Phase-contrast functional EIT images

Andy Adler[1], Martijn Miedema[2] David Tingay[3]

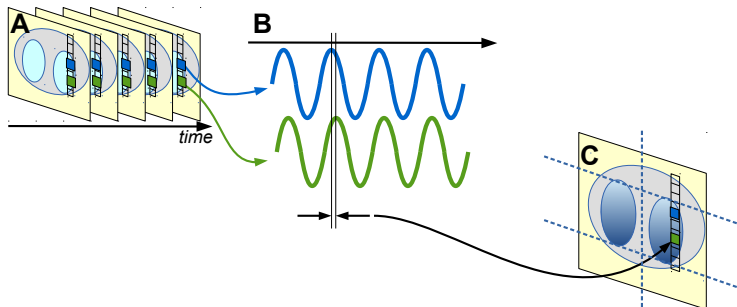[1]Carleton University, Ottawa, [2]Academic Medical Center, Amsterdam, Netherlands, [3]University of Melbourne, Australia
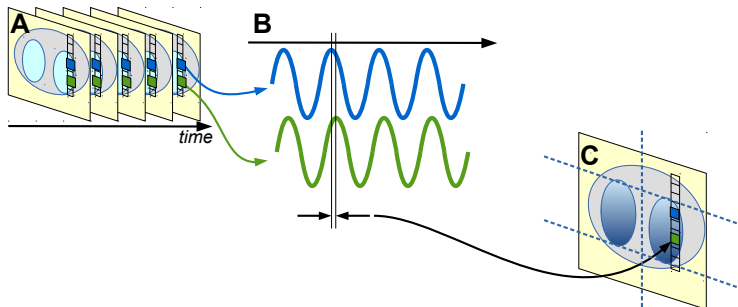
(A) EIT image sequence. (B) analysis of waveforms to calculate a TV, and generation of which fEIT images (C). (D) horizontal histogram of breathing in L/R slices. (E) L/R centre of gravity

phase-delay fEIT

(A) EIT image sequence. (B) waveforms at two pixels with a phase difference, which is represented as the (C) phase-delay fEIT image
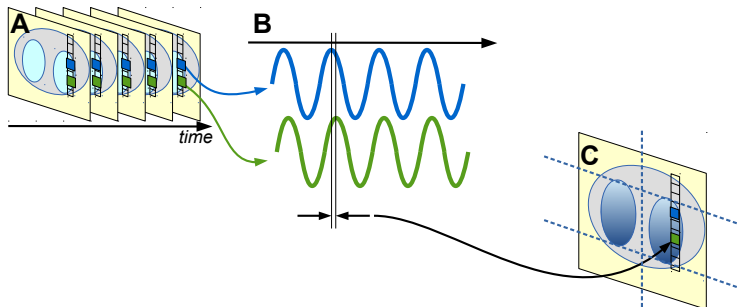
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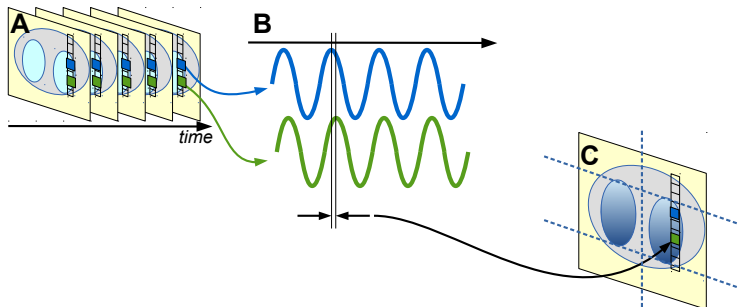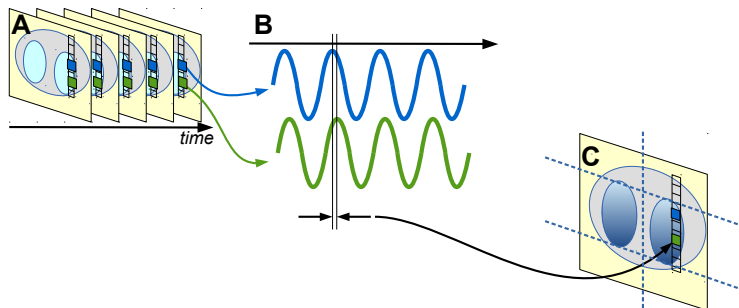
Challenges

phase-delay fEIT

(A) EIT image sequence. (B) waveforms at two pixels with a phase difference, which is represented as the (C) phase-delay fEIT image

