

Optimization of time domain induced polarization data acquisition and spectral information content

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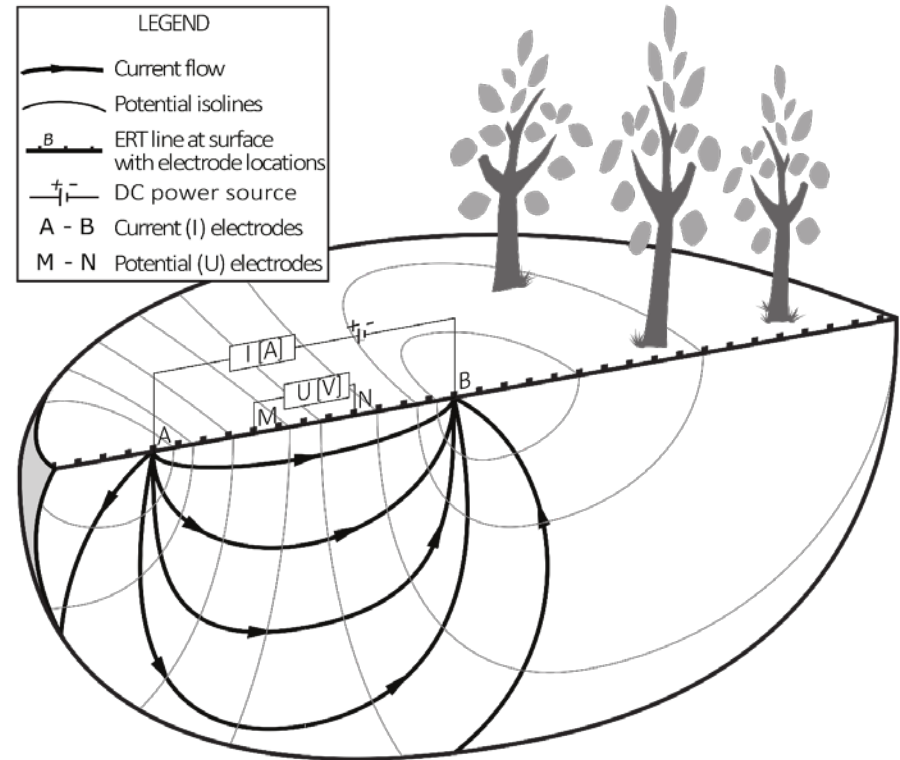
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Background

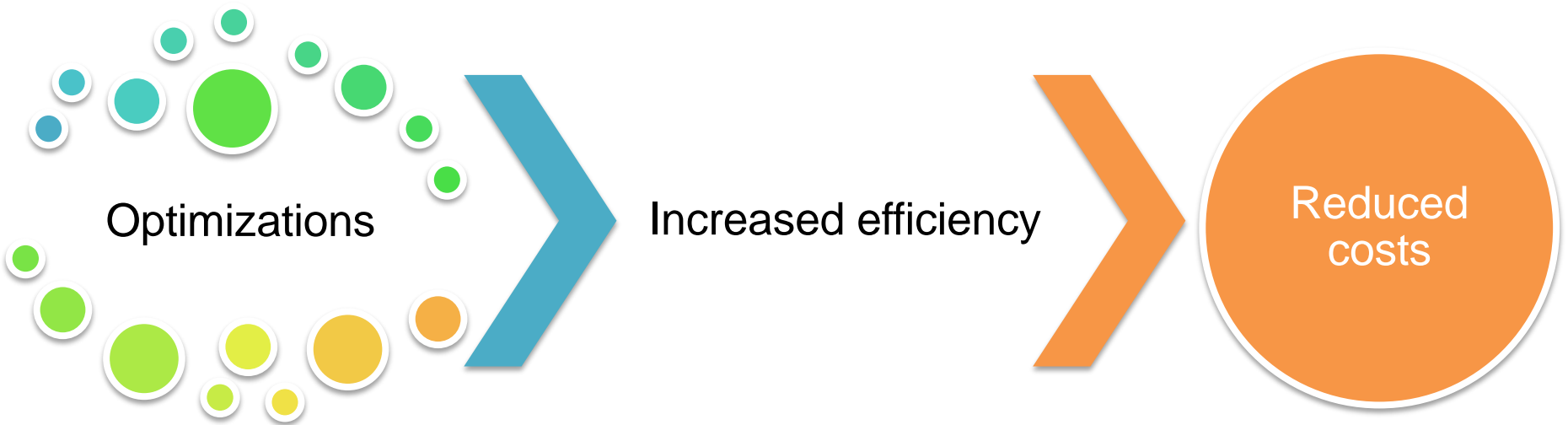
The direct current resistivity and time domain induced polarization method (DCIP) determines the electrical properties (resistivity and chargeability) of the subsurface.



