

Calibration results

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Normalized Residuals

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Reprojection error (cam0): mean 0.287115989562, median 0.281837953043, std: 0.0920269223608

Reprojection error (cam1): mean 0.285782727902, median 0.280697496997, std: 0.0960888456596

Gyroscope error (imu0): mean 0.790008920248, median 0.586964568952, std: 0.758942194542

Accelerometer error (imu0): mean 0.385507104189, median 0.280090388924, std: 0.560985849356

Residuals

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Reprojection error (cam0) [px]: mean 0.287115989562, median 0.281837953043, std: 0.0920269223608

Reprojection error (cam1) [px]: mean 0.285782727902, median 0.280697496997, std: 0.0960888456596

Gyroscope error (imu0) [rad/s]: mean 0.0154761424835, median 0.0114985376355, std: 0.0148675505282

Accelerometer error (imu0) [m/s^2]: mean 0.0992706347669, median 0.0721251318031, std: 0.144457574856

Transformation (cam0):

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T\_ci: (imu0 to cam0):

[[-0.00211703 -0.9999625 -0.00839785 0.02753132]  
[-0.03095047 0.00832832 -0.99948622 -0.04957591]  
[ 0.99951868 0.00237586 -0.03093168 -0.07759074]  
[ 0. 0. 0. 1. ]]

T\_ic: (cam0 to imu0):

[[-0.00211703 -0.03095047 0.99951868 0.07596071]  
[-0.9999625 0.00832832 0.00237586 0.02812751]  
[-0.00839785 -0.99948622 -0.03093168 -0.05171925]  
[ 0. 0. 0. 1. ]]

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

-0.00352909206676

Transformation (cam1):

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T\_ci: (imu0 to cam1):

[[-0.00211703 -0.9999625 -0.00839785 -0.02246502]  
[-0.03095047 0.00832832 -0.99948622 -0.04957591]  
[ 0.99951868 0.00237586 -0.03093168 -0.07759074]

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

T\_ic: (cam1 to imu0):

```
[[ 0.00211703 -0.03095047  0.99951868  0.07606656]
 [-0.9999625   0.00832832  0.00237586 -0.02186695]
 [-0.00839785 -0.99948622 -0.03093168 -0.05213911]
 [ 0.      0.      0.      1.      ]]
```

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

```
-0.00354978930467
```

Baselines:

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Baseline (cam0 to cam1):

```
[[ 1.      0.      0.      -0.04999634]
 [ 0.      1.      0.      0.      ]
 [ 0.      0.      1.      0.      ]
 [ 0.      0.      0.      1.      ]]
baseline norm: 0.0499963387847 [m]
```

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

```
[ 0.06609428 -9.76854826 -0.8599531 ]
```

Calibration configuration

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cam0

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Camera model: pinhole

Focal length: [390.002380371094, 390.002380371094]

Principal point: [323.030731201172, 237.355239868164]

Distortion model: radtan

Distortion coefficients: [0, 0, 0, 0]

Type: aprilgrid

Tags:

Rows: 6

Cols: 6

Size: 0.088 [m]

Spacing 0.0264 [m]

cam1

-----  
Camera model: pinhole  
Focal length: [390.002380371094, 390.002380371094]  
Principal point: [323.030731201172, 237.355239868164]  
Distortion model: radtan  
Distortion coefficients: [0, 0, 0, 0]  
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: 196.0  
Accelerometer:  
Noise density: 0.0183933306265  
Noise density (discrete): 0.257506628771  
Random walk: 0.000822996092865  
Gyroscope:  
Noise density: 0.00139927375564  
Noise density (discrete): 0.0195898325789  
Random walk: 6.6045706138e-05

