

Calibration results

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Normalized Residuals

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Reprojection error (cam0): mean 0.370331130357, median 0.326655091981, std: 0.228400523042

Reprojection error (cam1): mean 0.375603865799, median 0.333824532144, std: 0.227598949552

Gyroscope error (imu0): mean 3.30840487923, median 2.72270319846, std: 2.28704706103

Accelerometer error (imu0): mean 0.521310457272, median 0.362251399115, std: 0.498514386

Residuals

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Reprojection error (cam0) [px]: mean 0.370331130357, median 0.326655091981, std: 0.228400523042

Reprojection error (cam1) [px]: mean 0.375603865799, median 0.333824532144, std: 0.227598949552

Gyroscope error (imu0) [rad/s]: mean 0.0654690952441, median 0.0538788091327, std: 0.0452577321496

Accelerometer error (imu0) [m/s^2]: mean 0.135603785097, median 0.0942291876011, std: 0.129674048782

Transformation (cam0):

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T\_ci: (imu0 to cam0):

```
[[ 0.02205324 -0.99975444 -0.00216955  0.02978375]
 [-0.00856343  0.00198111 -0.99996137 -0.0436614 ]
 [ 0.99972012  0.02207097 -0.00851764 -0.07052307]
 [ 0.        0.        0.       1.      ]]
```

T\_ic: (cam0 to imu0):

```
[[ 0.02205324 -0.00856343  0.99972012  0.06947262]
 [-0.99975444  0.00198111  0.02207097  0.03141945]
 [-0.00216955 -0.99996137 -0.00851764 -0.04419579]
 [ 0.        0.        0.       1.      ]]
```

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

-0.00705913441375

Transformation (cam1):

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

```
[[ 0.02205324 -0.99975444 -0.00216955 -0.02021259]
 [-0.00856343  0.00198111 -0.99996137 -0.0436614 ]
 [ 0.99972012  0.02207097 -0.00851764 -0.07052307]
```

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

T\_ic: (cam1 to imu0):

```
[[ 0.02205324 -0.00856343  0.99972012  0.0705752 ]
 [-0.99975444  0.0019811   0.02207097 -0.01856461]
 [-0.00216955 -0.99996137 -0.00851764 -0.04430426]
 [ 0.      0.      0.      1.      ]]
```

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

```
-0.00705675934122
```

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]

```
[ 0.11810413 -9.77768942 -0.74247154]
```

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:

-----  
Model: calibrated  
Update rate: 200.0  
Accelerometer:  
Noise density: 0.0183933306265  
Noise density (discrete): 0.260120976292  
Random walk: 0.000822996092865  
Gyroscope:  
Noise density: 0.00139927375564  
Noise density (discrete): 0.019788719227  
Random walk: 6.6045706138e-05

