

## Calibration results

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### Normalized Residuals

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Reprojection error (cam0): mean 0.109599858235, median 0.103035429032, std: 0.0575227596359  
Reprojection error (cam1): mean 0.108424230771, median 0.101724508735, std: 0.0573528263901  
Gyroscope error (imu0): mean 0.494172593786, median 0.459307927265, std: 0.261119225486  
Accelerometer error (imu0): mean 0.590996557593, median 0.543939508056, std: 0.306270206721

### Residuals

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Reprojection error (cam0) [px]: mean 0.109599858235, median 0.103035429032, std: 0.0575227596359  
Reprojection error (cam1) [px]: mean 0.108424230771, median 0.101724508735, std: 0.0573528263901  
Gyroscope error (imu0) [rad/s]: mean 0.00111818493486, median 0.00103929520007, std: 0.000590845360127  
Accelerometer error (imu0) [m/s^2]: mean 0.0234022697178, median 0.0215389056233, std: 0.0121276814427

### Transformation (cam0):

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T\_ci: (imu0 to cam0):

```
[[ -0.99951835  0.02983497 -0.00854068  0.04741882]
 [  0.00750687 -0.03459249 -0.99937331 -0.04733619]
 [ -0.03011171 -0.99895607  0.03435186 -0.07177971]
 [  0.         0.         0.         1.        ]]
```

T\_ic: (cam0 to imu0):

```
[[ -0.99951835  0.00750687 -0.03011171  0.04558991]
 [  0.02983497 -0.03459249 -0.99895607 -0.07475699]
 [ -0.00854068 -0.99937331  0.03435186 -0.04443577]
 [  0.         0.         0.         1.        ]]
```

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

0.0

### Transformation (cam1):

-----  
T\_ci: (imu0 to cam1):

```
[[ -0.99951093  0.03032331 -0.00764228 -0.05347223]
 [  0.0080339  0.01281421 -0.99988562 -0.04580944]
 [ -0.03022191 -0.999458  -0.01305155 -0.07529875]
```

[ 0. 0. 0. 1. ]]

T\_ic: (cam1 to imu0):

[[-0.99951093 0.0080339 -0.03022191 -0.05535372]  
[ 0.03032331 0.01281421 -0.999458 -0.07304947]  
[-0.00764228 -0.99988562 -0.01305155 -0.04719562]  
[ 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):

[[ 0.99999948 -0.00091468 -0.00045719 -0.10096713]  
[ 0.00089198 0.99887603 -0.04739068 -0.00197044]  
[ 0.00050003 0.04739025 0.99887633 -0.00138013]  
[ 0. 0. 0. 1. ]]

baseline norm: 0.100995789778 [m]

Gravity vector in target coords: [m/s^2]

[ 0.03611886 -9.69633549 -1.46567265]

Calibration configuration

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cam0

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Camera model: omni

Focal length: [530.6177486815552, 530.5014563037028]

Principal point: [255.04435968614945, 256.83644262276215]

Omni xi: 1.79386077962

Distortion model: none

Distortion coefficients: []

Type: aprilgrid

Tags:

Rows: 6

Cols: 6

Size: 0.088 [m]  
Spacing 0.0264 [m]

cam1

-----  
Camera model: omni  
Focal length: [526.933073979917, 526.7815459159983]  
Principal point: [252.6484663960721, 254.9173296446699]  
Omni xi: 1.78366225211  
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:

