MUD® helps to prioritize geohazards

MUD® classifies anomalous land conditions related to catastrophic events

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Slopes don't always show signs of distress at the surface and can fail with limited, if any, warning. Visual inspections provide some but very limited information on what's happening in the subsurface. Infrastructure and transportation operators need a reliable and safe system to assess and monitor high-risk areas of their assets at regional, network and local levels, with a system that considers subsurface risks, the root of most events and failures.

Key Features MUD®:

A key feature of MUD® is its automated capacity to classify anomalous land condition variables, map each as polygons and detect zones with multiple and overlapping variables. Typical anomalous land condition variables, detected during the study period may include:

- areas of change
- non-localized, vertical change over the study period
- localized, patterned change (localized subsidence, fault correlation, undulating patterns)
- land slope (based on potential for movement where higher slope presents greater likelihood of downslope migration)
- presence of water course and/or water bodies which can cause erosion or structural integrity failure, and which are typically areas of increased concern.

MUD® algorithms alert operators to the risk zones that require immediate attention and supply an overview of anomalous land conditions across their network. This allows operators to prioritize valuable resources on the geohazards that require the most immediate response. For example, in a rail network, Land Condition Level "A", has greater risk due to many overlapping anomalous land conditions and evidence of patterned movement such as:

- increases in water saturation directly effects the course of the rail or its ballast
- within slope range greater than 0, and less than 5 degrees
- where water levels of existent water courses or water bodies have increased within the area

In comparison, in a rail network, "E" categories may not require an immediate response based on the presence of these these anomalous conditions:

- within 200 m of watercourse
- within 200 m of infrastructure
- within slope range greater than 0, and less than 22.5 degrees no evidence of patterns of anomalous, localized vertical change

- no evidence of non-patterned, non-localized anomalous vertical change of 2-3.5 inches over study period

An overview and detailed map are produced and analyzed to inform operators of the anomalous land condition's exact location, its slope (in degrees), its distance from the rail grade (in meters) and a description, including land cover type, elevation above or below rail grade and the approximate amount of vertical change (in mm).

Whether movement is constant, accelerating or responding to intervention, MUD® detects and measures type, rate, direction and patterns of surface and subsurface change within the land surrounding the infrastructure and its network.

FEATURES AVAILABLE SAR MONITORING	InSAR	MUD®	DiffInSAR	PSInSAR
MONITORING FREQUENCY	>20 days	<40 hours	>20 days	>20 days
MONITORS SURFACE	✓	✓	✓	✓
MONITORS UNDER LAND SURFACE	✗	✓	✗	✗
MONITORS IN 3D	✗	✓	✗	✗
MONITORS UNDER WATER	✗	✓	✗	✗
ELIMINATES LAYOVER AND DISTORTION	✗	✓	✗	✗
UNIFORM SPATIAL ACCURACY	✗	✓	✗	✗
COMPLETE AREA	✗	✓	✗	✗

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