The DCIP measurement principle. Original image provided by Wiebe Nijland, Utrecht University.

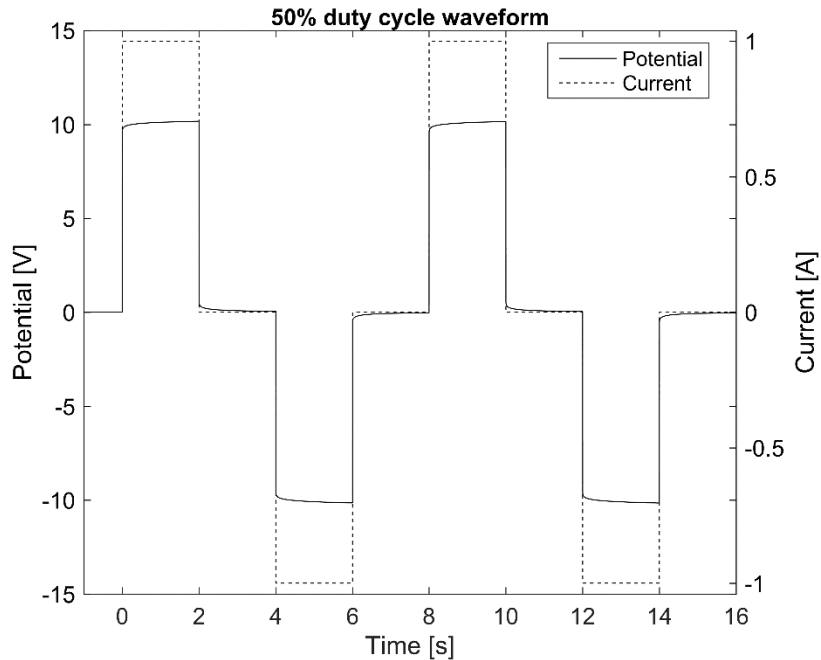
Aim

Increase the usefulness of the DCIP method by developing the data acquisition and processing methodology.