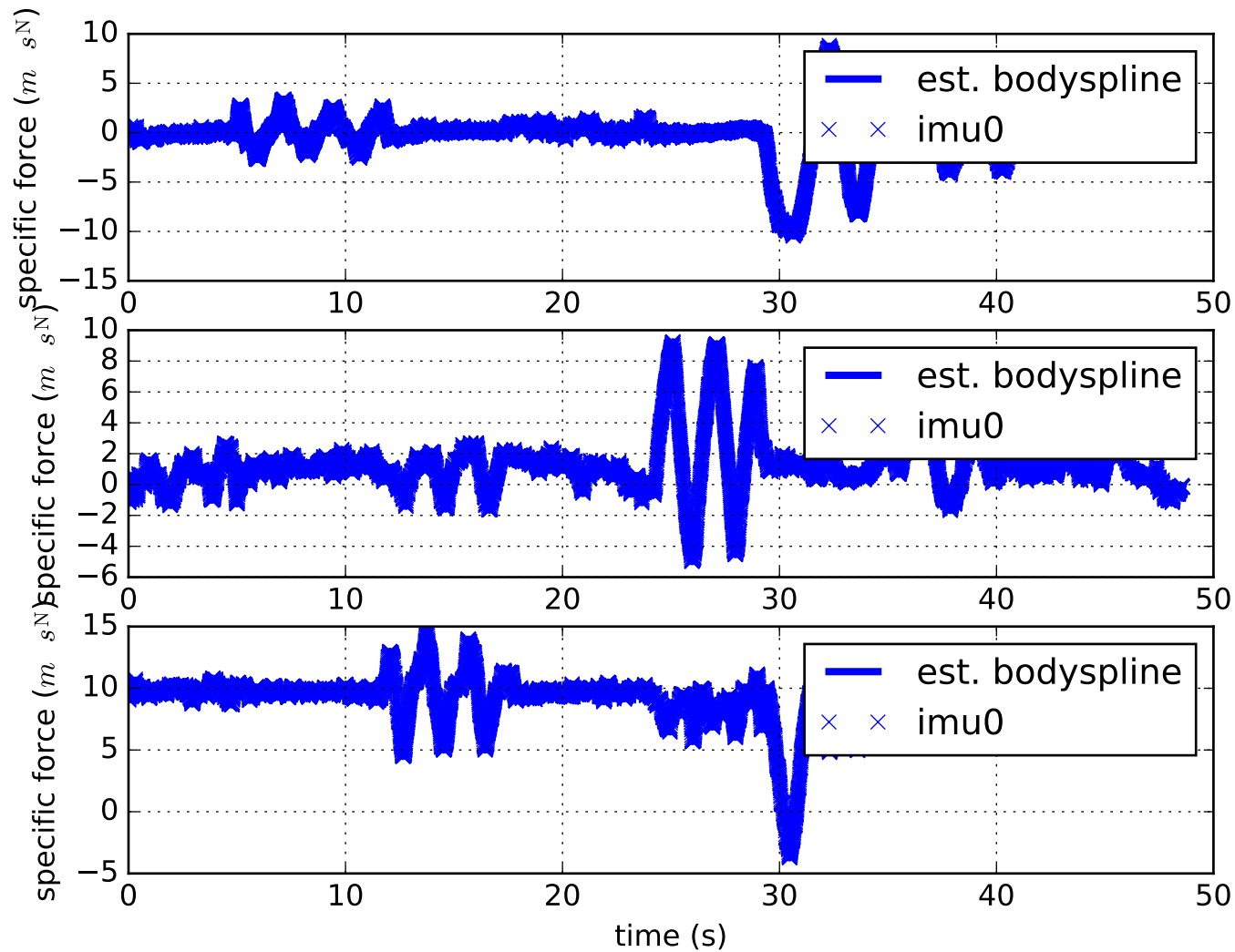
-----  
Model: calibrated  
Update rate: 200.0  
Accelerometer:  
 Noise density: 0.0028  
 Noise density (discrete): 0.0395979797464  
 Random walk: 0.00086  
Gyroscope:  
 Noise density: 0.00016  
 Noise density (discrete): 0.0022627416998  
 Random walk: 2.2e-05

T\_i\_b  
[[ 1. 0. 0. 0.]  
 [ 0. 1. 0. 0.]  
 [ 0. 0. 1. 0.]