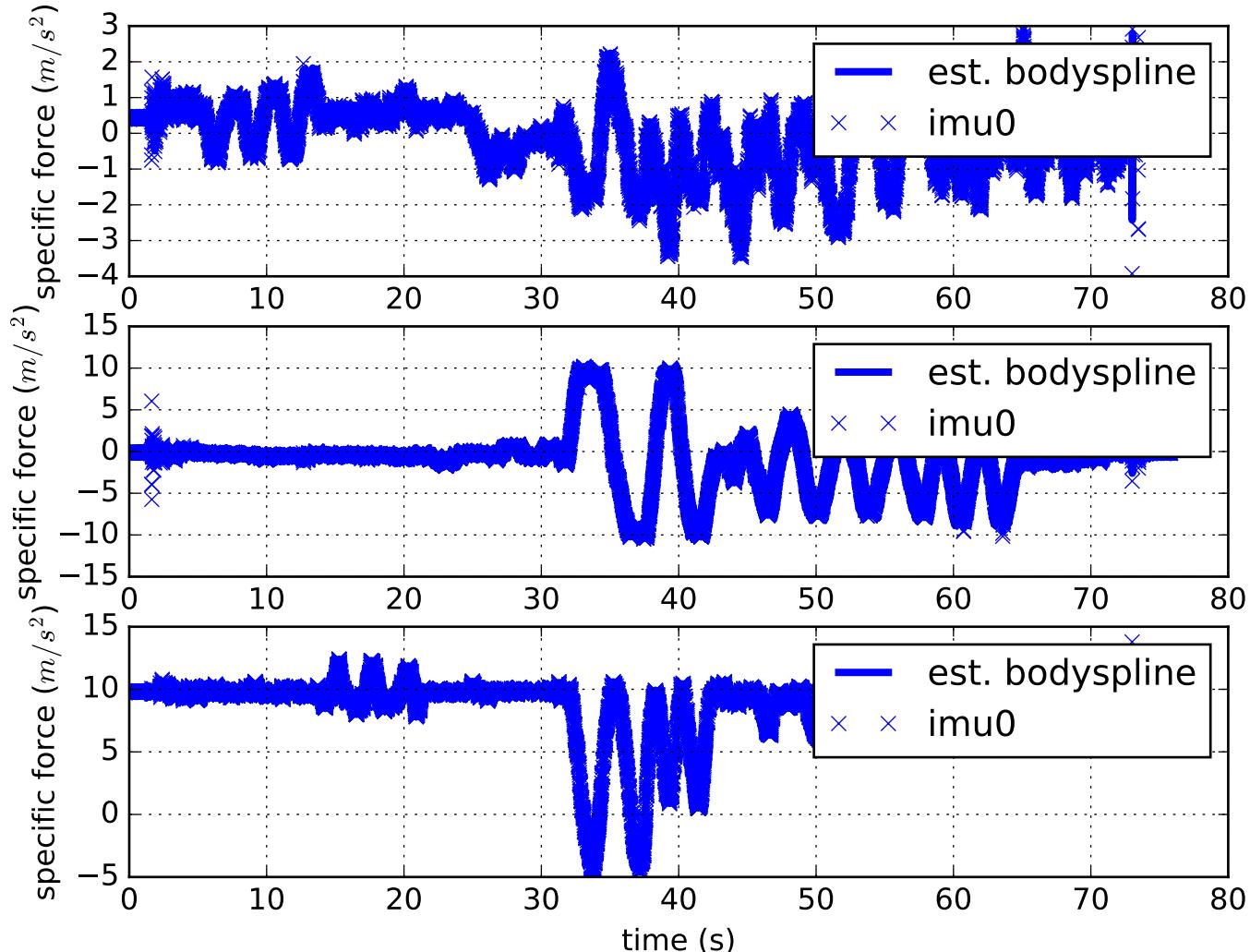
T\_i\_b

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

