Supplement of The Cryosphere, 18, 3231–3236, 2024
https://doi.org/10.5194/tc-18-3231-2024-supplement

The Cryosphere Open Access EGU

Supplement of

Brief communication: On the potential of seismic polarity reversal to identify a thin low-velocity layer above a high-velocity layer in ice-rich rock glaciers

Jacopo Boaga et al.

Correspondence to: Jacopo Boaga (jacopo.boaga@unipd.it)

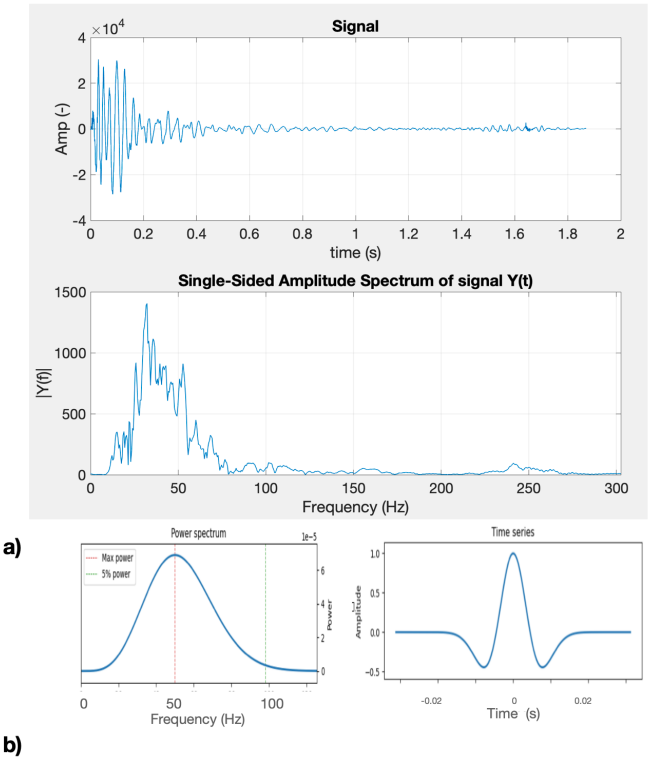

Fig. S1 a) experimental recordings of 1 shot at Schafberg site with 20kg sledgehammer, time and frequency domain; b) Ricker wavelet adopted for synthetic modelling centred at 50 Hz.

S1. Technical info for SRT / ERT processing

Flüelapass site

- *ERT Acquisition*

Syscal Pro- device, 48 channels, 2 m spacing, Dipole-Dipole skip 0-3, stacking range 3-6 (5% standard deviation threshold), and direct and reciprocal measurements.

- *ERT inversion modelling ResIPy*

Filtering

- $\rho_a < 0$
- $stacking\ error < 5\%$
- $reciprocal\ error < 10\%$ *(1050/1901)*

Inversion modelling

- *Inversion type: regularized inversion with linear filtering;*
- *Regularization mode: normal regularization;*
- *Data type: logarithmic;*
- *Expected data error: 10% (a_wgt = 0.01, b_wgt = 0.10);*
- *Flux type: 3D;*
- *Weights update: routine based on Morelli and LaBrecque (1996);*
- *smoothing factor: normal isotropic regularisation (= 1);*
- *Iteration: 2;*
- *Final RMS misfit: 1;*

Expected data error evaluated with the reciprocal check. We defined a boundary threshold for the reciprocal error that allowed for a reliable quality of the measured apparent resistivities but at the same time a homogeneous distribution of measured points in the pseudo-section.
We applied an isotropic smoothing since we were interested in highlighting both lateral and vertical variations of resistivity.

- *SRT acquisition*

Geode seismographs, 48 channels, 100 Hz geophones, 2 m geophones spacing, 4 meters shots spacing, 2 shots in each position, 20 kg hammer as seismic source.

- *SRT inversion modelling Pygimli*

Inversion modelling:

- *Picking error: 2 ms*
- *smoothing factor: normal isotropic regularisation (= 1);*
- *Regularization factor λ: 150;*
- *Starting model: gradient model 300-3000 m/s;*
- *Iteration: 4;*
- *Abort criteria reached: dPhi = 1.26 (< 2.0%);*
- *rms/rrms(data, Response) = = 0.00489155/14.2038%;*
- *chi^2(data, Response, error, log) = 5.48181;*

Picking error: we evaluated the data uncertainty by performing a repeated picking of P-wave first arrivals for several shot gathered, calculating this way a representative standard deviation of 2 ms.
Regularization factor: we chose λ values using the L-curve analysis.
We applied an isotropic smoothing since we were interested in highlighting both lateral and vertical variations of Vp.

Schafberg site

- *ERT Acquisition*

Syscal Pro- device, 48 channels, 3 m spacing, Dipole-Dipole skip 0-3, stacking range 3-6 (5% standard deviation threshold), and direct and reciprocal measurements.

- *ERT inversion modelling ResIPy*

Filtering

- $\rho_a < 0$
- $stacking\ error < 5\%$
- $reciprocal\ error < 20\%$ *(saved 1029/1901)*

Inversion modelling

- *Inversion type: regularized inversion with linear filtering;*
- *Regularization mode: normal regularization;*
- *Data type: logarithmic;*
- *Expected data error: 20% (a_wgt = 0.01, b_wgt = 0.20);*
- *Flux type: 3D;*
- *Weights update: routine based on Morelli and LaBrecque (1996);*
- *smoothing factor: normal isotropic regularisation (= 1);*
- *Iteration: 2;*
- *Final RMS misfit: 1.17*

Expected data error evaluated with the reciprocal check. We defined a boundary threshold for the reciprocal error that allowed for a reliable quality of the measured apparent resistivities but at the same time a homogeneous distribution of measured points in the pseudo-section.
We applied an isotropic smoothing since we were interested in highlighting both lateral and vertical variations of resistivity.

- *SRT acquisition*

Geode seismographs, 48 channels, 100 Hz geophones, 3 m geophones spacing, 4 meters shots spacing, 2 shots in each position, 20 kg hammer as seismic source.

- *SRT inversion modelling Pygimli*

Inversion modelling:

- *Picking error: 2 ms*
- *smoothing factor: normal isotropic regularisation (= 1);*
- *Regularization factor λ: 200;*
- *Starting model: gradient model 500-5000 m/s;*
- *Iteration: 4;*
- *Abort criteria reached: dPhi = 0.42 (< 2.0%)*
- *rms/rrms(data, Response) = 0.00309603/17.893%*
- *chi^2(data, Response, error, log) = 2.39635;*

Picking error: we evaluated the data uncertainty by performing a repeated picking of P-wave first arrivals for several shot gathered, calculating this way a representative standard deviation of 2 ms.
Regularization factor: we chose λ values using the L-curve analysis.
We applied an isotropic smoothing since we were interested in highlighting both lateral and vertical variations of Vp.