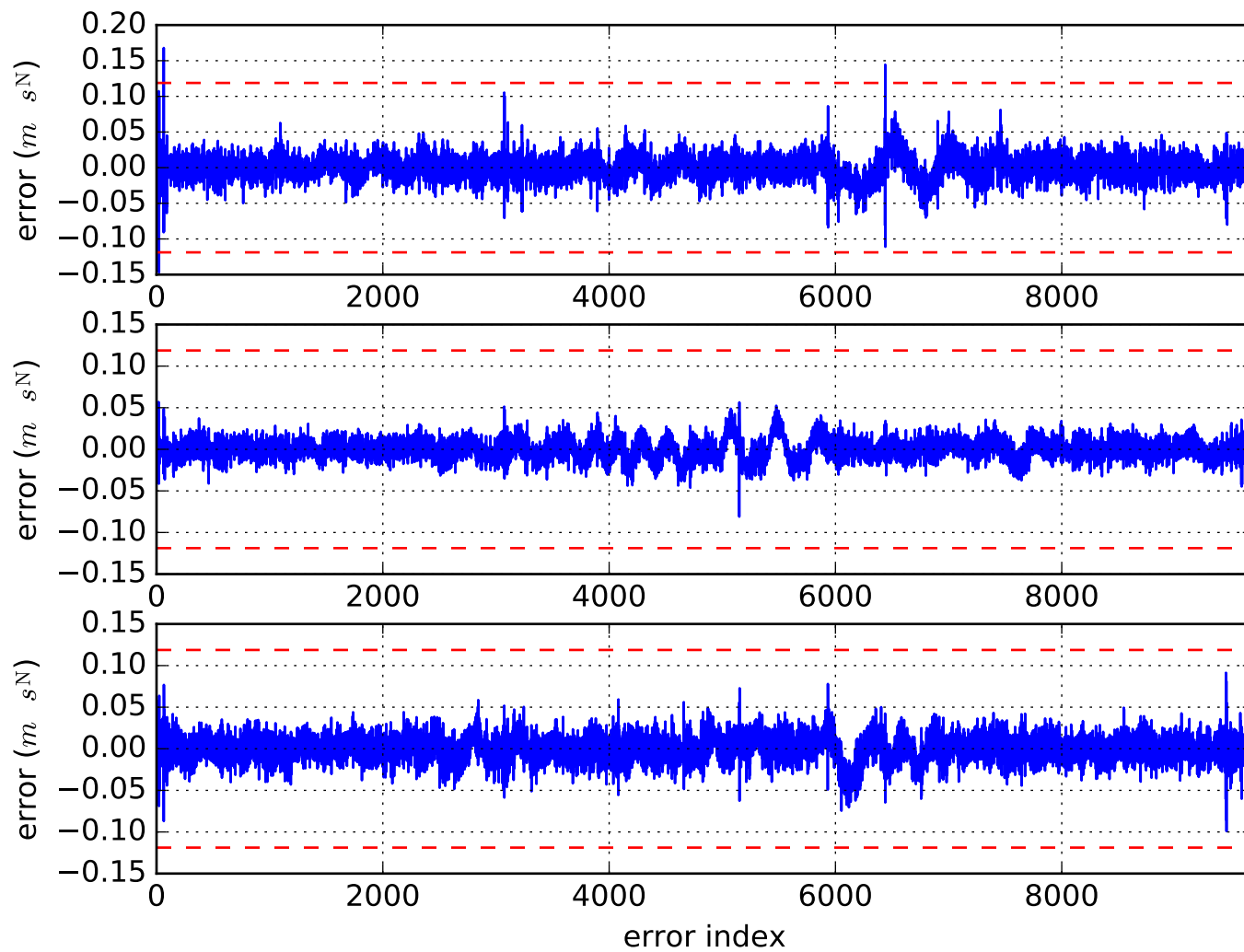
[ 0. 0. 0. 1.]

time offset with respect to IMU0: 0.0 [s]