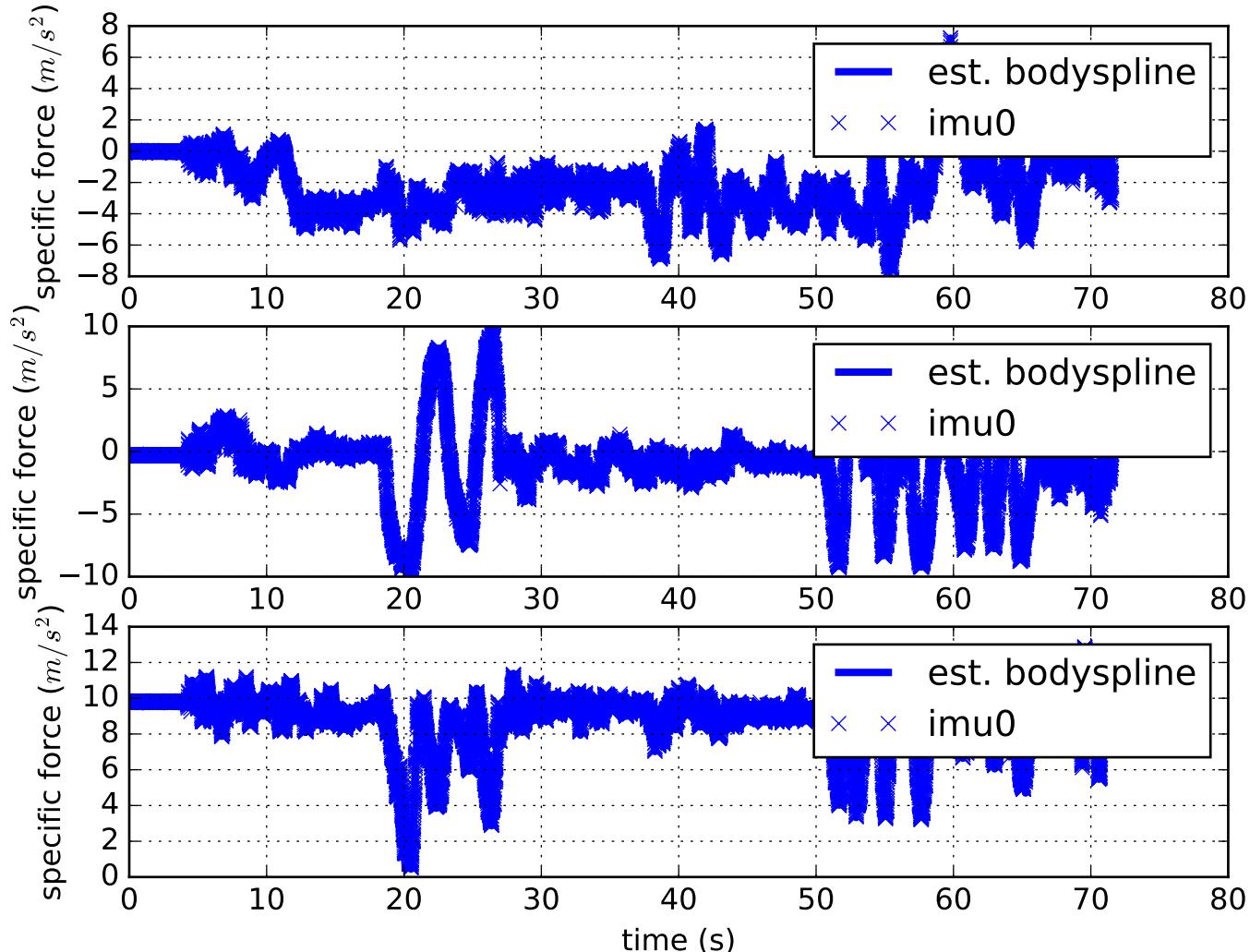
T\_i\_b

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

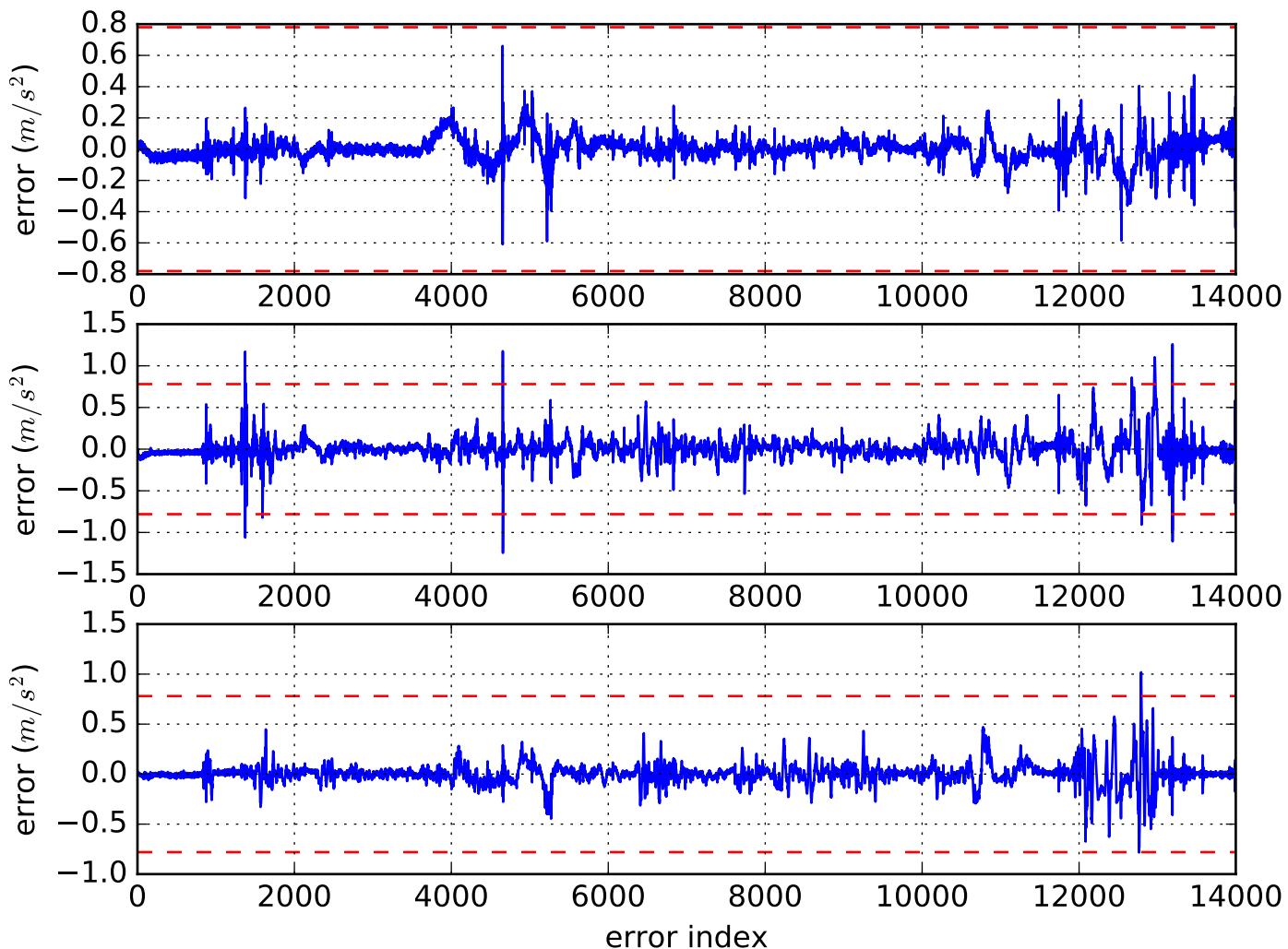
time offset with respect to IMU0: 0.0 [s]



