**Crater Formation and Shock Melt Production for the 17th March 2013 Lunar Impact Flash**

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**Introduction**

For the first time, it was possible to relate an impact flash on the Moon, observed on 17th March 2013 [1], with its corresponding crater detected by LRO [2]. Robinson et al. [2] estimated the impact energy to be 6.4 $10^6$ kJ – 6.0 $10^6$ kJ by using scaling laws.

**Objectives:**
1. Improve the determination of impact energy by modelling crater formation with the shock physics code iSALE [3,4,5].
2. Determine impact-induced melt production and ejection of molten particles.
3. Assess the contribution of ejected melt particles to the radiated energy (i.e., the observed flash).

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**Methods**

Constrain kinetic energy of the impact event:

- numerical simulation with iSALE:
  - tune impact energy by projectile mass (velocity 8.5 km/s).
  - target properties (porosity, coefficient of friction) are chosen according to lunar exploration data [9].
  - lunar regolith target
    - basalt (ANEOS)
    - porosity 40%
    - Drucker-Prager strength
  - parametrisation with coefficient of friction $\mu = 1.0$.

**References**


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**Conclusion**

- Best fit impact energy for the 17th March impact: 10.3 GJ
- Most radiation is emitted in infrared (T < 3000 K)
- CCDs capture a significant amount of radiation for more than 1s (flash duration) for droplet sizes larger than 2.5 mm radius
- Cooling of melt droplets depends on droplet size.
- Most of the radiated light from the ejecta is emitted in infrared wavelength (T ~ 2000 – 3000 K).
- But, typical CCDs are most sensitive in optical spectrum.
- Still, CCDs can capture a significant amount of radiation for more than 1s for droplet sizes larger than 2.5 mm radius.