Science Opportunities for Lunar Retro-Reflectors

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A. Lunar South Pole
A unique opportunity for LLR

- Potential locations for new retro-reflectors from future lander missions
- Earth-visible locations at cold regions near lunar south pole
- Overcome current thermal-optical design limitation of retro-reflectors

B. What are the benefits of a LLR retro-reflector at the lunar south pole?

- Access to higher-order shape of the lunar core-mantle boundary (CMB)
- Ability to drive a past lunar dynamo through elliptical instabilities

C. Simulations show multiple benefits for a LLR-retro reflector at the lunar south pole

- Strengthen detection and reduce precious observation time by almost a decade;
- Presence of equatorial ellipticity of the lunar CMB will modify the free core nutation and induce a new proper mode;
- Resolving for the shape will help understand the relaxed (hydrostatic) state of the lunar core.

D. Take away: Retro-reflectors are low-cost, deploy & forget solutions, with demonstrated longevity (50+ years) and contribute to multidisciplinary science.

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