

New in AFNI's *physio_calc.py* (for FMRI physio regressors): QC images, reports and interactive mode



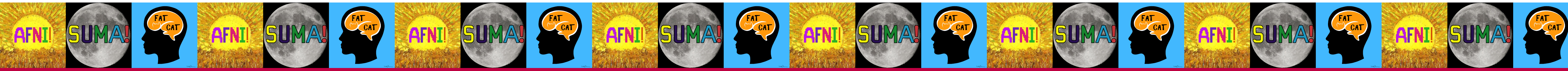
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#1690



Introduction

physio_calc.py is a recent AFNI¹ program for processing physiological (cardiac, respiratory) time series. It creates slice-wise RETROICOR² and RVT³ regressors to include in FMRI processing, such as with *afni_proc.py*⁴ or other software.

New features described here include:

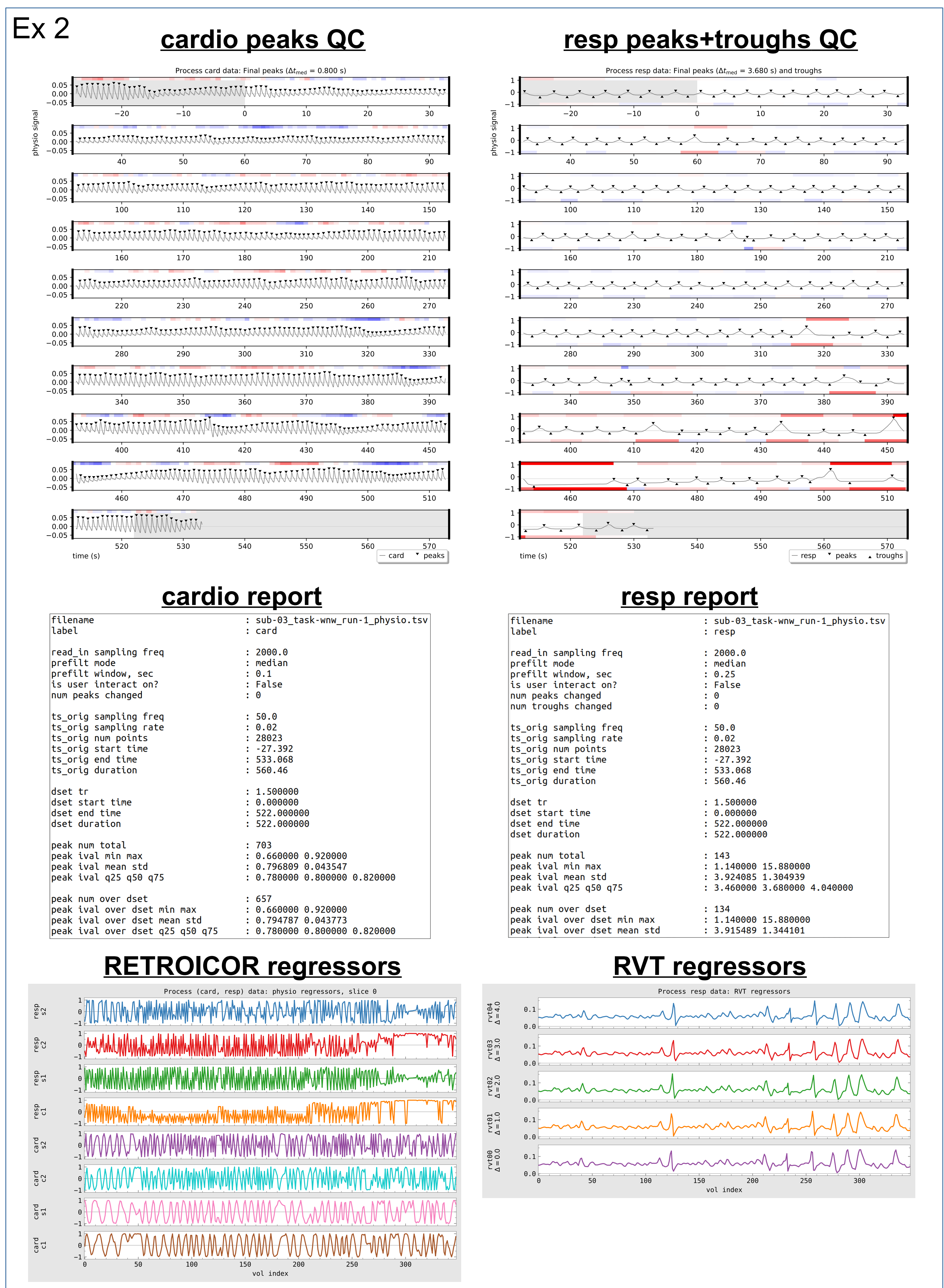
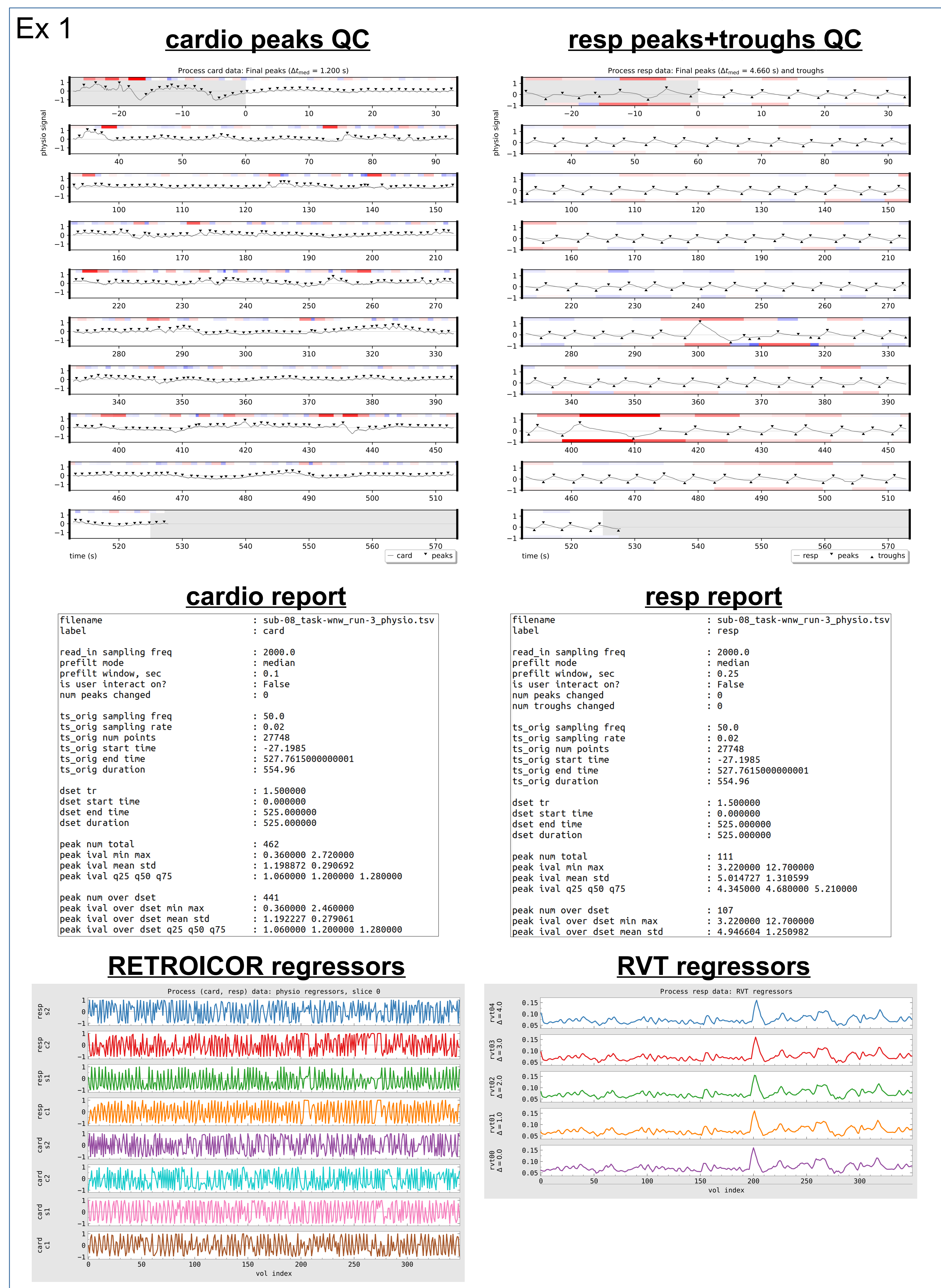
- Quality control (QC) images of physio time series processing
- A simple “interactive” mode to correct peak/trough detection
- Helpful reports of time series properties to query/compare

