




bup_bdown_TORTOISE GUI:


Blip-up Blip-down correction

Please enter the pertinent blip-up blip-down information:

Blip-up data list file (required): 

Blip-down data list file (required): 

Structural image file (recommended): 

Initial deformation field: 

Bup Bdown Settings:

Display registration progress?

Restrict deformation to phase encoding?

Constrain up_to_middle deformation to down_to_middle?

Final DWI resolution:

Gradient step-length: Correlation window size:

Start from step:

Use metrics: metric 1 metric 2 metric 3 metric 4

Use synthesized DWIs?

Number of DWIs: DWI weights:
(weight1 x weight2 x...weightn)
(or "signal" for signal based weighting)
(or 0 for equal weighting)

Do quadratic registration to structural?

Constrain DWIs to structural at middle too?

Gaussian smoothing for metric : deformation field :

Before you begin bup-bdown EPI correction, you must generate the up.list and down.list from the TORTOISE DIFFPREP module.

Blip-up data list file: This tag indicates the full path to the list file for the up data. The up.list is required.

Blip-down data list file: This tag indicates the full path to the list file for the down data. The down.list is required.

Full path to the structural: This tag indicates the full path to the ACPC-aligned structural image. A T2 structural is strongly suggested for optimal results.

Initial deformation field: This tag indicates the full path to an existing deformation field (i.e., displacement field obtained through the “*line-integral*” method) that the user would like to initialize the correction with.

Display registration process? : Select this option if you would like to generate the GUI that displays the registration process. By default, this option will be selected.

Restrict deformation to phase encoding? : Select this option if you would like to correct the data in the phase encoding direction only. By default, this option will be turned on to model the deformation field based on the physical constraints of EPI distortions.

Constrain up_to_middle deformation to down_to_middle? : Theoretically, the displacement of the corrected image to the up image should be the exact inverse of the displacement of the corrected image to the down image. Because several factors, such as motion, invalidate this assumption, this option is turned off by default.

Final DWI resolution: This option allows you to choose the resolution at which you would like to output your corrected data. By default, this option will be set at 1.5 mm isotropic.

Gradient step-length: This option refers to the step-length along the metric gradient direction in the optimization procedure. The step-length is dependent on the magnitude of the EPI distortions and the resolution of the raw data. For a typical human dataset, it has been empirically found that a value of 1.5 works well. However, larger EPI distortions generally require larger gradient step-length values.

Correlation window size: This option allows you to choose the window size with which the local cross-correlations will be computed. Refer to the ANTS documentation (<http://stnava.github.io/ANTs/>) for more details.

Start from step: This option allows you to choose the step at which to begin the bup-bdown correction. By default, the correction will begin at Step 1. You can find a description of what is done at each step below:

Step 1: Motion and eddy current correction done in DIFFPREP is applied to the original up and down data. The tensors are then computed from the corrected up and down DWIs. This outputs two images in a new bup_bdown_proc directory: blip_up.nii and blip_down.nii. Each of these images consists of an estimated b0 and synthesized DWIs.

Step 2: The blip_up.nii and blip_down.nii images are registered to each other and to the structural to correct for EPI distortions. Deformation fields are generated from these registration steps.

Step 3: The deformation fields from Step 2 are combined and then applied to the original up and down DWIs in one interpolation step. The corrected up and down data are then combined and output as a DMC.list file in the bup_bdown_proc folder. The DMC.list can be opened and viewed in DIFFCALC.

Use metrics: This option allows you to choose the type of registration you would like to apply to your up and down data. At least one metric must be selected. If you have provided a structural, select metrics (1) and (2). Otherwise, select metrics (3) and (4). For a description of the metrics, please refer to the paper.

Use synthesized DWIs? : By default, the software generates synthesized DWIs from the motion and eddy-current corrected up and down data and uses these DWIs for the registration. If this option is not selected, the registration will be performed on the real data.

Number of DWIs: This tag indicates the number of synthesized or real DWIs that are used in the registration. At least 6 DWIs are recommended.

DWI weights: The tag allows you to choose the type of weighting you would like to apply to the b0 image and the DWIs. There are three options:

Option 1: Type '0' to set the weighting to zero. Setting the weighting to zero will apply equal weighting to the b0 and DWIs.

Option 2: Type 'signal' to set the weighting according to the real signal in the DWIs.

Option 3: Specify the weights you would like to use for each DWI. For example, if you are using 6 DWIs and want the third DWI to carry more weight than the other DWIs, you would fill this field with "0x0x1x0x0x0x0". (Note: The weights must add up to 1.)

Do quadratic registration to structural?: This option allows you to choose whether or not a quadratic registration is performed. By default, this option is selected since this type of registration takes care of the concomitant field distortions in the data.

Constrain DWIs to structural at middle too? : Because of the different contrast between the structural and the DWIs, a structural may not be useful in certain cases. This option, when selected, forces the DWI registration to use the structural information. (Note: If this option is disabled, b0 image registration will still use structural information.)

Gaussian smoothing for gradient: If you observe local instabilities in the deformation fields and the final DWIs, increase the value listed. Refer to the ANTS documentation (<http://stnava.github.io/ANTs/>) for more information.

Gaussian smoothing for Deformation field: If you observe local instabilities in the deformation fields and the final DWIs, increase the value listed. Refer to the ANTS documentation (<http://stnava.github.io/ANTs/>) for more information.