Challenges
- Reference phase

phase-delay fEIT

(A) EIT image sequence. (B) waveforms at two pixels with a phase difference, which is represented as the (C) phase-delay fEIT image

Challenges
- Reference phase → Average signal

phase-delay fEIT

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Challenges

- Reference phase $\rightarrow$ Average signal
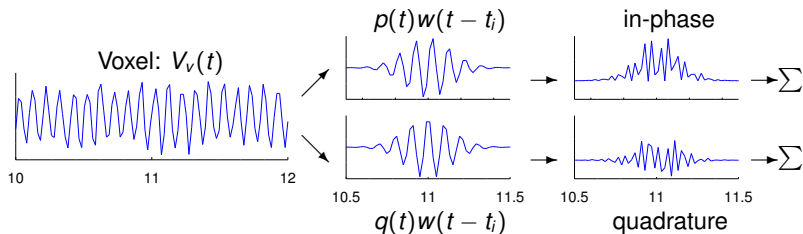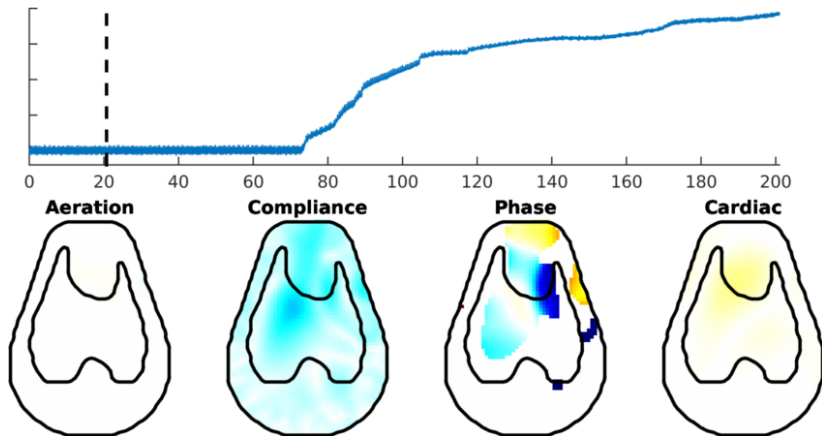- 360° phase changes

Figure: Phase detection: voxel waveform (*left*) multiplied by windowed *p*, *q* (*centre*) to produce (*right*) which are summed.
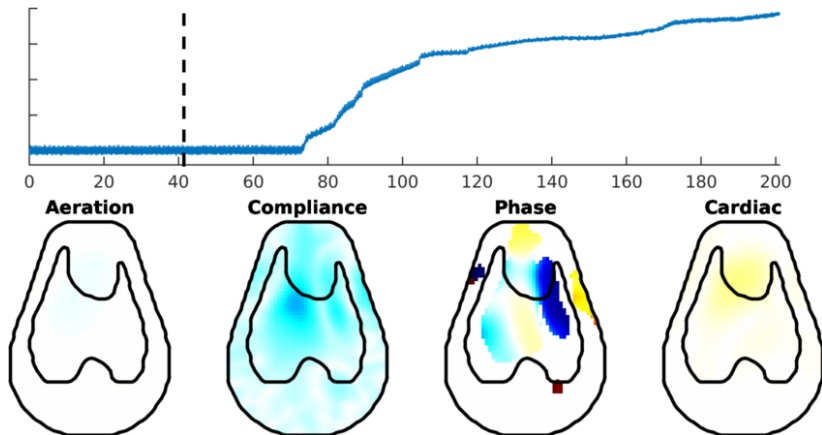
Experimental Methods

