Table S1 Initialisms in the paper.

Initialism	
ALT	Active layer thickness
APT	Artificial permafrost table
CRCOP	China-Russia crude oil pipeline
ER	Electrical resistivity
ERT	Electrical resistivity tomography
GT	Ground temperature
MAAT	Mean annual air temperature
MAGT	Mean annual ground temperature
ROW	Right-of-way
SLLP	Southern limit of latitudinal permafrost
TPCT	Two-phase closed thermosyphon
VWC	Volumetric liquid water content
ZAA	Zero annual amplitude

Figure S1 Jiabei automated weather station and instrumentations. Photo taken on April 2018. The rain gauge sensor has been installed but is ineffective. The photo shows the location of the Jagdaqi pump station. The CR3000 data logger, multiplexer, battery cell, solar charge controller, and wireless transmission module are placed in the white box with a solar panel (i.e. insulated box). All monitoring devices are protected by an aluminum alloy fence.

Figure S2 Position of boreholes drilled on and off the pipeline ROW and the ERT profile at the JS permafrost site. Photo taken on 29 June 2021. Ground temperatures are measured using thermistor chains connected to the CR3000 data logger. (a) Wireless transmission module (HKT-DTU, Campbell Scientific, Inc., USA), (b) CR3000 data logger with a TRM128 multiplexer, (c) Solar charge controller (Phocos ECO (10 A), Germany), (d) Battery cell, a part of the power supply device.

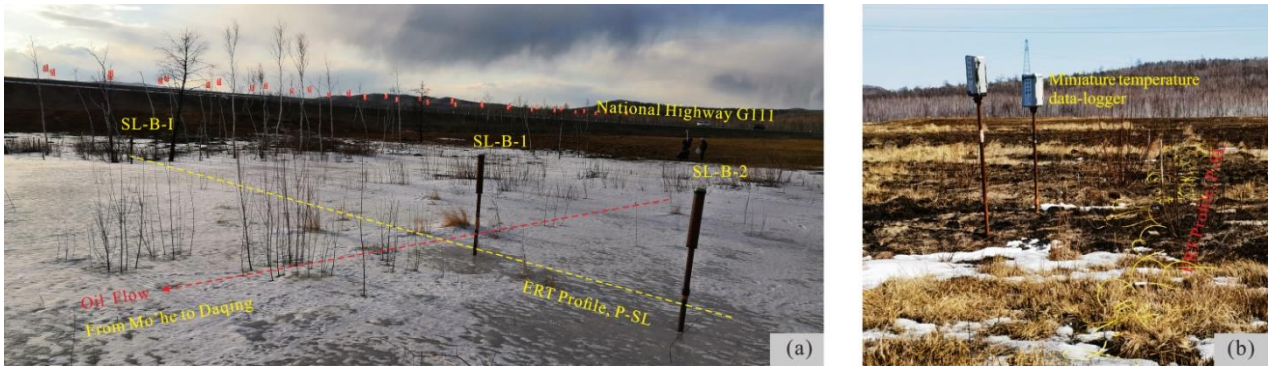

Figure S3 (a) Position of boreholes drilled on and off the pipeline ROW and the ERT profile at the SL permafrost site. Photo taken on 30 March 2018. The ground surface within the trench is completely covered with ice and snow. (b) Miniature temperature data loggers were installed in August 2020. Photo taken on 17 April 2021. The surface vegetation is destroyed by manual-controlled fire.

