

Permafrost Degradation Threatens Arctic Communities and Infrastructure

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Active layer thickness (ALT) is one of the essential climatic variables and is important for understanding many natural processes in the cold regions. ALT is also a required variable for land-use planning and construction on permafrost. The Circumpolar Active Layer Monitoring (CALM) program, part of Global Terrestrial Network for Permafrost (GTN-P), is the primary global archive of ALT data worldwide with more than 250 sites located in polar and high altitude permafrost environments. Some of the CALM sites go back to early 1970th, however the majority of sites were established in either in mid-1990s or after the fourth international polar year (2008). Three main measurement methods are employed by the CALM program include mechanical probing at the at grids ranging from 10 to 1000 square meters, thaw tubes, and shallow temperature boreholes, where ALT is obtained by interpolation of maximum depth of zero degree C isotherm. Using CALM data we temporal variability of ALT across circumpolar permafrost regions that have more than 10 years of data and were active over the last 5 years. The results show that absolute majority of CALM sites have increasing ALT trends over the last 20 years. The median rate is about 5 cm/decade, with majority of sites experiencing 2 to 8 cm/decade increase. Sites located in continuous permafrost generally show less changes relative to sites in discontinuous permafrost. Northern Eurasia regions, including Russian European North and North of Central Siberia were found to have highest regional rates of change. Changes in permafrost have negative impacts on communities and industrial facilities of the Northern Eurasia. Enhanced permafrost monitoring is urgently needed to address challenges associated with permafrost degradation in Northern Eurasia.

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