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Increased occurrence of hillslope thermokarst in northern Alaska over the past 30 years

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It has been widely documented that air temperature warming trends over the past few decades have resulted in warming of near surface (at least to 20 m depth) permafrost throughout much of northern Alaska. In response to this warming, it is expected that surface permafrost degradation will become more prominent. We have observed enhanced thermokarst failure development in mountainous regions of the western Brooks Range and in the northern foothills of the Brooks Range (in transition to the North Slope). In the western Brooks Range, the failure mode on hillslopes has primarily been from the development of active layer detachments (ALDs). We have observed several hundred active ALD features, primarily on carbonate/mixed sedimentary surface lithology types. These features tend to be long and narrow, providing new dissections of hillslopes. In the northern foothills the prominent form of hillslope thermokarst is that of gulley features, resulting from ice wedge degradation. The increased occurrence of thermokarst in northern Alaska has the potential to substantially modify landscape and stream network hydrology, geomorphology, and ecology.