

Subject : Bio-inspired drill for the Moon : experimental exploration.

General frame of the study:

Rotary drilling is widely used on Earth but has limited performance in space applications (on the Moon or Mars or an asteroid). Novel innovative solutions are being developed to enable easier exploration of the Lunar or Martian sub-surface (ultra-sonic drilling; moles). Amongst these solutions, one has been derived from the working principle of a biological system: wood wasps which are able to drill into wood to lay its eggs. This drilling principle is referred to as Dual Reciprocating Drilling: DRD.

This technique is currently studied and under development thanks to an international joint PhD between the Surrey Space Centre (University of Surrey, Guildford, United-Kingdom) and ISAE (Toulouse, France). This PhD is financially and technically supported by the European Space Agency. The study proposed here is part of this PhD project.

Precise Objective

The main goal of this study is to do a large exploration of the different parameters influencing DRD. The main focus will be on geometrical parameters and the main measurement done will be the forces required to move the drill head in the drilled substrate. The results of these experiments and their interpretation will lead to an empirical force model.

Depending on the sensibility of the person leading the study and on time resources, the empirical model will be completed by further experimental, analytical or numerical work. If good progress is made, the study could be concluded by a designing phase using the generated knowledge to optimize the drill bit.

Location :

ISAE, Toulouse, France

Staffing:

The study will be followed by Michel Labarrère and Yves Gourinat (ISAE) and by the PhD student working on DRD, Thibault Gouache (Surreys Space Centre and ISAE).

Contact :

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