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A TECHNO-ECONOMIC ANALYSIS OF ASTEROID MINING

**Abstract**

Asteroid mining has been proposed as an approach to complement Earth-based supplies of rare earth metals and supplying resources in space, such as water. However, existing studies on the economic viability of asteroid mining have remained rather simplistic and do not provide much guidance on which technologies would need to be improved in order to increase its economic viability. This paper provides a first techno-economic analysis of asteroid mining with the objective of providing recommendations for future technology development and performance improvements. Both, in-space resource provision such as for water and return of rare earth metals to Earth are considered. Starting with first principles of techno-economic analysis, gradually additional economic and technological factors are added to the analysis model. Using reference architectures from the literature and new mining architectures, such as using small spacecraft, their economic viability is assessed, taking cost and price sensitivities into account. Finally, conclusions on key technological factors are provided, where performance improvements would bring asteroid mining closer to its economic viability.