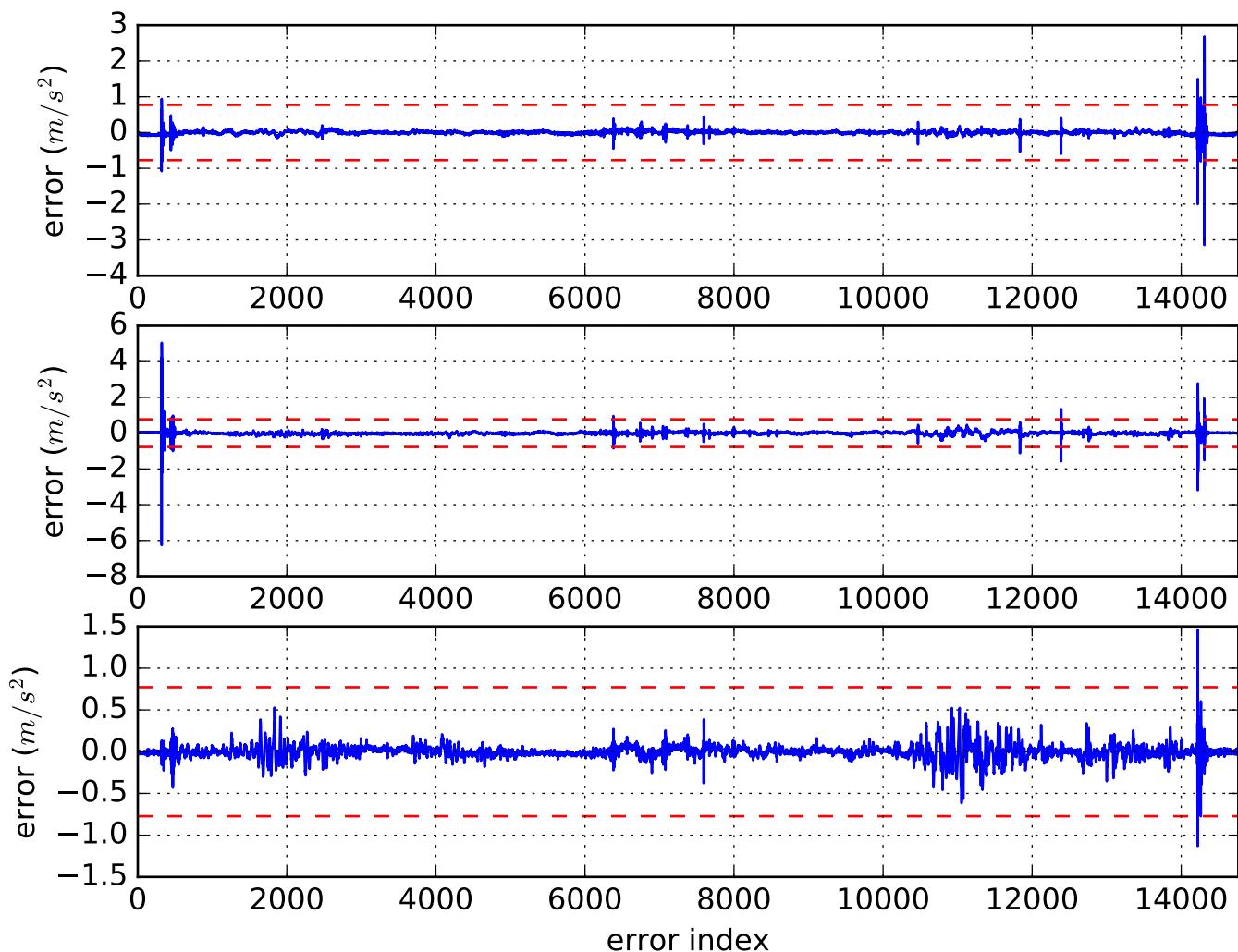
time offset with respect to IMU0: 0.0 [s]



