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Title: *Use of Electrical Resistivity Tomography to monitor permafrost thaw and persistence in the discontinuous zone, northwest Canada*

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The rate of permafrost temperature rise in response to climate warming or other environmental change slows down as ground temperatures approach 0°C because heat is used to change ice in the soil to water. The small increases in ground temperature that do occur within boreholes are challenging to detect because of limitations in logging system accuracy but can represent significant changes in unfrozen moisture, especially in fine-grained soils between -0.5°C and 0°C. Repeated DC Electrical Resistivity Tomography (ERT) surveys are being tested as a complementary method to monitor permafrost change over this critical temperature range. ERT uses electrical current transmitted into the ground through an array of electrodes to generate a two-dimensional image of the resistance of the ground which is strongly influenced by unfrozen moisture conditions and therefore, by temperature. The sensitivity of the method to seasonal variation (thawing and freezing of the active layer) vs. progressive change due to climate warming or other environmental causes, however, requires further investigation. Repetitive ERT surveys have been conducted at 10 sites with permanent electrode arrays established in 2010 along the Alaska Highway in the southern Yukon and northern British Columbia. Similar surveys have also been made since 2006 at sites with palsas which are being warmed by a combination of rising air temperature and higher water levels. Results illustrate the usefulness and the limitations of the ERT technique for monitoring the persistence and change of thin permafrost (generally less than 10 m thick) which can be expected to be vulnerable to thaw as the climate warms. Improved identification of imminent permafrost thaw and quantification of thaw rates are needed for environmental management and predictions of potential greenhouse gas release from organic terrain.