

## Calibration results

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### Normalized Residuals

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Reprojection error (cam0): mean 0.0896113725846, median 0.0855177103386, std: 0.0452083199996  
Reprojection error (cam1): mean 0.0901944150724, median 0.085508746459, std: 0.0458429876501  
Gyroscope error (imu0): mean 0.492409906574, median 0.457520185683, std: 0.260795611648  
Accelerometer error (imu0): mean 0.581901156879, median 0.536662355638, std: 0.302618160427

### Residuals

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Reprojection error (cam0) [px]: mean 0.0896113725846, median 0.0855177103386, std: 0.0452083199996  
Reprojection error (cam1) [px]: mean 0.0901944150724, median 0.085508746459, std: 0.0458429876501  
Gyroscope error (imu0) [rad/s]: mean 0.001114196429, median 0.00103525000264, std: 0.000590113105599  
Accelerometer error (imu0) [m/s^2]: mean 0.0230421102245, median 0.0212507450892, std: 0.0119830677875

### Transformation (cam0):

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T\_ci: (imu0 to cam0):

```
[[ -0.99951885  0.02980339 -0.00859208  0.04725218]
 [  0.00756258 -0.03448541 -0.99937659 -0.04754779]
 [ -0.03008111 -0.99896072  0.03424343 -0.06691446]
 [  0.          0.          0.          1.         ]]
```

T\_ic: (cam0 to imu0):

```
[[ -0.99951885  0.00756258 -0.03008111  0.04557617]
 [  0.02980339 -0.03448541 -0.99896072 -0.06989289]
 [ -0.00859208 -0.99937659  0.03424343 -0.04482077]
 [  0.          0.          0.          1.         ]]
```

timeshift cam0 to imu0: [s] (t\_imu = t\_cam + shift)

0.0

### Transformation (cam1):

-----

T\_ci: (imu0 to cam1):

```
[[ -0.99951278  0.03025715 -0.00766262 -0.05371583]
 [  0.00806097  0.01306573 -0.99988215 -0.04616899]
 [ -0.03015346 -0.99945675 -0.01330326 -0.07048542]
```



[ 0. 0. 0. 1. ]]

T\_ic: (cam1 to imu0):

[[-0.99951278 0.00806097 -0.03015346 -0.05544287]  
[ 0.03025715 0.01306573 -0.99945675 -0.06821861]  
[-0.00766262 -0.99988215 -0.01330326 -0.04751284]  
[ 0. 0. 0. 1. ]]

timeshift cam1 to imu0: [s] (t\_imu = t\_cam + shift)  
0.0

Baselines:

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Baseline (cam0 to cam1):

[[ 0.99999947 -0.00094448 -0.00042164 -0.10104111]  
[ 0.00092337 0.99886919 -0.04753402 -0.00189931]  
[ 0.00046606 0.04753361 0.99886953 -0.00140851]  
[ 0. 0. 0. 1. ]]

baseline norm: 0.101068772082 [m]

Gravity vector in target coords: [m/s^2]  
[ 0.03444932 -9.69475661 -1.47612003]

Calibration configuration

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cam0

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Camera model: eucm

Focal length: [191.30518329983798, 191.2667458622697]

Principal point: [254.9873542470252, 256.9316965342323]

EUCM alpha: 0.62898914422

EUCM beta: 1.04677097885

Distortion model: none

Distortion coefficients: []

Type: aprilgrid

Tags:

Rows: 6



Cols: 6  
Size: 0.088 [m]  
Spacing 0.0264 [m]

cam1

-----  
Camera model: eucm  
Focal length: [190.62685934069438, 190.57076396847287]  
Principal point: [252.6145595502377, 255.03805423506523]  
EUCM alpha: 0.628762706207  
EUCM beta: 1.04358755045  
Distortion model: none  
Distortion coefficients: []  
Type: aprilgrid  
Tags:  
 Rows: 6  
 Cols: 6  
 Size: 0.088 [m]  
 Spacing 0.0264 [m]

IMU configuration

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IMU0:

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Model: calibrated  
Update rate: 200.0  
Accelerometer:  
 Noise density: 0.0028  
 Noise density (discrete): 0.0395979797464  
 Random walk: 0.00086  
Gyroscope:  
 Noise density: 0.00016  
 Noise density (discrete): 0.0022627416998  
 Random walk: 2.2e-05  
T\_i\_b  
[[ 1. 0. 0. 0.]