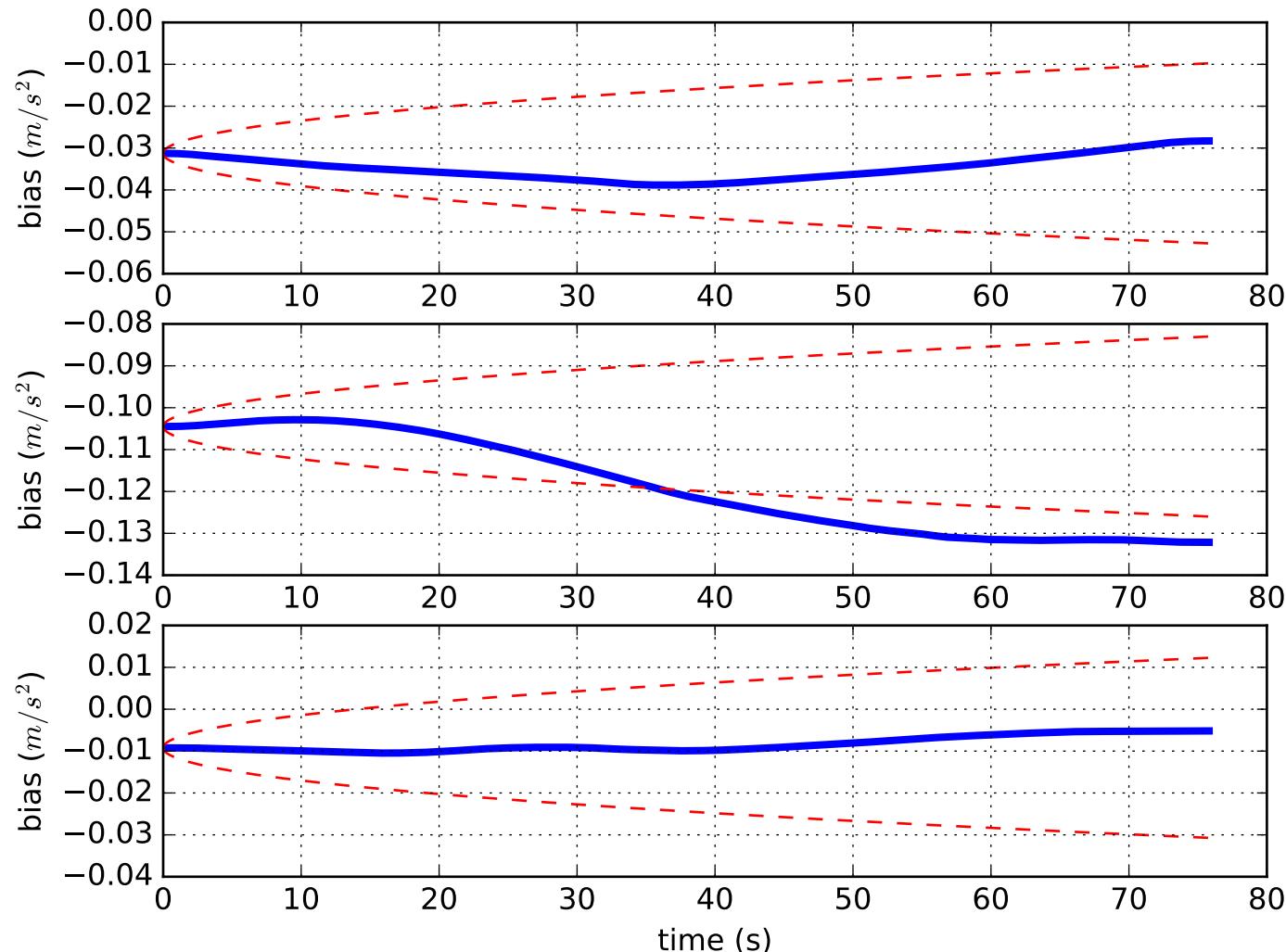
Comparison of predicted and measured specific force (imu0 frame)