- Extremely premature neonatal lambs
- Instrumented pre-birth
- Swisstom pioneer set: 32 electrodes, lamb belt, GREIT
- EIT placed immediately after birth but before first breath
- High frequency oscillatory ventilation (10 Hz)
- Various care parameters tested
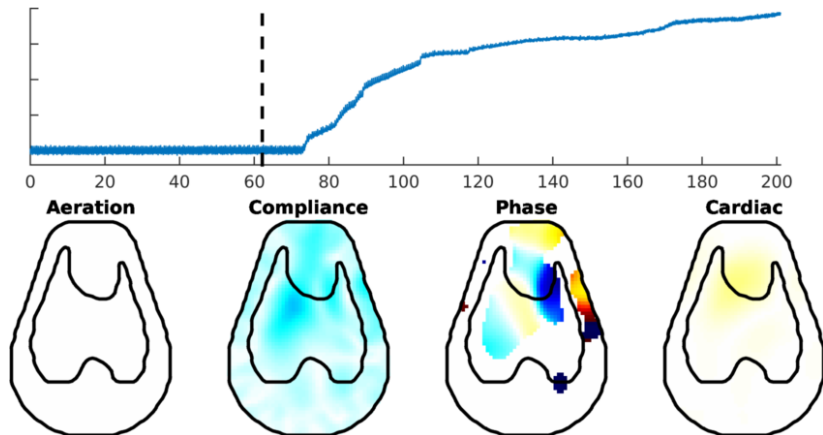- Spontaneous pneumothorax is fairly common
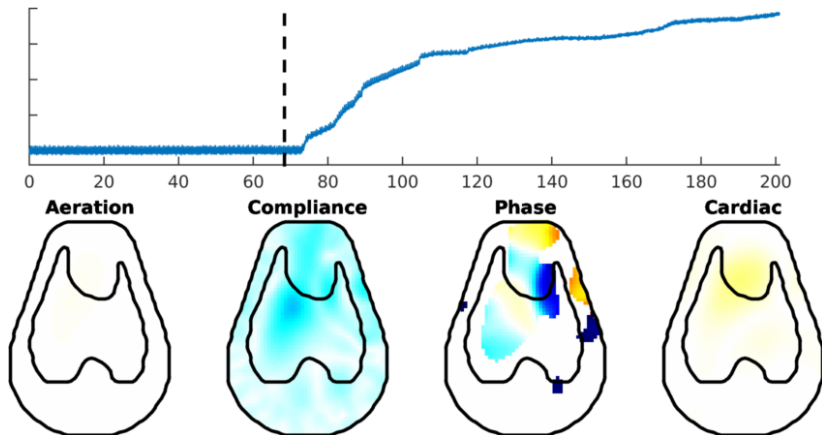
phase-delay fEIT of Pneumothorax
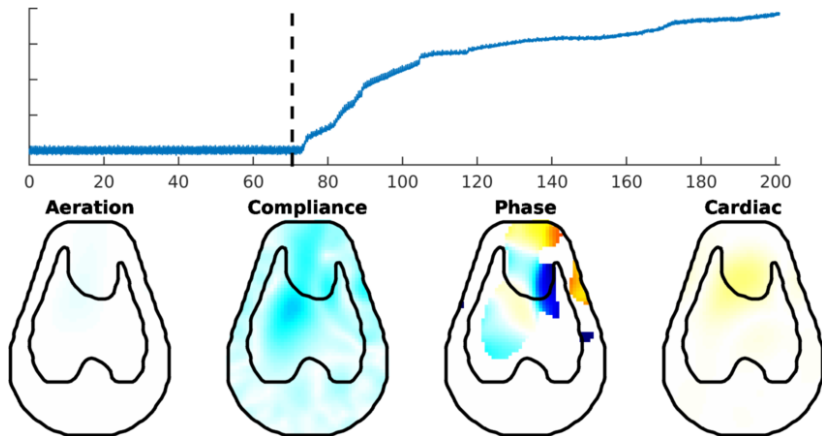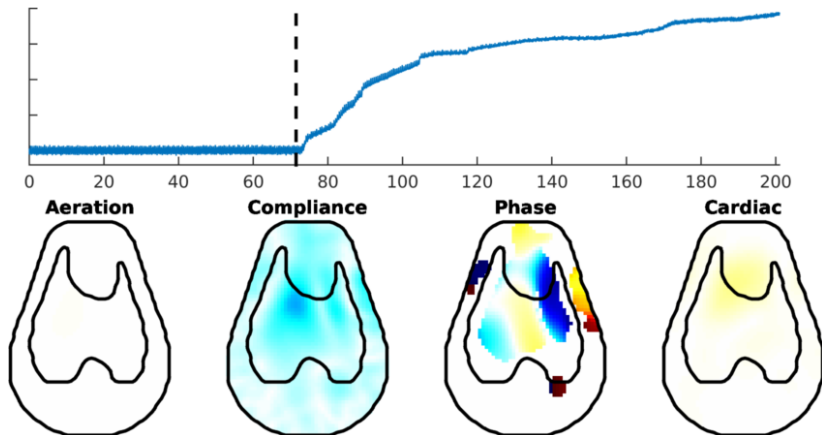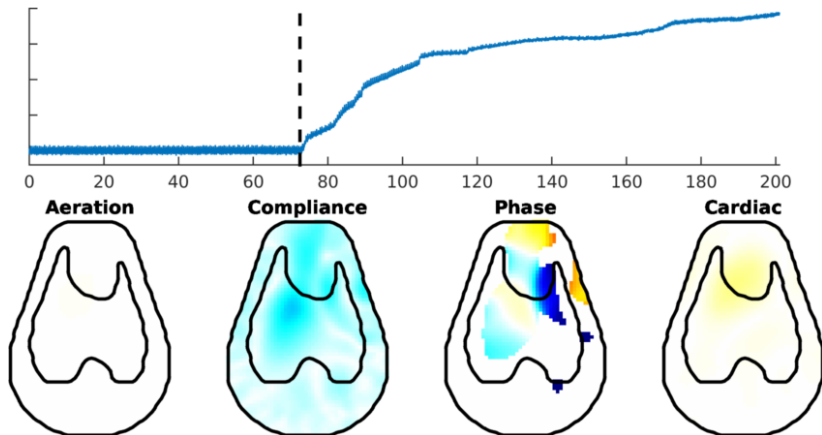