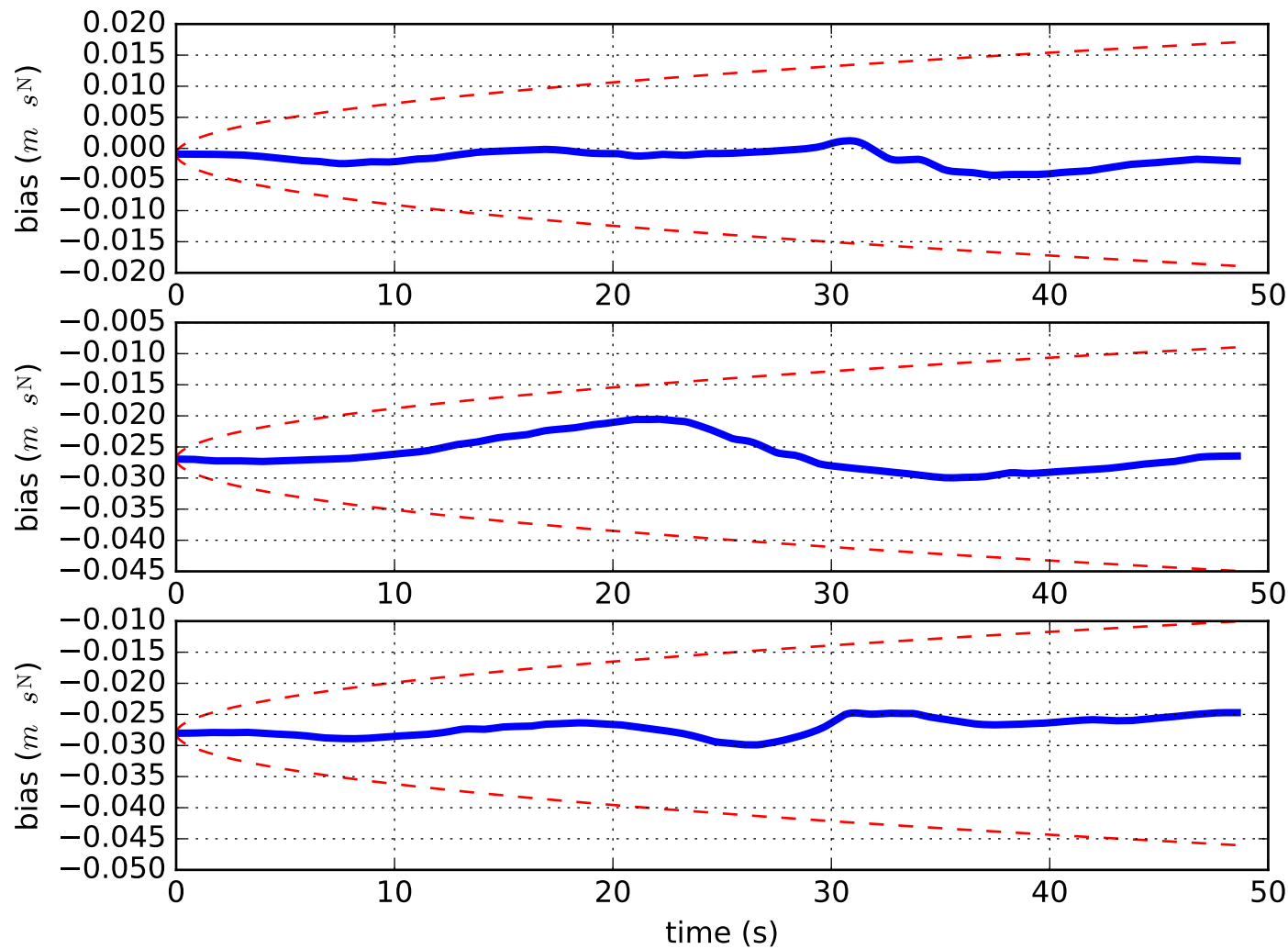
Comparison of predicted and measured specific force (imu0 frame)



