Global Crater Detection Using Chang-E2 DEM and Optical Image Data and Extension of Lunar Crater Catalogues

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As one of the most significant landform on lunar, crater plays an important role in study of long-term evolution of the moon, while crater detection methods as well as the resulting lunar crater catalogues extremely facilitated such research. But with the limitation of available DEM resolution and incomplete global coverage of relative higher resolution optical images, existing catalogues resulted from crater detection using DEM and optical images were hardly improved regarding the global completeness. Currently, the most complete crater catalogue of lunar is LU60645GT by Goran Salamunic′car using 1/16°SELENE LALT and up to 1/512°LRO LOLA global DEMs, which includes 60645 identified craters. Forthcoming Chang-E2 global DEM and CCD image data which are expected to be in better resolution become our main motivation for extension of global lunar crater catalogues using crater detection methods. By comparing the complexity and efficiency between methods using DEM and ones using optical images, and with consideration of the fact that Chang'E-2 CCD images offer higher resolution than DEM, we employed a combined two-step method which used both DEM and optical images. For lager craters in step one, DEM contains elevation information which can be used to calculate several morphological attributes, so it can dramatically simplify the complexity of computation and avoid the disadvantage of optical images caused by lighting condition under different solar elevation angles. While for sub-km and even smaller craters, DEM cannot provide sufficient resolution for accurate identification, so we use 7m Chang-E2 CCD image data instead in step two to supplement the global lunar crater identification. The regular circular-shape of much small size craters without much degradation greatly benefits crater detection algorithm for optical images. On completion of crater identification in these two steps, we merged the two results with necessary removal of duplicate items, and a more complete global lunar crater catalogue after verification process will be our goal.