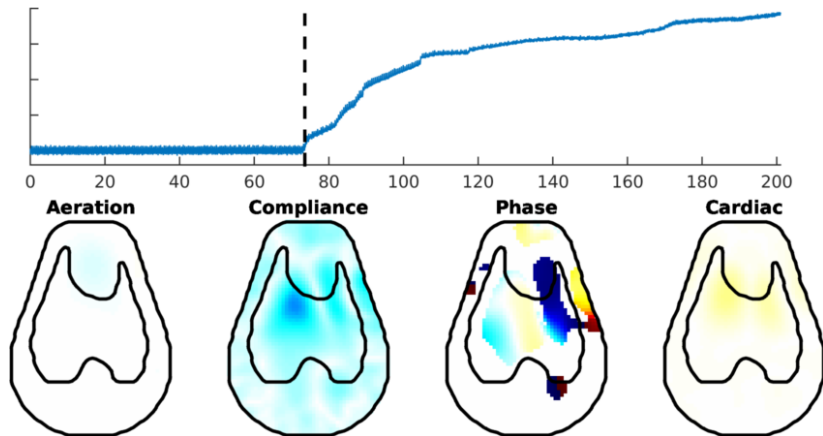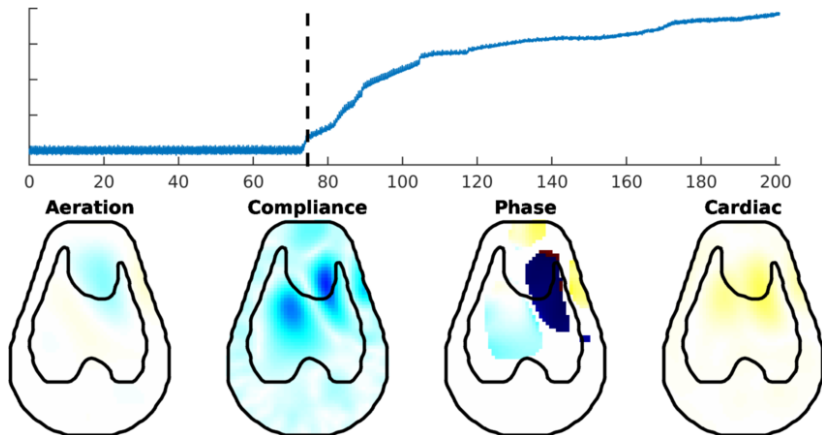
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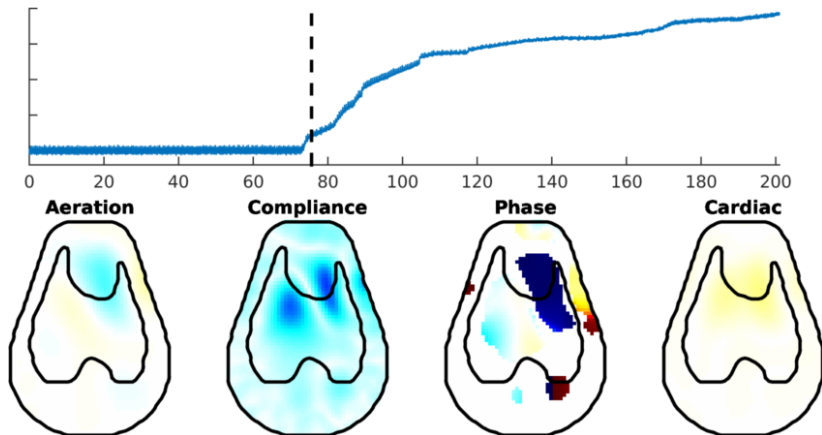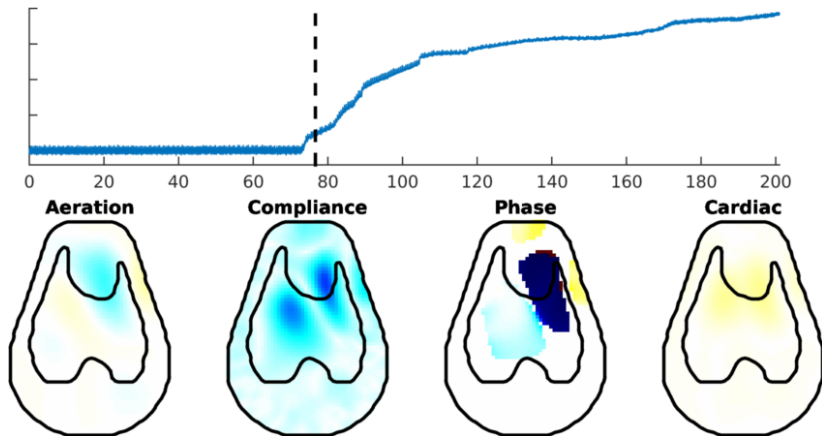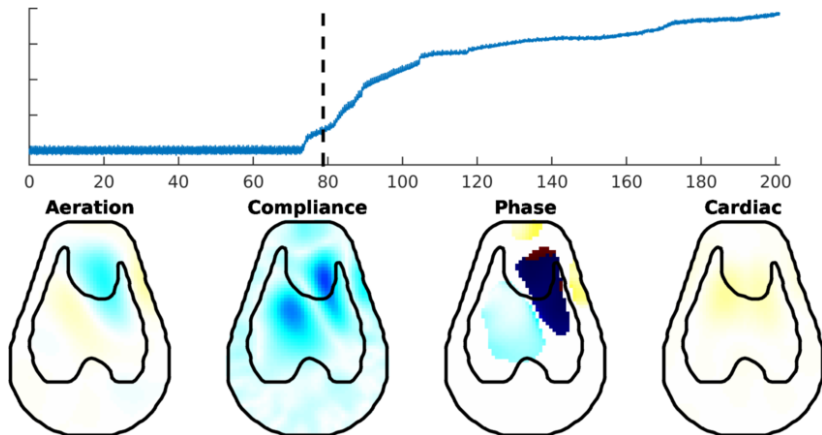# phase-delay fEIT of Pneumothorax