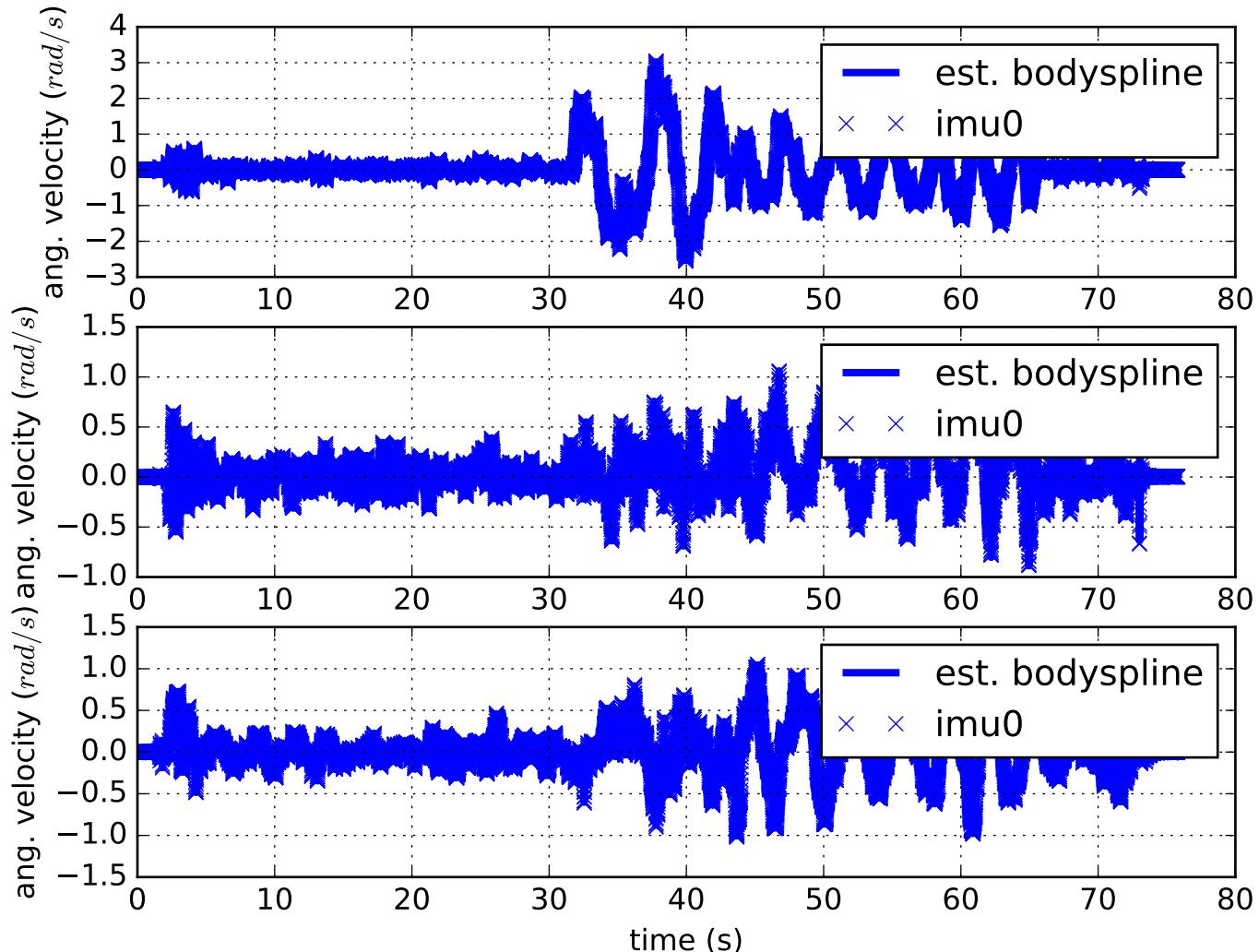
imu0: acceleration error



