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Combining ERT and an orthophoto time series to investigate thaw-related landslides in the Canadian Arctic

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Retrogressive thaw slumps (RTS) are a common permafrost related landslide type in the Arctic and provide a large amount of material to coastal nearshore zone, lakes and rivers. RTS are characterized by highly dynamic changes and rapid internal processes. Along the Canadian coastline there is an increasing number of RTS documented over the last century, acting sensitive to a warming climate.

The occurrence and behaviour of these landslides is strongly dependent on the presence of ground ice, including their likelihood for polycyclicity and reactivation. To detect and evaluate the ground ice content in different activity- and stabilization stages we used electrical resistivity tomography (ERT) on several RTS on Herschel Island in the Canadian Beaufort Sea. We combined ERT profiles remeasured 10 years apart, with orthophotos since 1952 to gain a detailed insight in their long-term behaviour, the availability of ground ice and the factors controlling polycyclicity.

This study demonstrates the capacity of ERT for detecting massive ice bodies and internal changes. Combining this with a time component and orthophoto analysis, provides a unique insight into the behaviour of retrogressive thaw slumps, but also shows the need to use complimentary techniques to correctly interpret geophysical measurements.