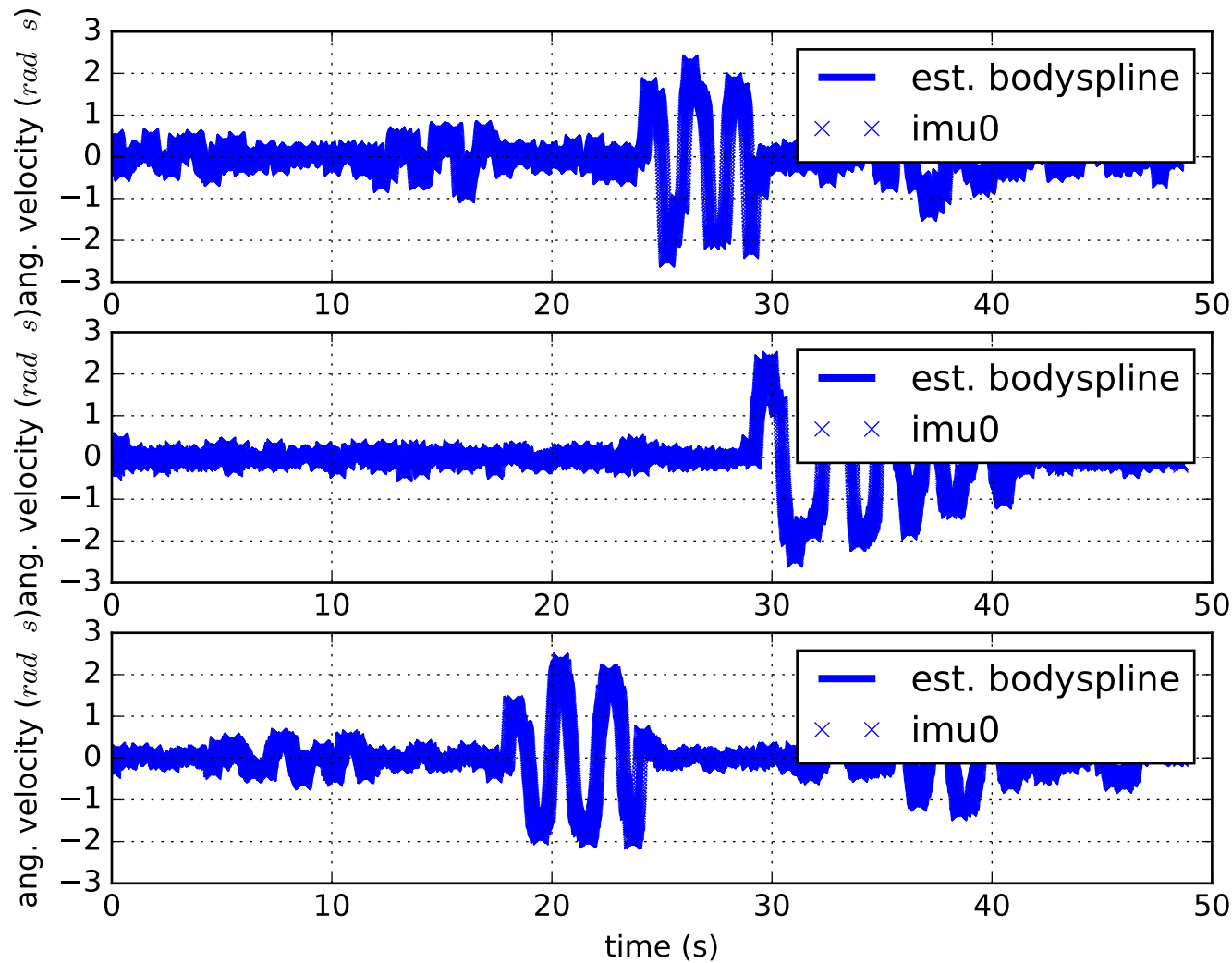
imu0: acceleration error



imu0: estimated accelerometer bias (imu frame)

