ABCD ATSM epi_pepolar (fMRI Field Map)

Question?
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Introduction

- A short SE EPI acquisition that acquires both positive (fwd; PA) and negative (rev; AP) polarity phase encoding in separate temporal phases is provided. This data can be used for offline distortion correction such as UCSD's distortion correction (used in ABCD) and FSL TOPUP.

- Widespread adoption in GE research communities

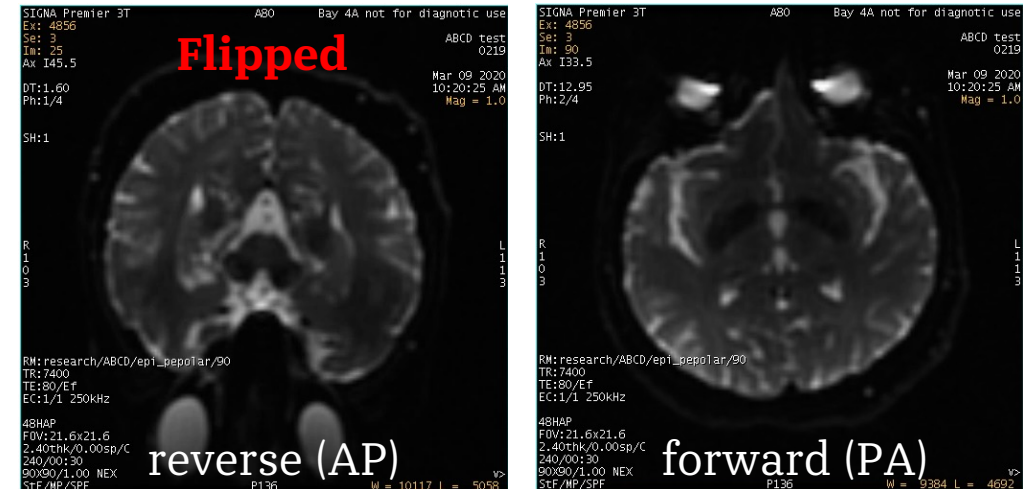- **The below issues cause confusion for GE users**

Issues

- The DICOM headers report the (incorrectly) same phase encoding direction for all volumes

- The reversed images are stored to disk with the row order reversed, but no difference in spatial alignment is recorded in the DICOM header. (Flipped)

CV12: pepolar (0=fwd; 1=rev; 2=r-f; 3=f-r) (default=2)

Reported in the DICOM tag (0019,10B3) UserData12

reverse (AP)   forward (PA)

Solution

- The development branch (v1.0.202100814) of dcm2niix fixed these issues. All future stable releases will include these fixes (based on PSD name + CV12). This option provides a mechanism to trouble shoot any unintended consequences of the kludge: `make CFLAGS=-DmyDisableGEPEPolarFlip`

- Reported PhaseEncodingDirection/PhaseEncodingPolarityGE in the BIDS sidecar correctly

- Additionally, dcm2niix splits this series into two series expected by the BIDS and FSL's TOPUP

- Open-source validation data provided by U of Michigan (UHP Rx28), https://github.com/neurolabusc/dcm_qa_polar
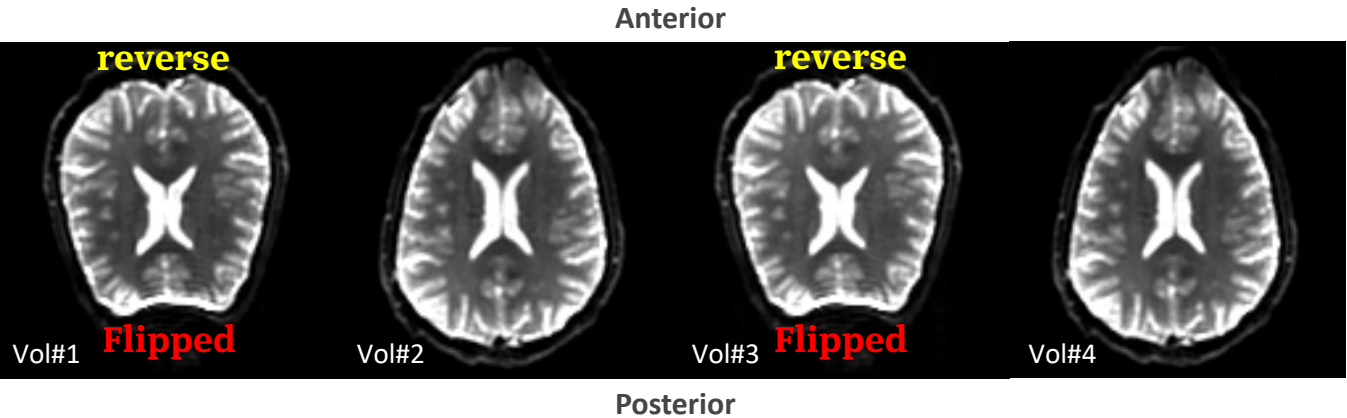For details: https://github.com/rordenlab/dcm2niix/issues/532

epi_pepolar (fMRI Field Map) with CV12 (pepolar) = 2 (r-f), # of phases = 4, Series# = 5

Before

rsfMRI_Field_Map_5.nii

BIDS sidecar JSON

```
"PhaseEncodingPolarityGE": "Flipped",
"PhaseEncodingDirection": "j",
```

incorrect

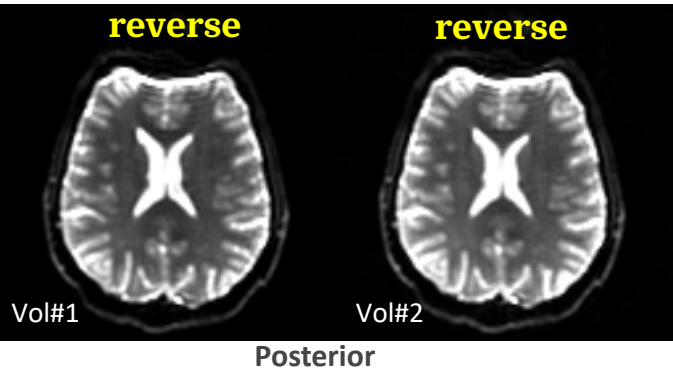**After** (dcm2niix **v1.0.202100814 or later**)

rsfMRI_Field_Map_5.nii
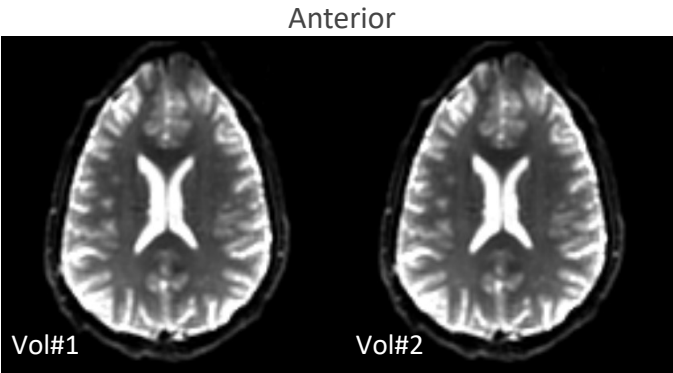
BIDS sidecar JSON

```
"PhaseEncodingPolarityGE": "Flipped",
"PhaseEncodingDirection": "j",
```

correct

rsfMRI_Field_Map_1005.nii

BIDS sidecar JSON

```
"PhaseEncodingPolarityGE": "Unflipped",
"PhaseEncodingDirection": "j-",
```

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