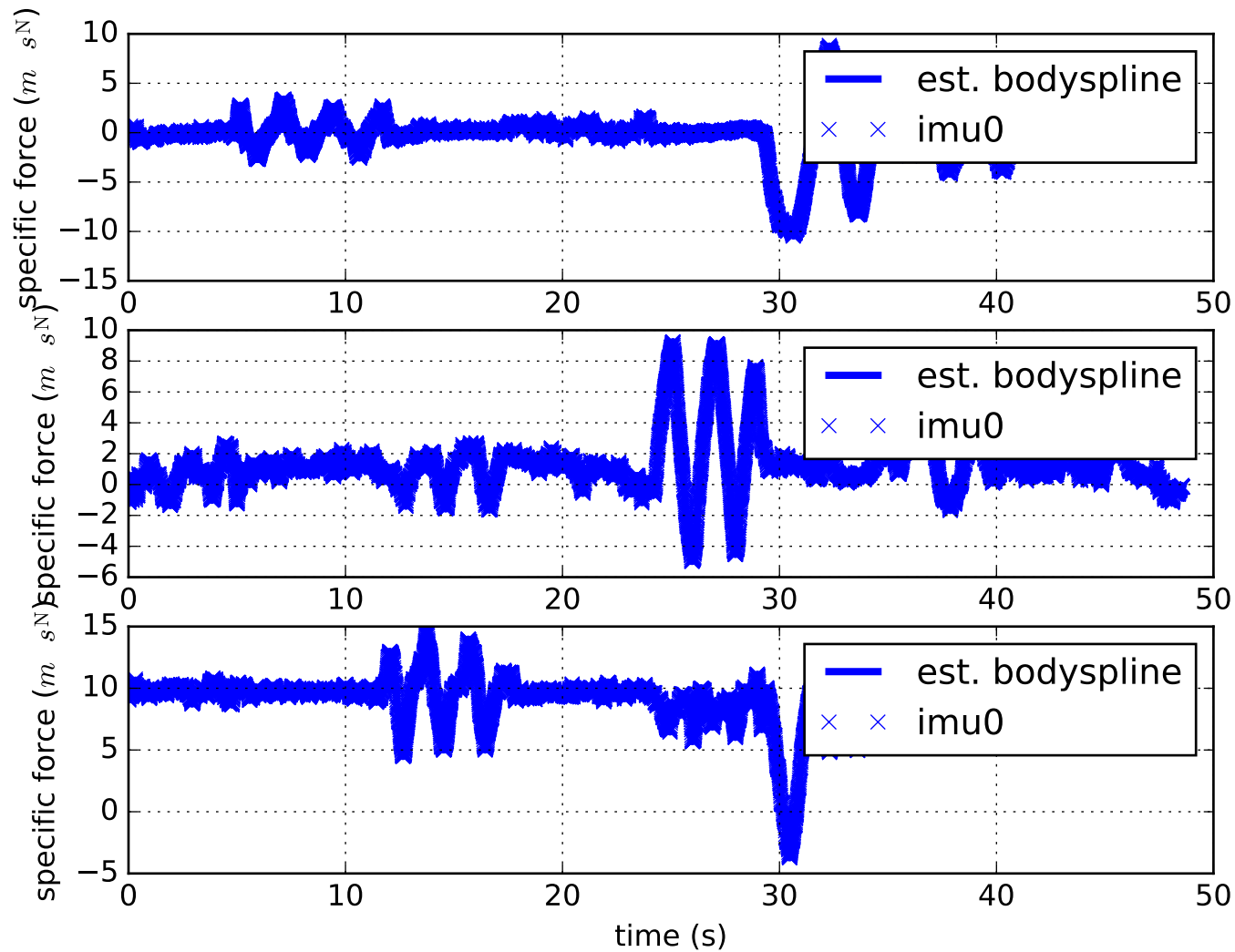


```
[ 0.  1.  0.  0.]  
[ 0.  0.  1.  0.]  
[ 0.  0.  0.  1.]
```

time offset with respect to IMU0: 0.0 [s]