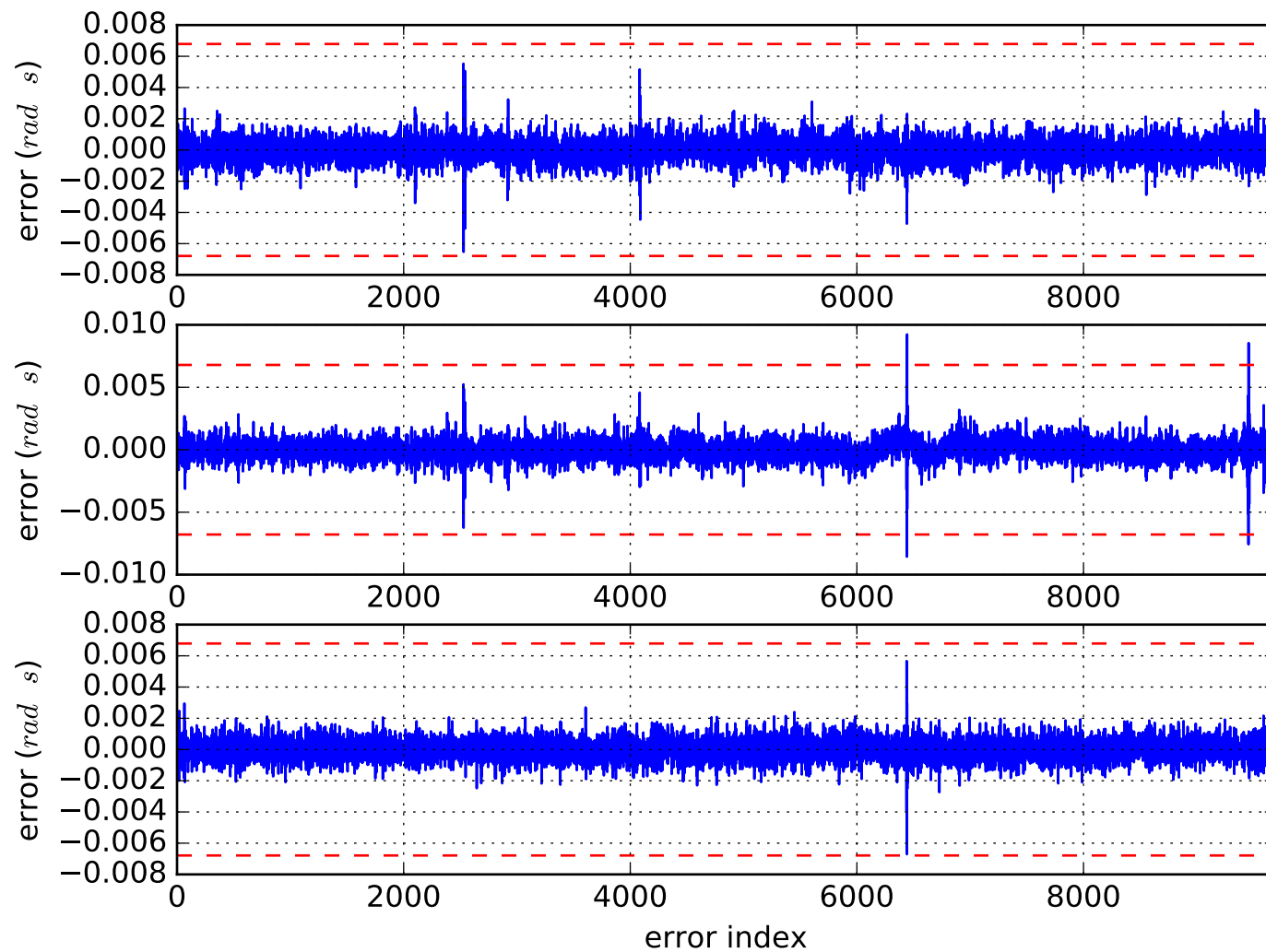


Comparison of predicted and measured angular velocities (body frame)