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Aeration   Compliance   Phase   Cardiac
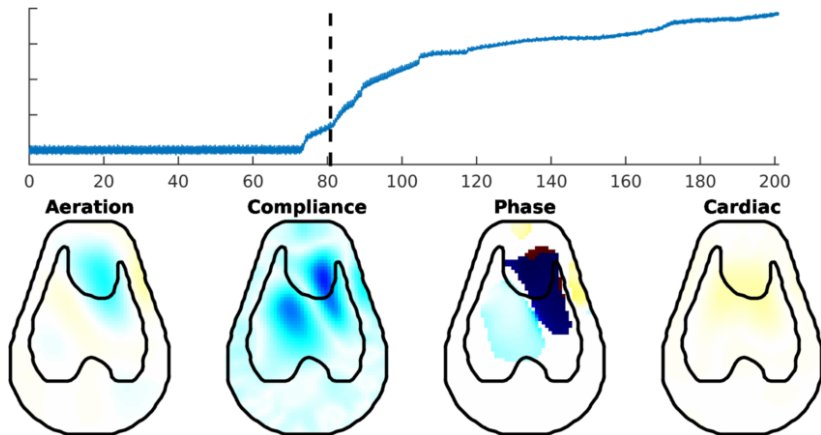
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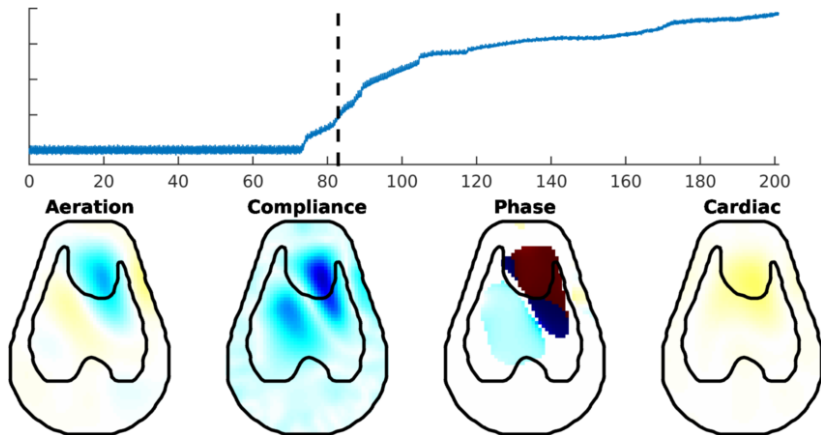
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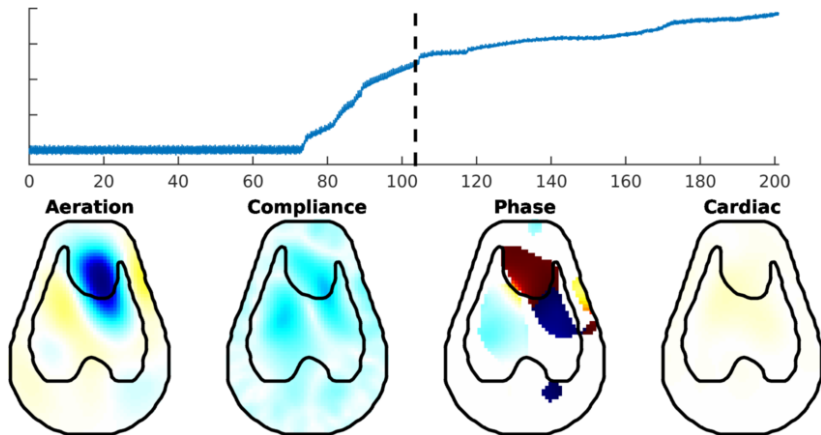