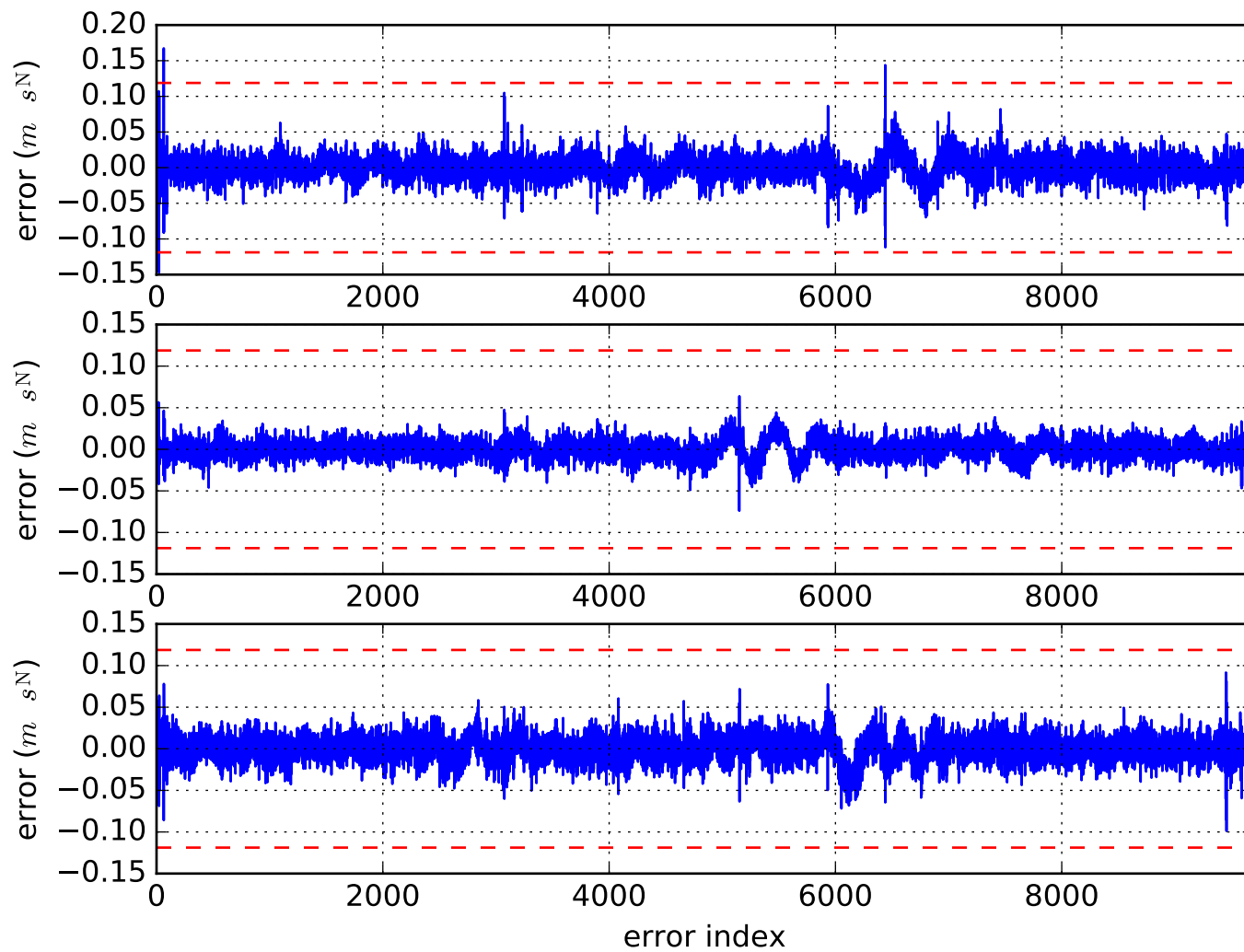


Comparison of predicted and measured specific force (imu0 frame)