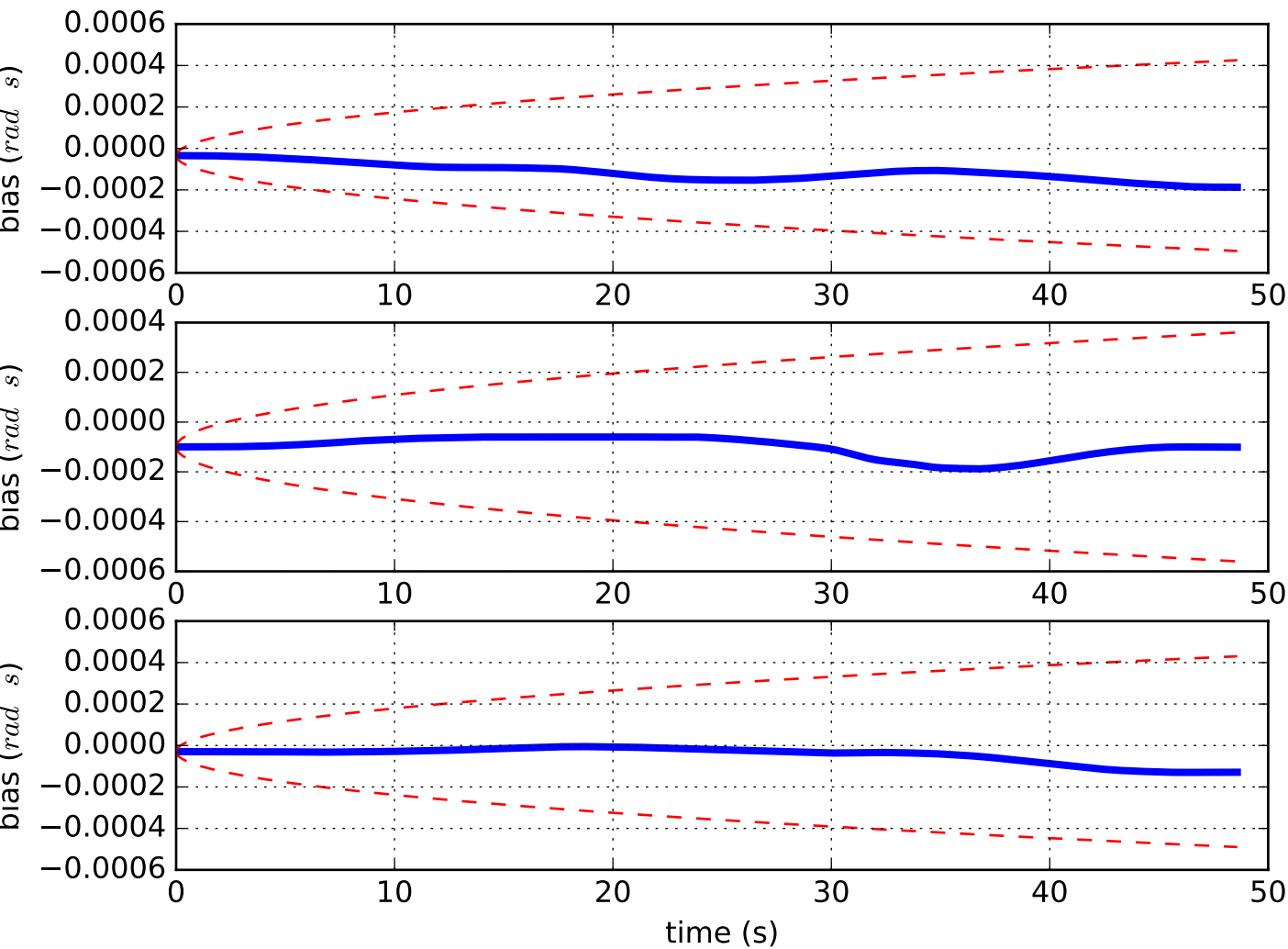




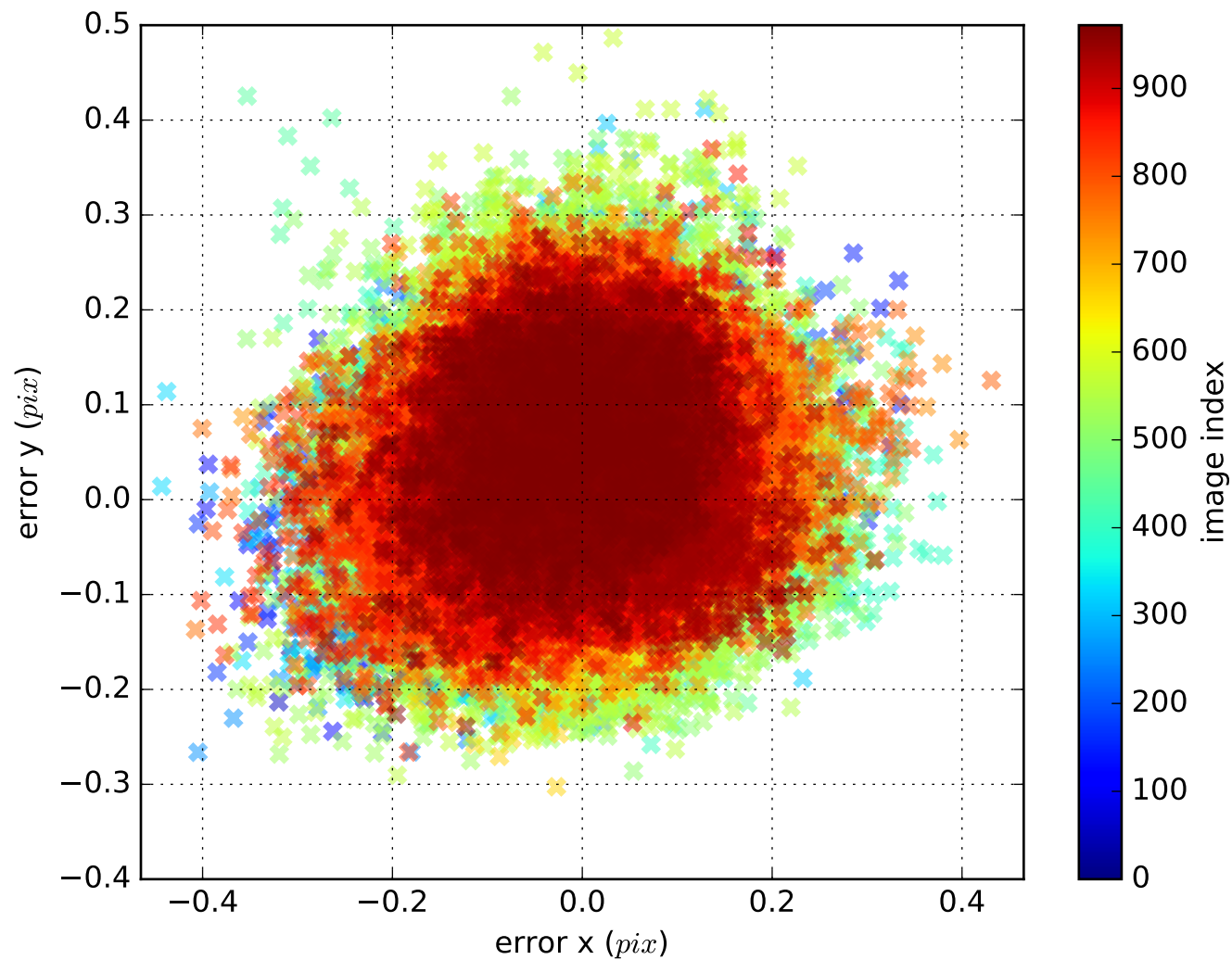
imu0: angular velocities error



imu0: estimated gyro bias (imu frame)



cam0: reprojection errors



cam1: reprojection errors