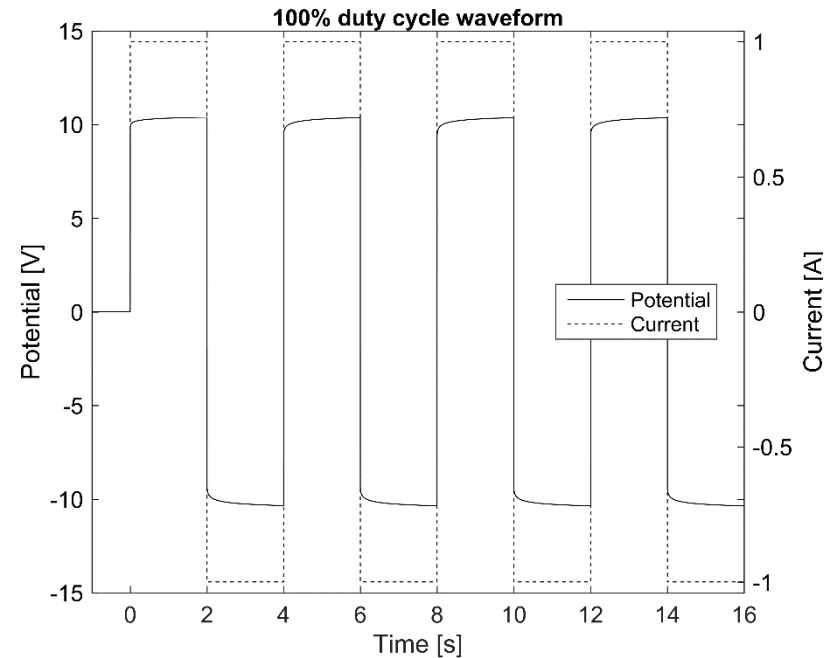


Results

Waveform optimization



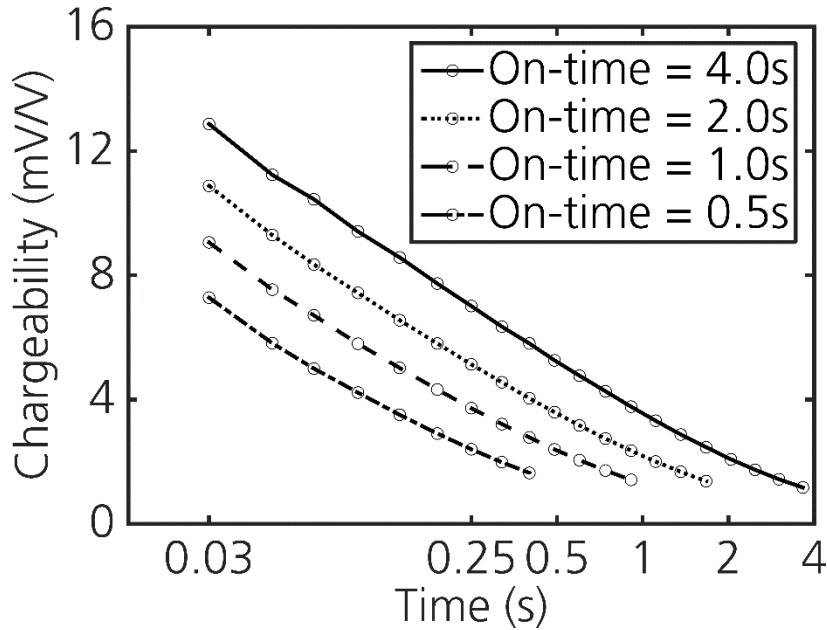
50% duty-cycle. Traditionally used, sub-optimized, IP waveform.



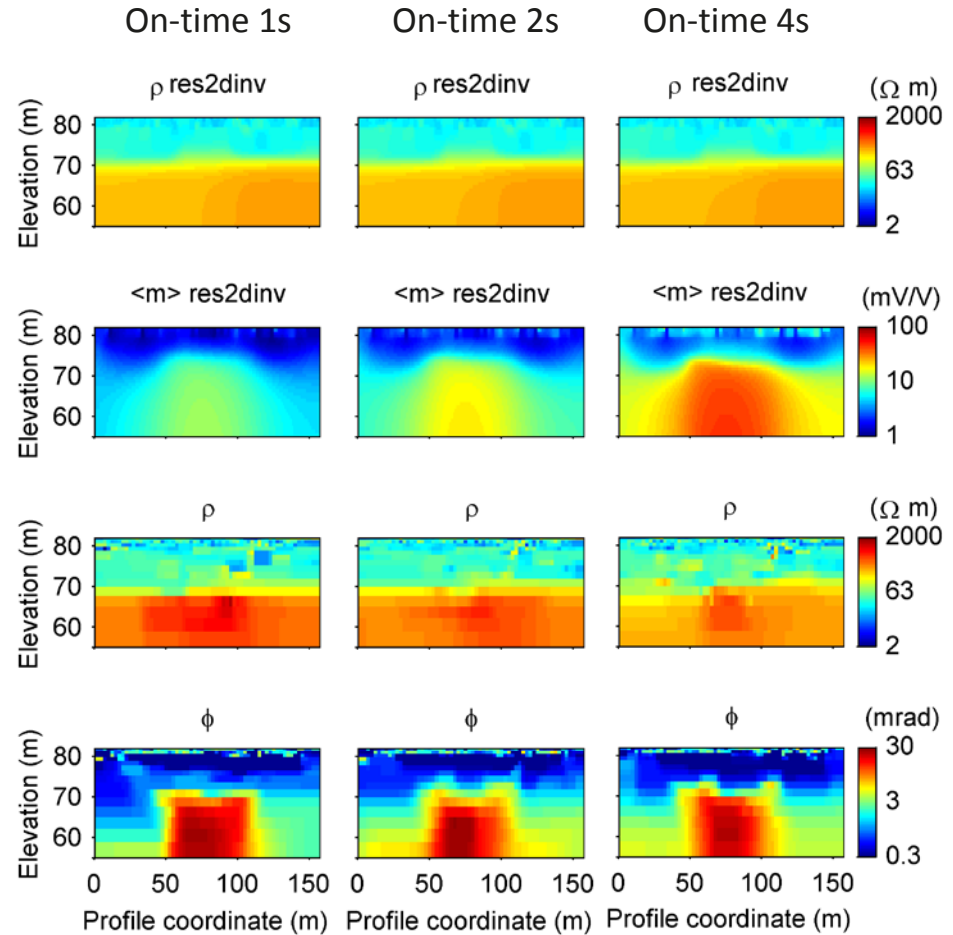
100% duty-cycle. Skipping current off-time and measuring IP in the on-time gives a faster acquisition and higher signal-to-noise ratio.