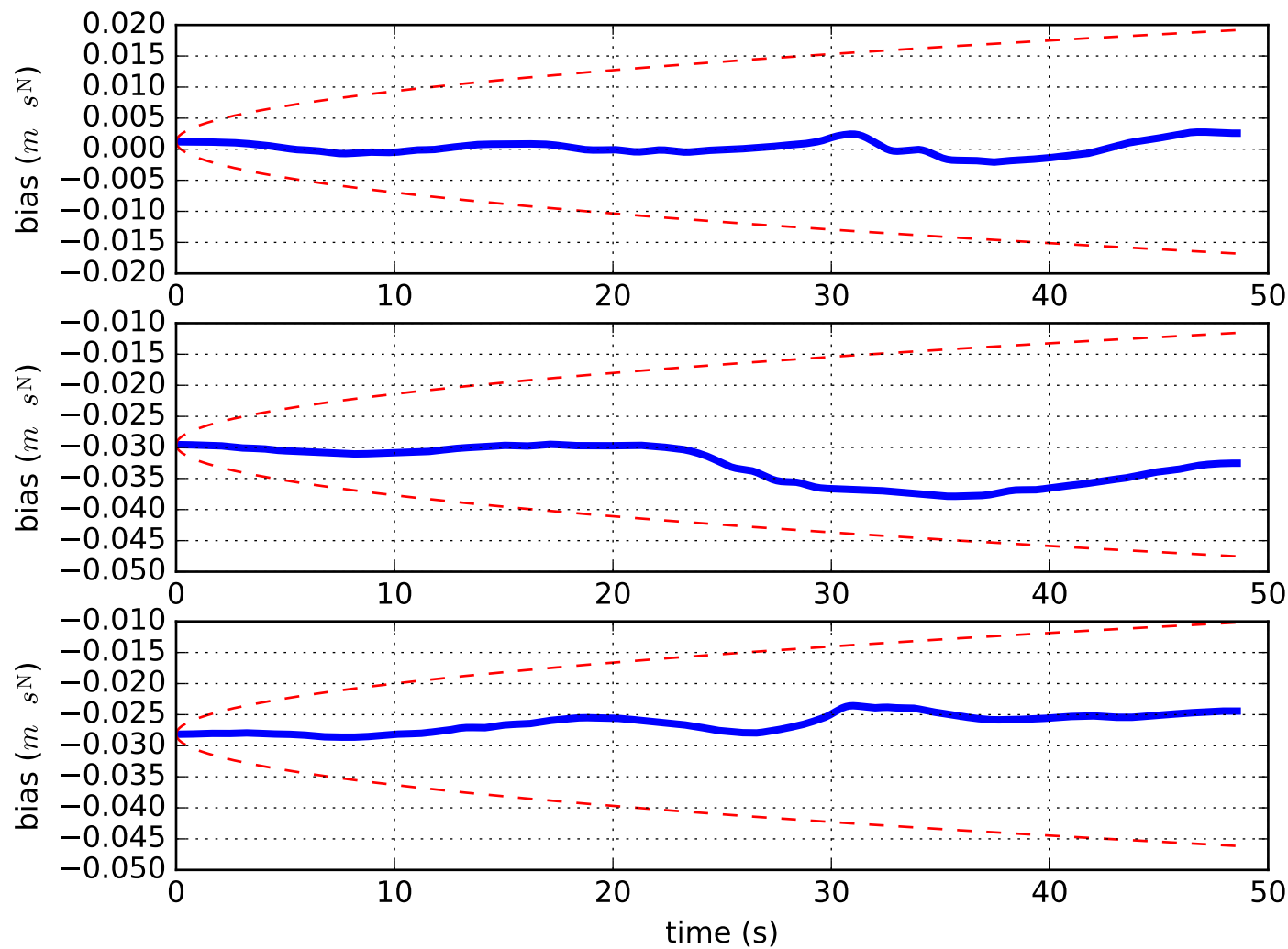


imu0: acceleration error