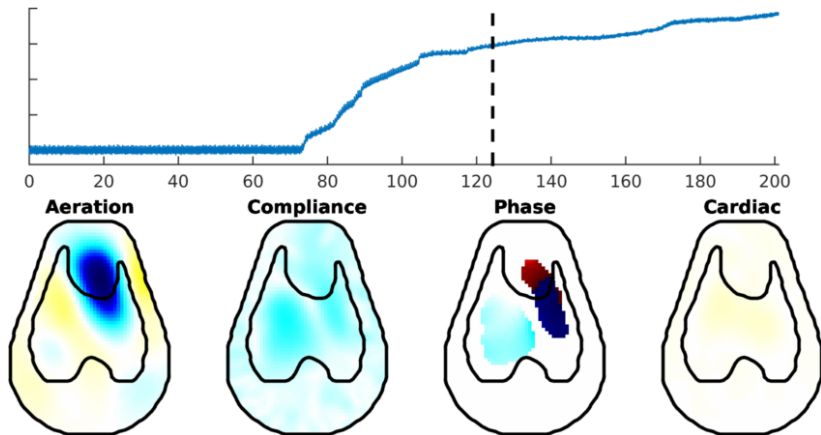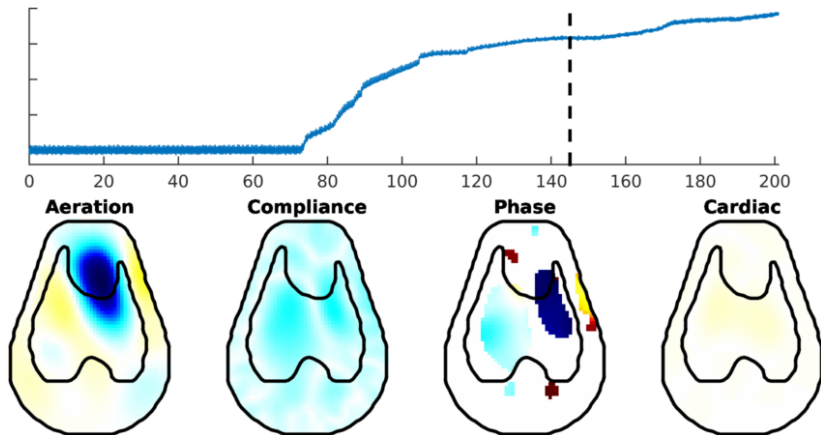# phase-delay fEIT of Pneumothorax
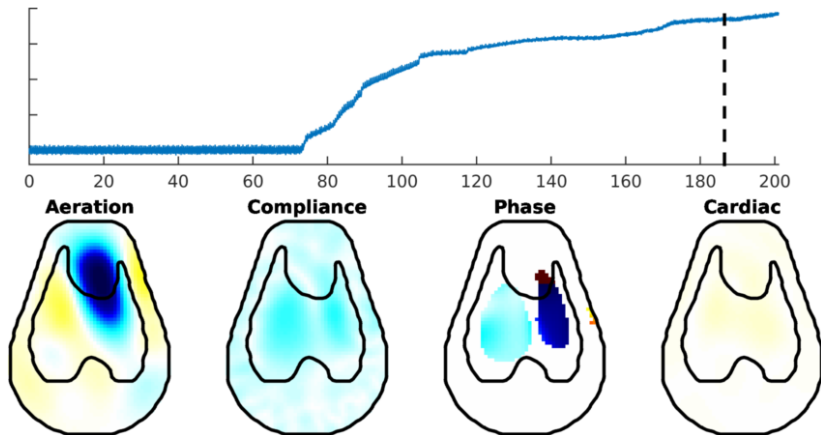
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EIT 2018, Edinburgh, UK
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