Light Curve Inversion for Asteroids

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This research tested the accuracy of light curve analysis in creating three dimensional (3D) models of asteroids. The hypothesis states the basic shape of the model is accurate when inverted based on light curves and that more data produces more accurate results. The asteroids chosen for this project were found on the Minor Planet Center Asteroid Light Curve Database. Observations of two asteroids were analyzed for this project: Itokawa and Kalliope. For each target, separate models were made using different data sets. The types of data sets included the original data, light time travel corrected data, and data added or subtracted from the original data set ranging from one to five years in difference. The most accurate model for both asteroids was based on data that was light time travel corrected and did not span a large time period. Data is most accurate when light time travel corrected and observed over a short time period. This partially supported the hypothesis because the produced models had accurate shape. However, the hypothesis was partially not supported because the span of data collection was more important in creating an accurate shape model than the quantity of data. This research can be applied to asteroid mining which is gaining interest in the field of astronomy. Inversion and light curve analysis are valuable tools in gaining necessary information to mine asteroids i.e. rotation rate and surface.