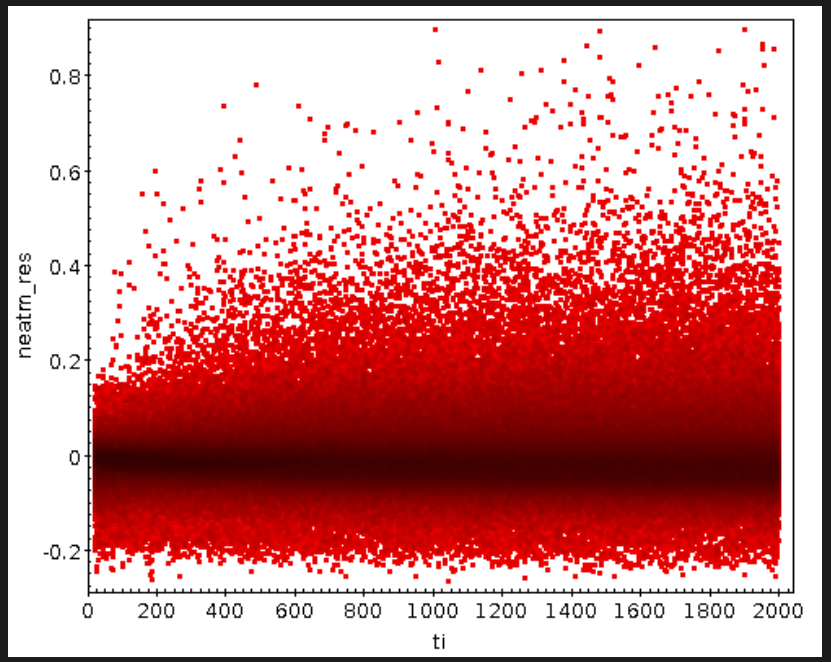
Which Model is better?