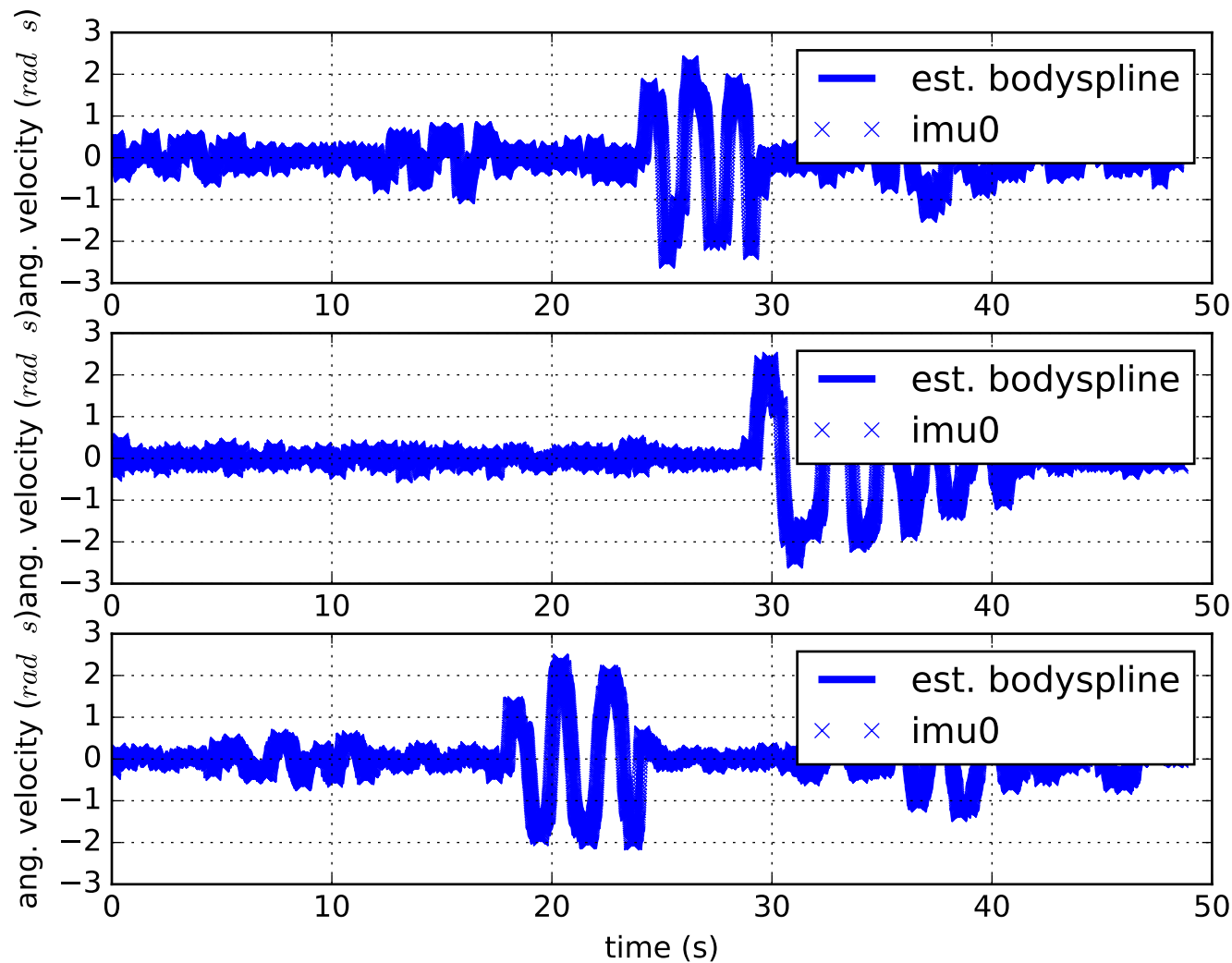


imu0: estimated accelerometer bias (imu frame)