Results

Current on-time matters



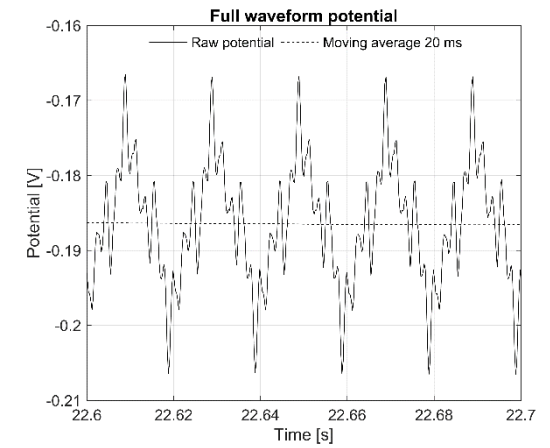
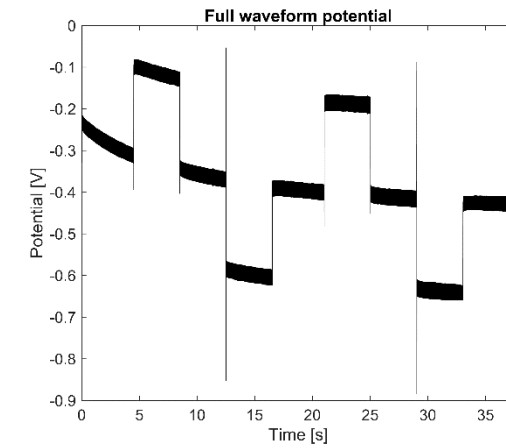
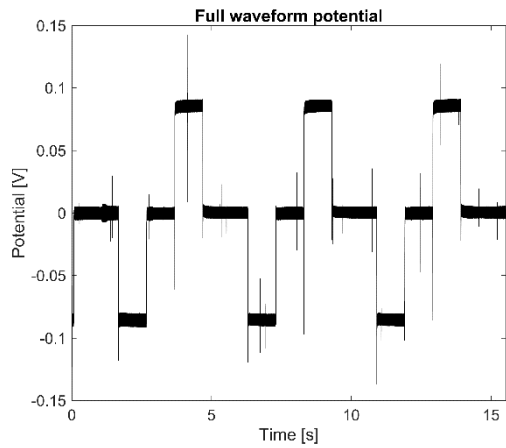
Registered IP responses for different current on-time. The on-time duration affects the IP data.



The problem with not considering current on-time. Res2Dinv chargeability inversion model depends on the current on-time and thus gives biased results.

Results

Signal processing



Spikes.

Background drift.

Harmonic noise.



User value

- ✓ Field acquisition time reduced by 50%.
- ✓ Improved data quality by waveform optimization.
- ✓ IP models not biased by acquisition settings.
- ✓ Higher data reliability and quality with signal processing.
- ✓ Data driven uncertainty estimates.