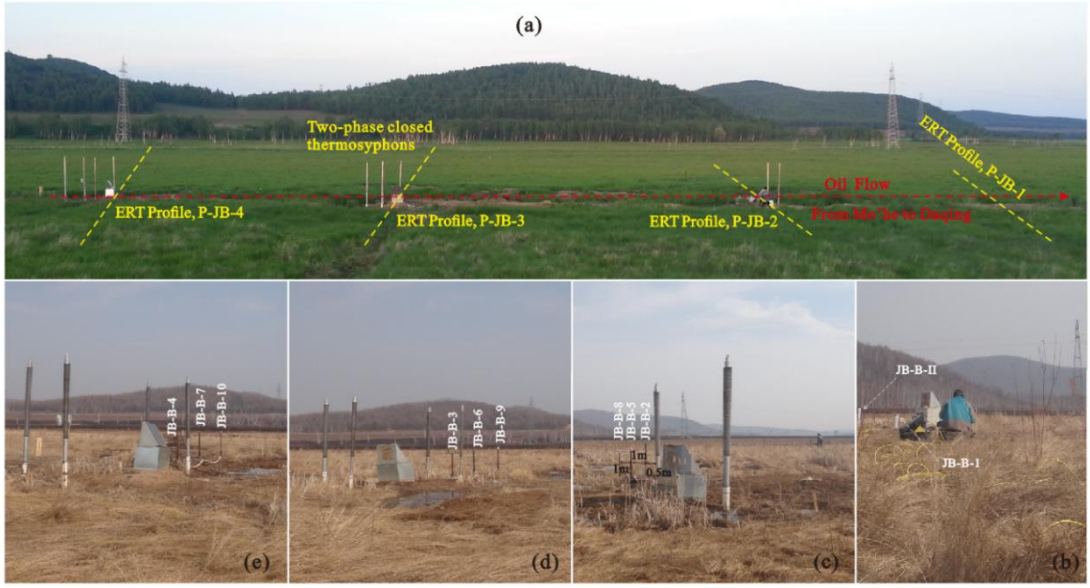

Figure S4 Picture of the monitored cross-sections, perpendicular to the pipeline at 20 m intervals, at the JB permafrost site. (a) Plane view, (b) section 1, without TPCT, (c) section 2, one pair of TPCTs, (d) section 3, two pairs of TPCTs at a longitudinal spacing of 1.3 m, (e) section 4, two pairs of TPCTs at a longitudinal spacing of 1.4 m. The data acquisition

device is the same as that at the JS site.

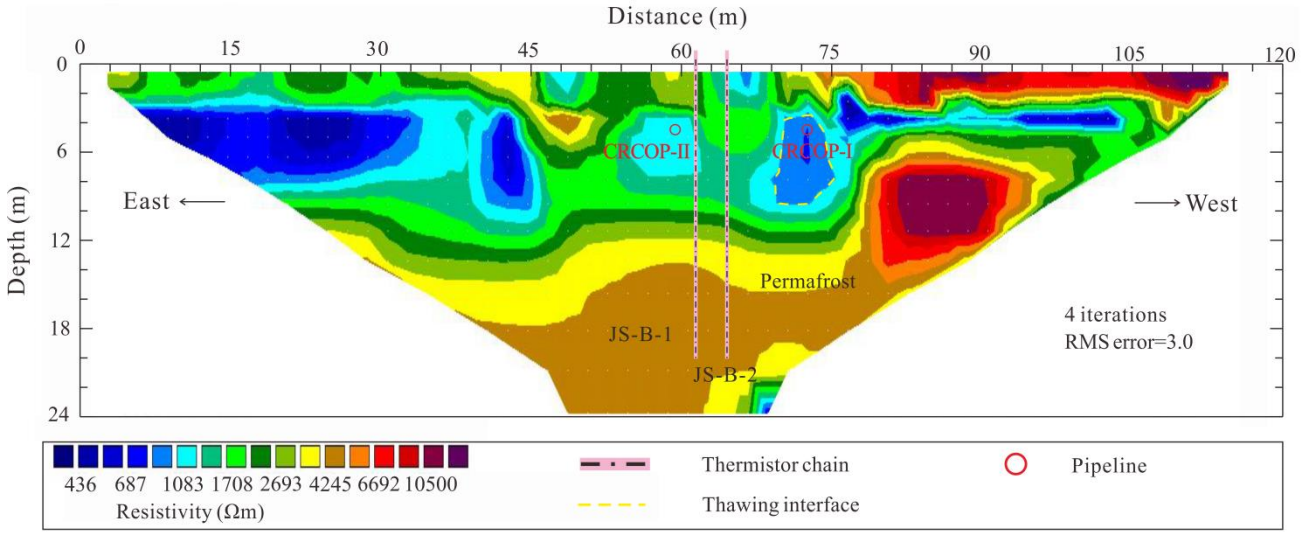

Figure S5 Inversion results of electrical imaging along P-JS profile at the JS site, carried out in April 2018.

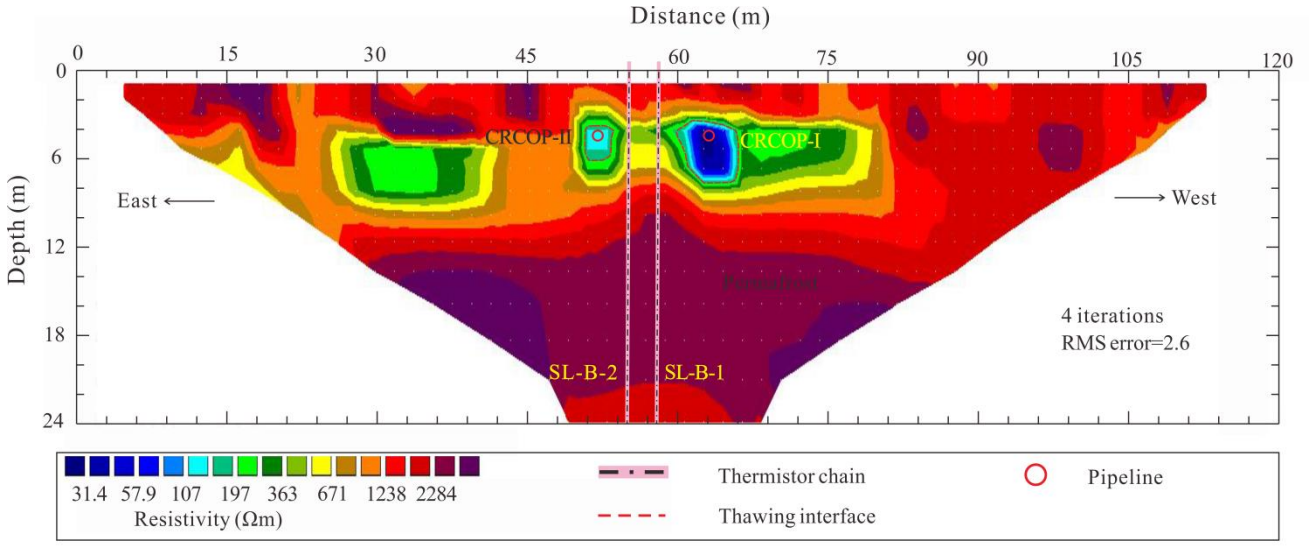

Figure S6 Inversion results of electrical imaging along P-SL profile at the SL site, carried out in April 2018.