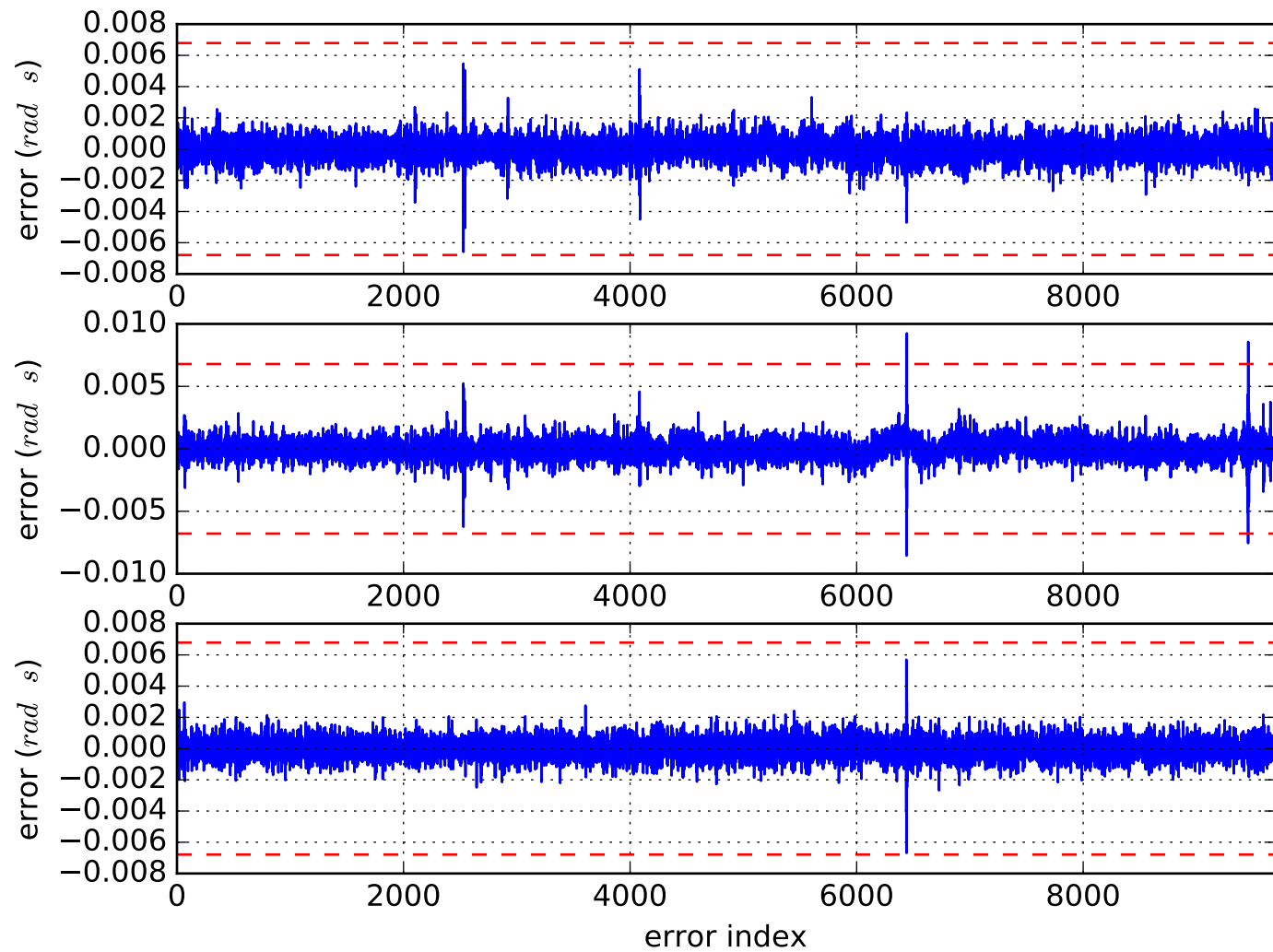


Comparison of predicted and measured angular velocities (body frame)



