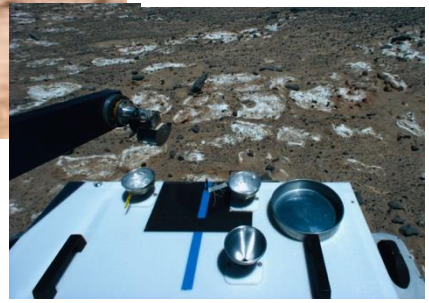
Drilling and Sampling Automation

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KREX2 rover in the Atacama Desert with drill and transfer arm



KEY ATTRIBUTES / COMPETENCY

Change Point Algorithms

Cooperating surface agent architectures

Autonomous drilling fault management and recovery SW

Adaptive Drill Controls

Planetary protection protocols/Contamination control

Drilling/sampling in lunar/Mars analog soils, simulants

In-situ resource prospecting

TECHNICAL / SCIENTIFIC CHALLENGE ADDRESSED

Future human and precursor exploration will require a **rapid**, but thorough, initial survey of any local "area of operations" on Mars to determine the spatial distribution, quantity, and quality (e.g., salt/mineral/organic content) of any local water, as well as to evaluate any signs of current or extinct life.

SUMMARY

Drilling into non-cuttings-permeable, typically massive subsurface rocks or into solid ice layers sometimes leads to stalling, binding or choking faults.

Drilling automation software detects these faults and initiates recovery procedures.

Relevant field testing has validated hands-off drill prototype hardware and automation software, robotic sample transfer.

HERITAGE

Drill	Type	Cum. Depth	Deployed Mass (kg)	Haughton Crater Field Tests
DAME	Rotary Coring	7m	55	2004-06, 2008
CRUX	Rotary-Percussive	8m	43	2009, 2010, 2016
Icebreaker (IceBite)	Rotary-Percussive	3m	32	2011, 2012
LITA/Icebreaker-2	Rotary-Percussive	2m	10	2013
Icebreaker-3	Rotary-Percussive	2m	12	2014
TRIDENT	Rotary-Percussive	8m	22	2023

APPLICATIONS BEYOND

Searching for subsurface planetary resources (Moon, Mars)

Subsurface signs of extant or past life on Mars

Construction for human exploration outposts