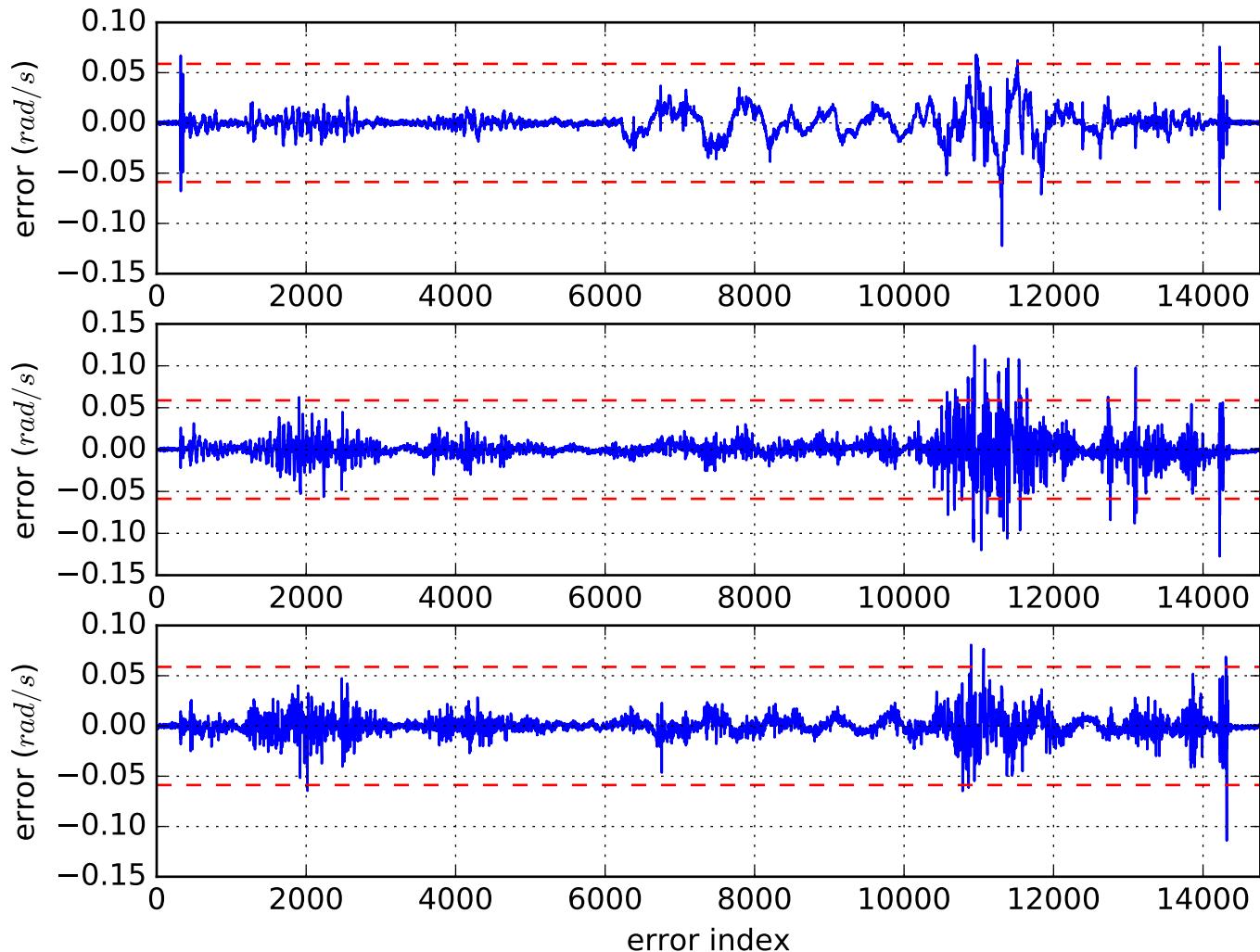
# imu0: estimated accelerometer bias (imu frame)