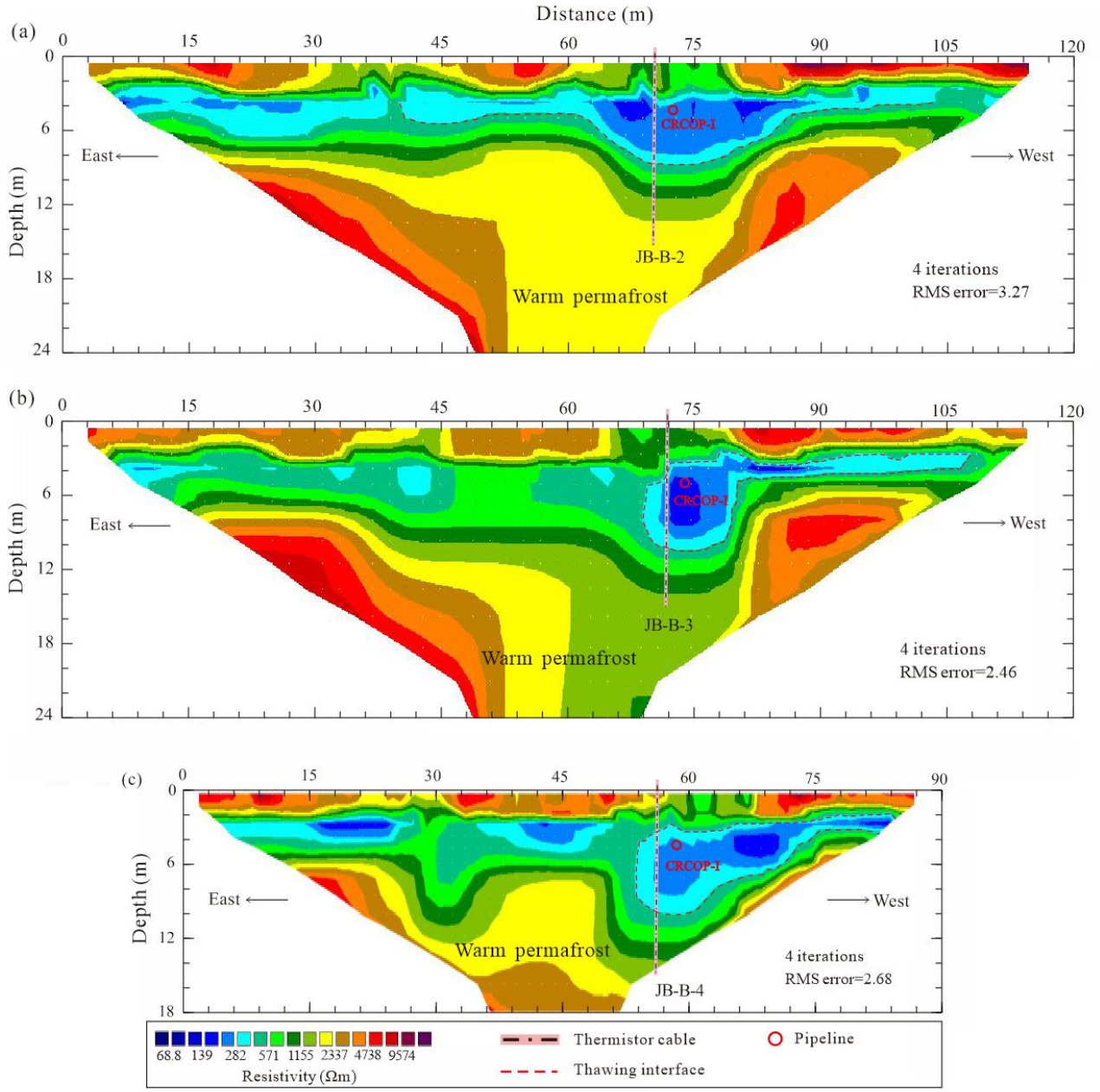

Figure S7 Inversion results of electrical imaging along monitored cross-sections with TPCTs at the JB site, carried out in April 2018. (a) P-JB-2 profile, one pair of TPCTs, (b) P-JB-3 profile, two pairs of TPCTs at a longitudinal spacing of 1.3 m, and (c) P-JB-4 profile, two pairs of TPCTs at a longitudinal spacing of 1.4 m.