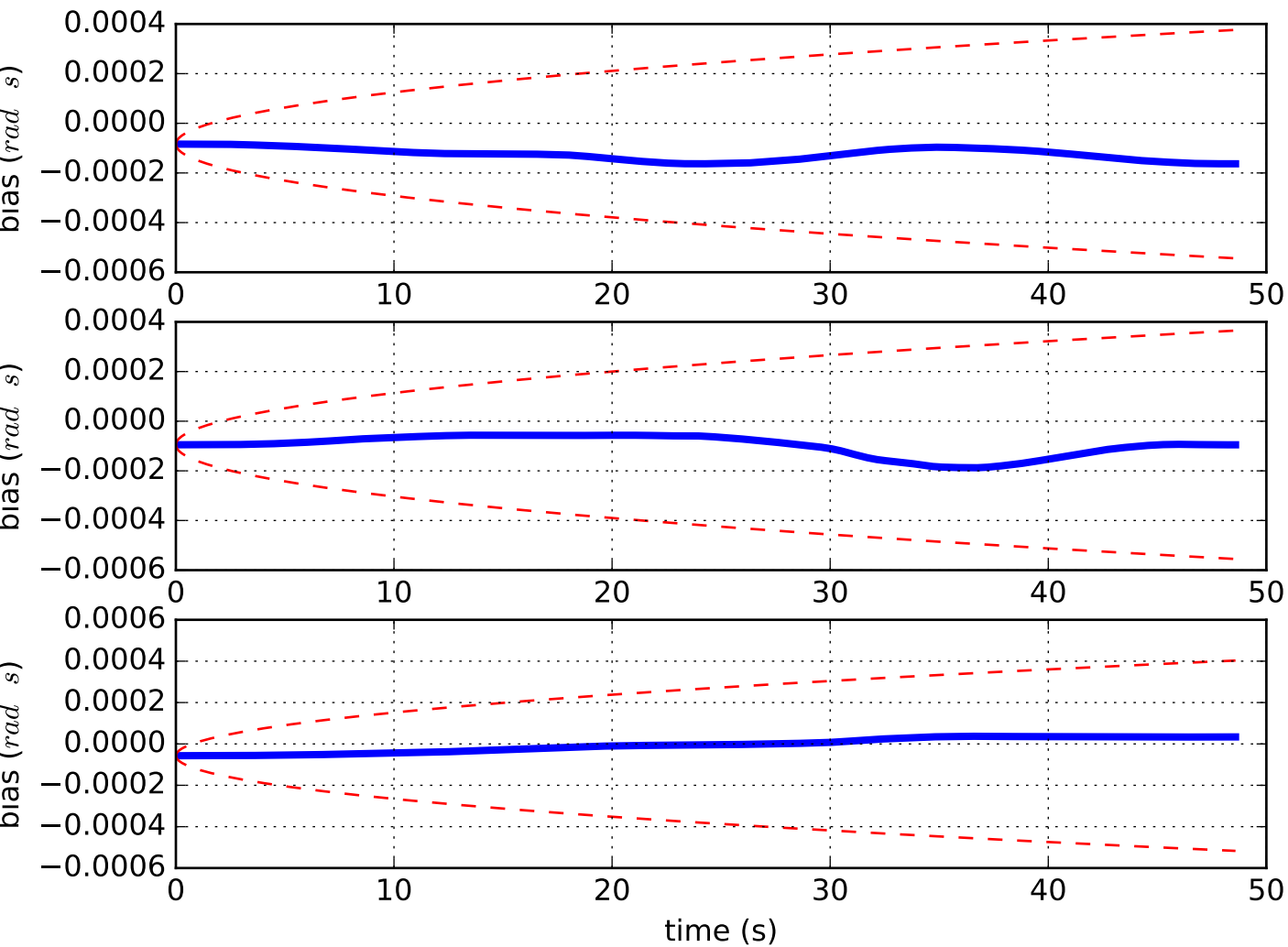


imu0: angular velocities error



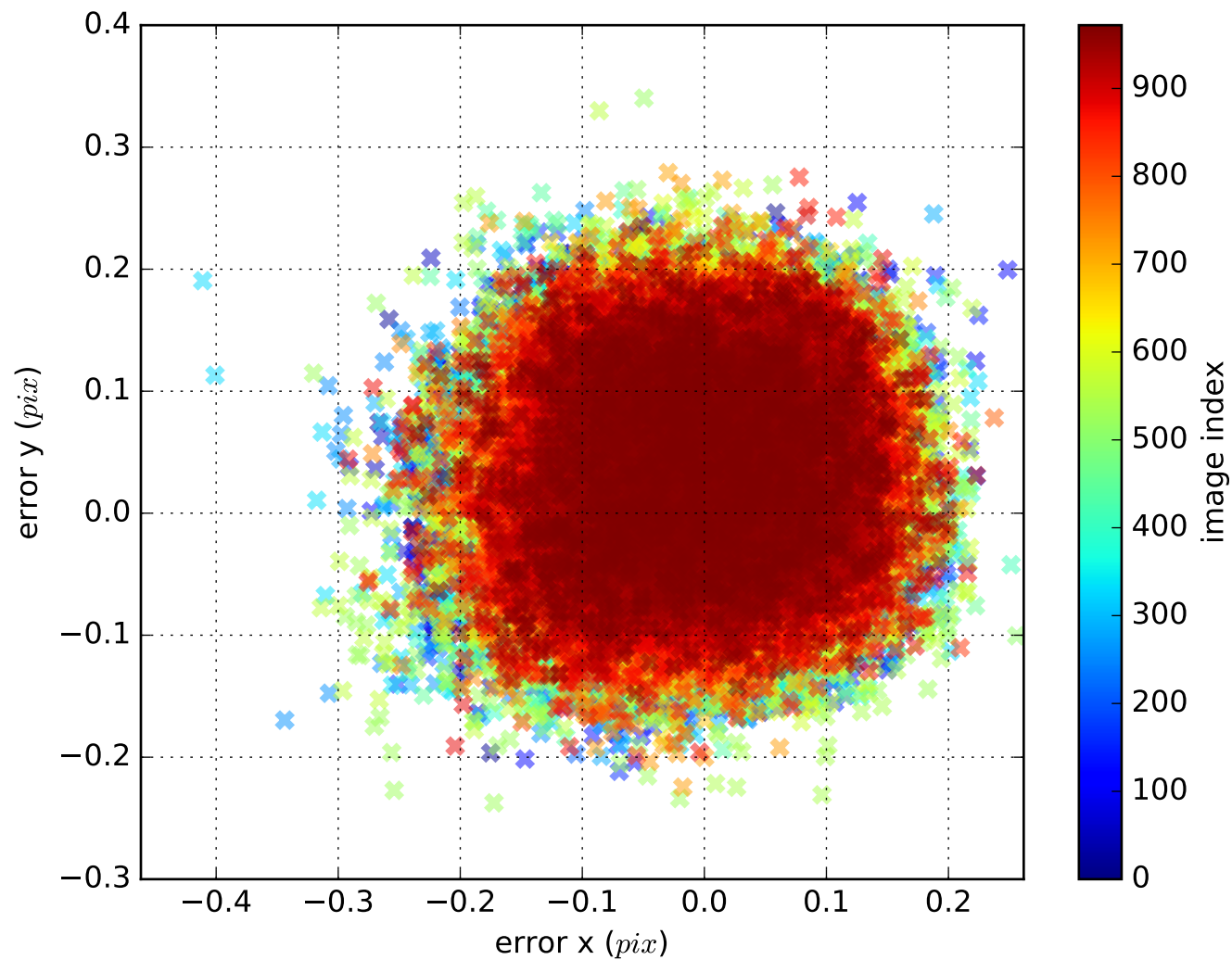


imu0: estimated gyro bias (imu frame)





cam0: reprojection errors





cam1: reprojection errors