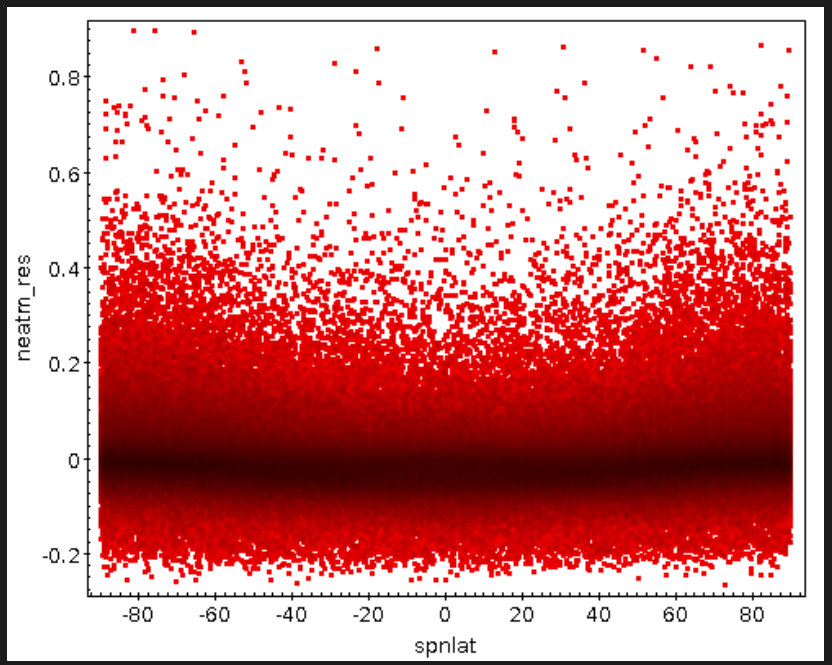
- NEATM used in 99.9% of cases

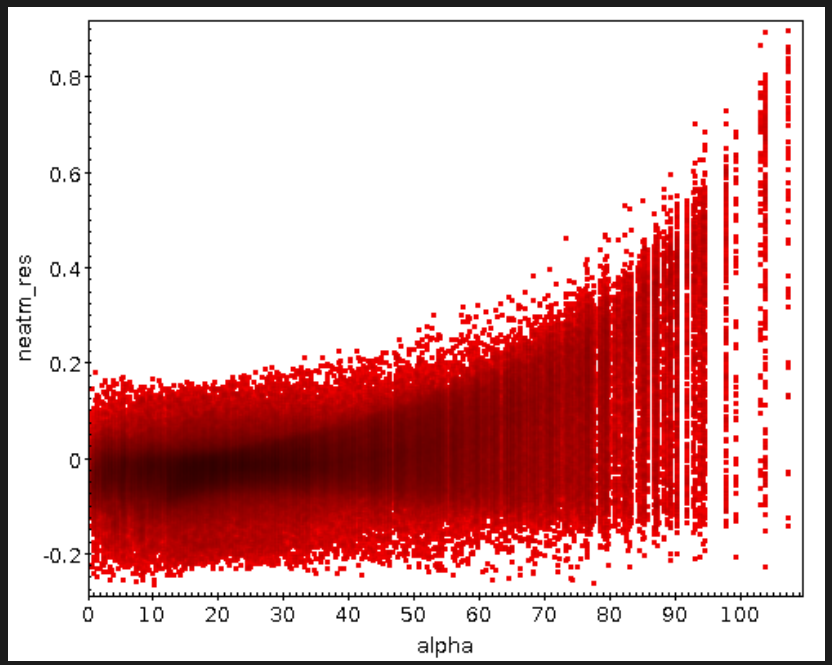
- **But is the NEATM really more accurate in all cases?**
  - What about fast-rotating asteroids?
  - What about bare-rock asteroids (high thermal inertia)?
  - What about observing geometry?
- **Time to Monte-Carlo!**

