

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – Science, Instruments and Technologies (3B)

Author: Ms. Noura Al Nuaimi

United Arab Emirates University (UAEU), United Arab Emirates, 201503349@uaeu.ac.ae

Ms. Alanoud Alameri

United Arab Emirates University (UAEU), United Arab Emirates, 201511451@uaeu.ac.ae

Dr. Waleed Ahmed

United Arab Emirates University (UAEU), United Arab Emirates, wkh.ahmed@gmail.com

COMPARATIVE DRILLING TECHNIQUES: EARTH VS.SPACE

Abstract

We are living in a complex world that scientist faces tremendous challenges to discover, learn, find reasons, and solutions. Earth is a little part of this big world to start finding and answering the questions. But still not enough, if people saw this much of knowledge from the Earth, how much more we will know if we discovered space. Scientists used drilling to dig in the lithosphere of the Earth and do their investigations. Therefore, the same thing is used to investigate other planets like Moon and Mars. Drilling systems for collecting samples from Earth's surface are quite similar to the one used to explore Mars planet and Moon. For these systems, there will be many differences in some of the mechanisms since the environment the drilling systems will work in will be different. Moreover, there are multiple experiments and innovative ideas are applied by America's space agency (NASA) and other space agencies. Passing through NASA's Mars missions, Rovers was a challenging mission, because it has a powerful drilling system attached to its robotic arm. Great advances made through years in conceptual understanding of the evolution of the Earth's continental crust. Drilling provides the opportunities for direct study of Earth process and helps in surface observations and remote sensing. Different drilling techniques are used in Earth compared to space drilling discoveries. NASA used a smart drilling technique to drill the Martian surface and collect the samples on the same time, then examine the samples and send its data. With time the drilling technique had different issues, so the engineers needed to do some enhancement for drilling system. Therefore, Curiosity rover continued collecting samples with a new way of drilling without any severe problems. Furthermore, the new drilling regime is called extended feed drilling (FED), and it uses the robotic arm to perform the drilling process instead of the stabilizers. This method solved the issue the system faced. On the other hand, drilling in the lunar environment poses many different technical challenges compared with human activities. Plans are being developed to drill and core a 100m deep hole on the Moon and compared to the Apollo 17 landing site, which was drilled only 2.986m depth achieved. Lunar drilling is considered a very ambitious step. Furthermore, Honeybee's Mechanized Sample Handler (MeSH) is a prototype miniature centralized sample preparation station that could be mounted on a rover for a future mission to Mars.