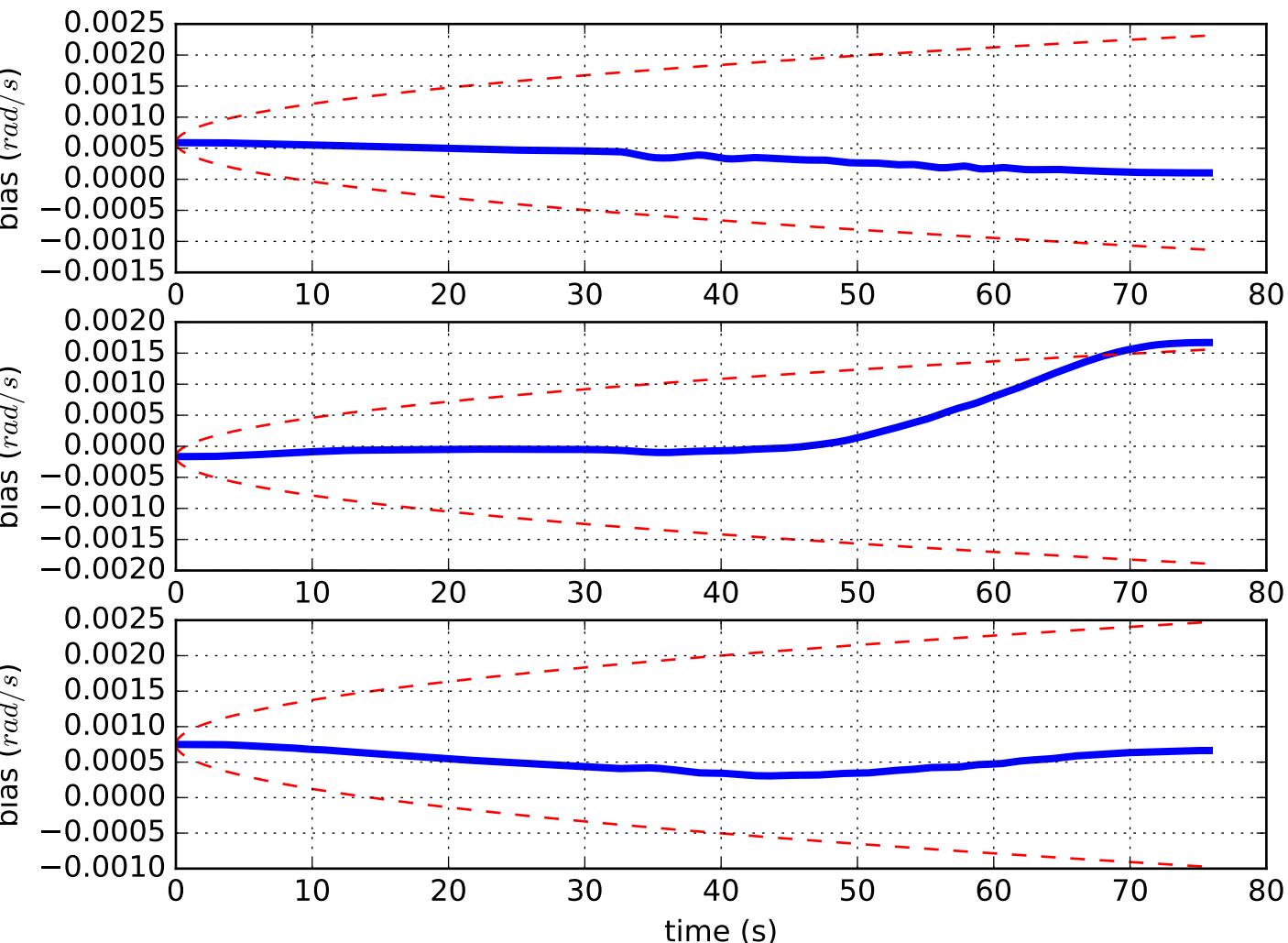
Comparison of predicted and measured angular velocities (body frame)