Simulating Near-Earth Asteroids

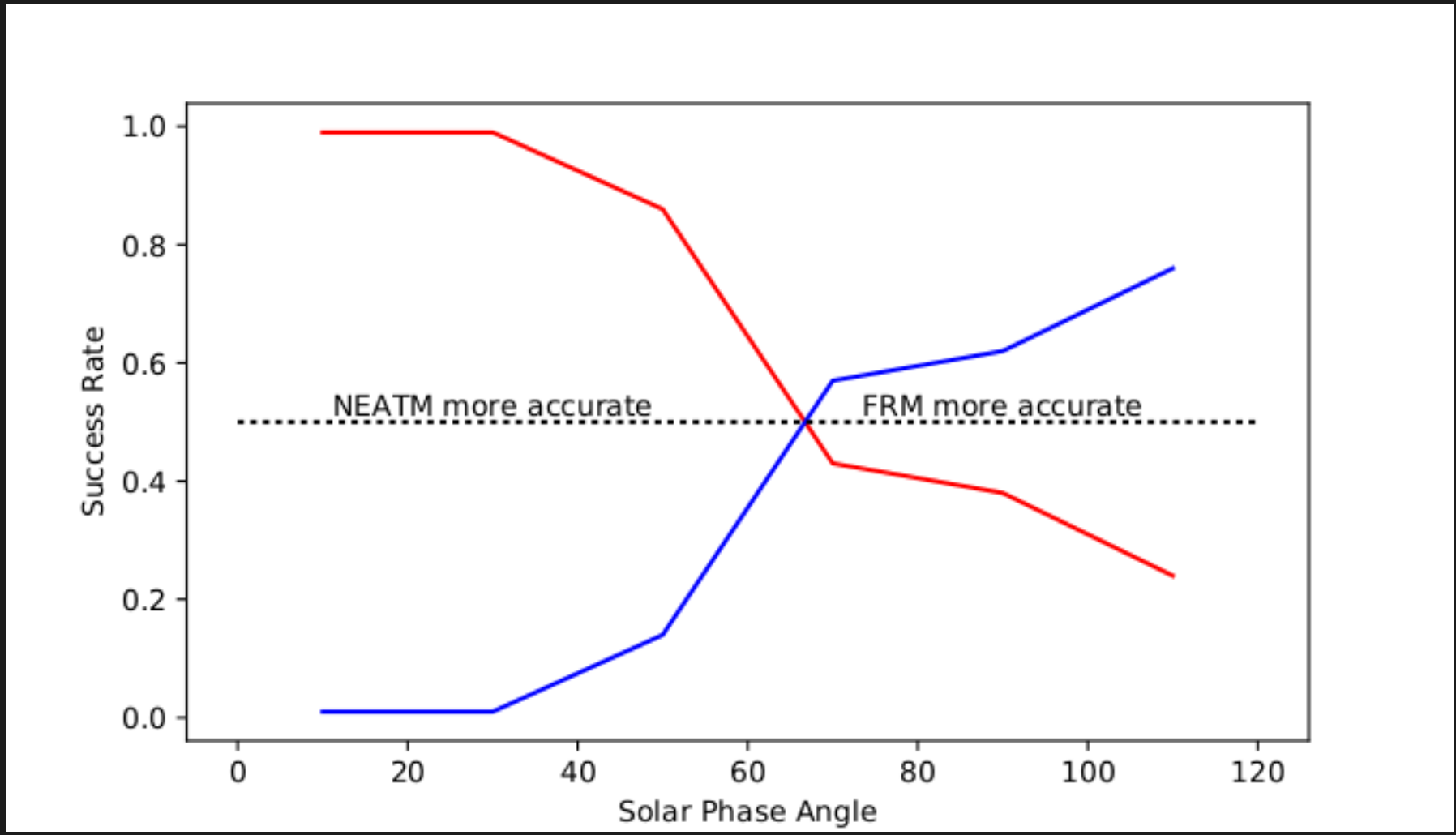




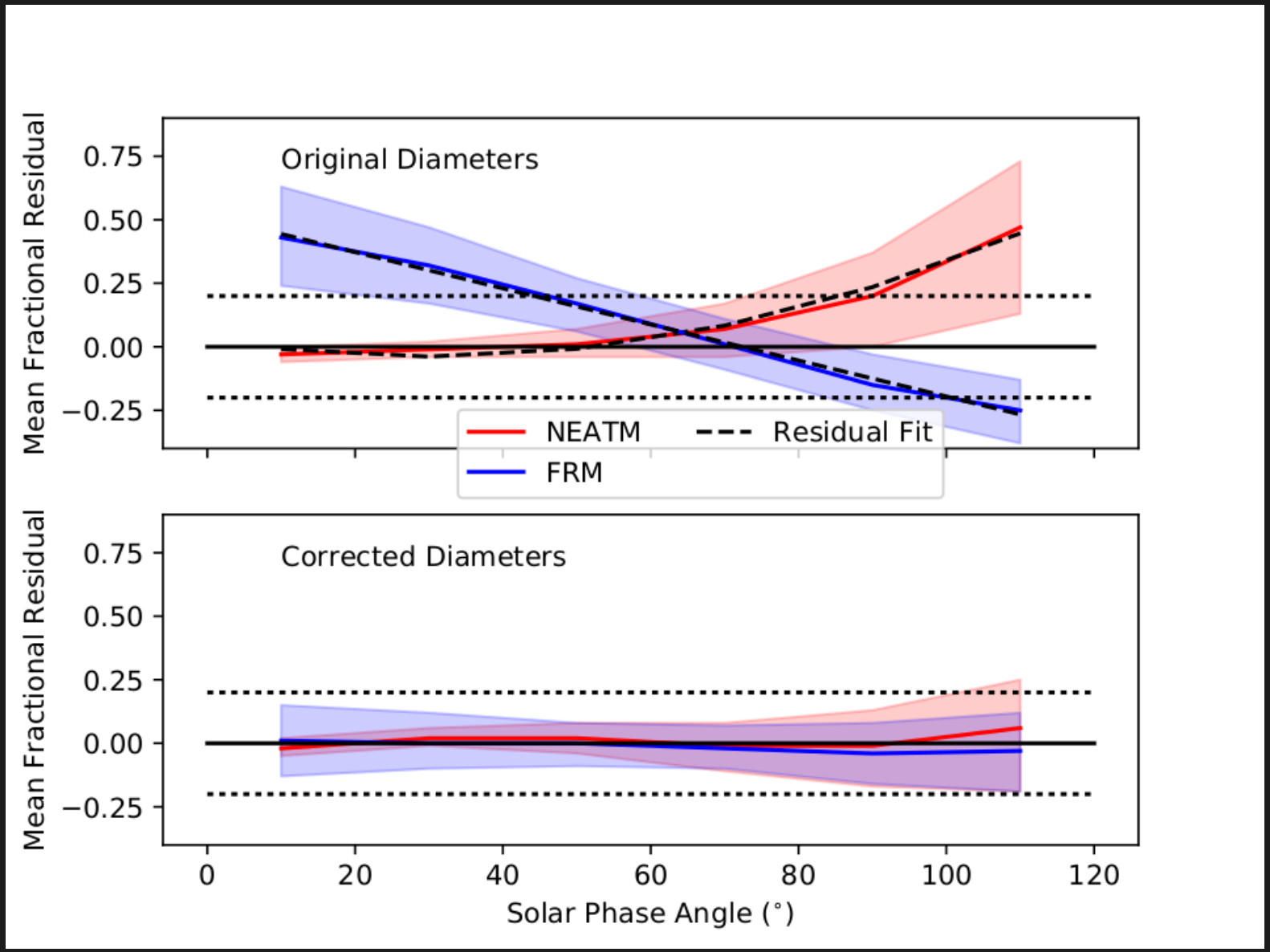




Which Model is better?



Empirical Diameter Corrections



Thermal Modeling of Near-Earth Asteroids: Results

- We find the NEATM to perform better than the FRM for solar phase angles less than 70 degrees
- Minor effects from physical properties and geometries, solar phase angle has the largest impact
- Empirical diameter (and albedo) corrections as a function of solar phase angle