Methods & Results

Peak/trough QC: *physio_calc.py* can output several QC images of intermediate processing. In the final one, triangles highlight peaks (▼) and troughs (▲). Color rectangles encode each interpeak interval: median values are white, while shorter ones are bluer (■) and longer ones are redder (■). These can highlight either physiological patterns in the time series, or potential QC issues (e.g., an erroneous or missing peak). The same appears at the bottom of each panel when estimating troughs. The FMRI-overlap interval has a white background; the rest has a gray background (■).

Reports: *physio_calc.py* outputs a dictionary of useful quantities after processing each physio time series. This includes time sampling, filter information, inter-peak and trough statistics, counts of fixed points, and more. These can be combined easily using AFNI's *gen_ss_review_table.py*⁵ into an across-group spreadsheet, which can be queried to find outliers or interesting patterns. This quantitative QC is helpful in summarizing group properties and/or finding data issues.

Interactive mode: Users can add an option “do_interact” when running *physio_calc.py*, to be able to add, remove or shift estimated peaks and troughs. This functionality requires no extra dependencies (only Matplotlib), and utilizes simple mouse- and button-clicks to edit the points. This editing can quickly improve results when processing noisy physio time series.



Conclusions

Physio time series can be useful for FMRI processing, but they are highly susceptible to noise and distortion and must be checked for accuracy. To date, little formal attention has been paid to the QC of these physio inputs and their computed regressors. AFNI's *physio_calc.py* contains several features to provide efficient QC images and quantitative reporting. It also has a simple interface for fixing any features within the estimates. Careful QC of all processing steps (both visual and quantitative) is key to all FMRI processing and sub-step processing⁵, so these features should be considered vital in all analyses.
→ And see also *OHBM Poster #1687* for more discussion of *physio_calc.py*

Acknowledgments, References & QR Code

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