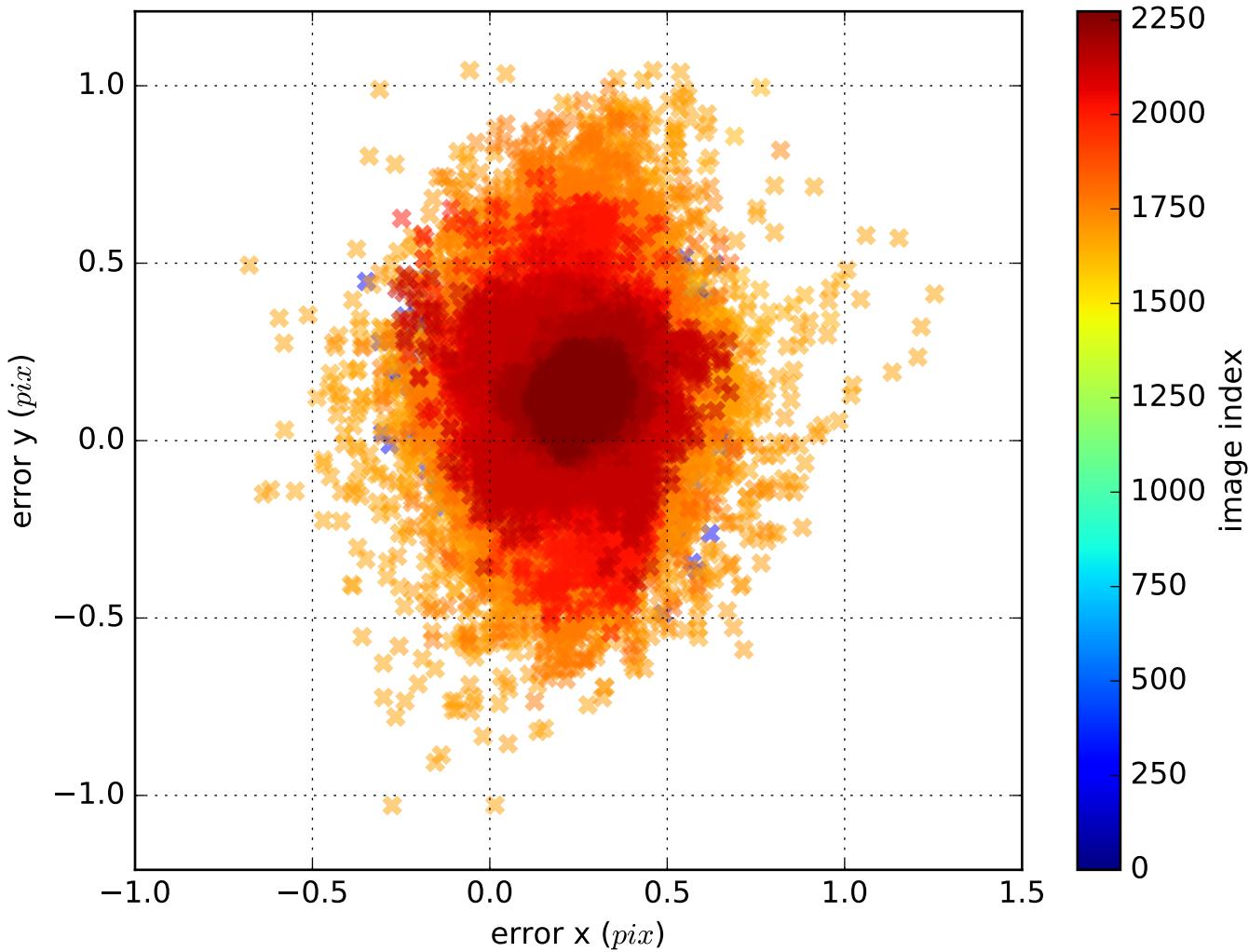
imu0: angular velocities error



# imu0: estimated gyro bias (imu frame)



cam0: reprojection errors



cam1: reprojection errors