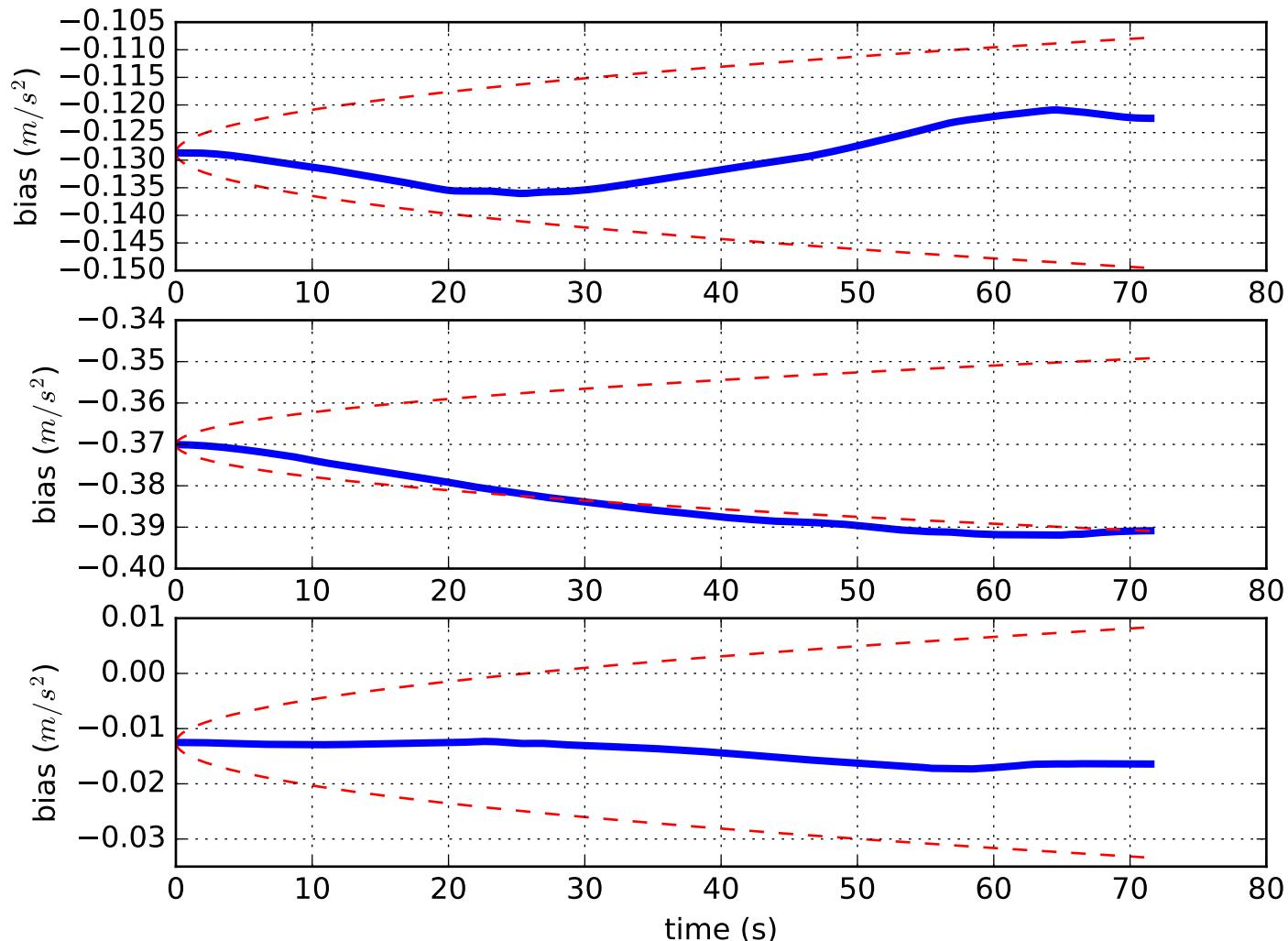
Comparison of predicted and measured specific force (imu0 frame)



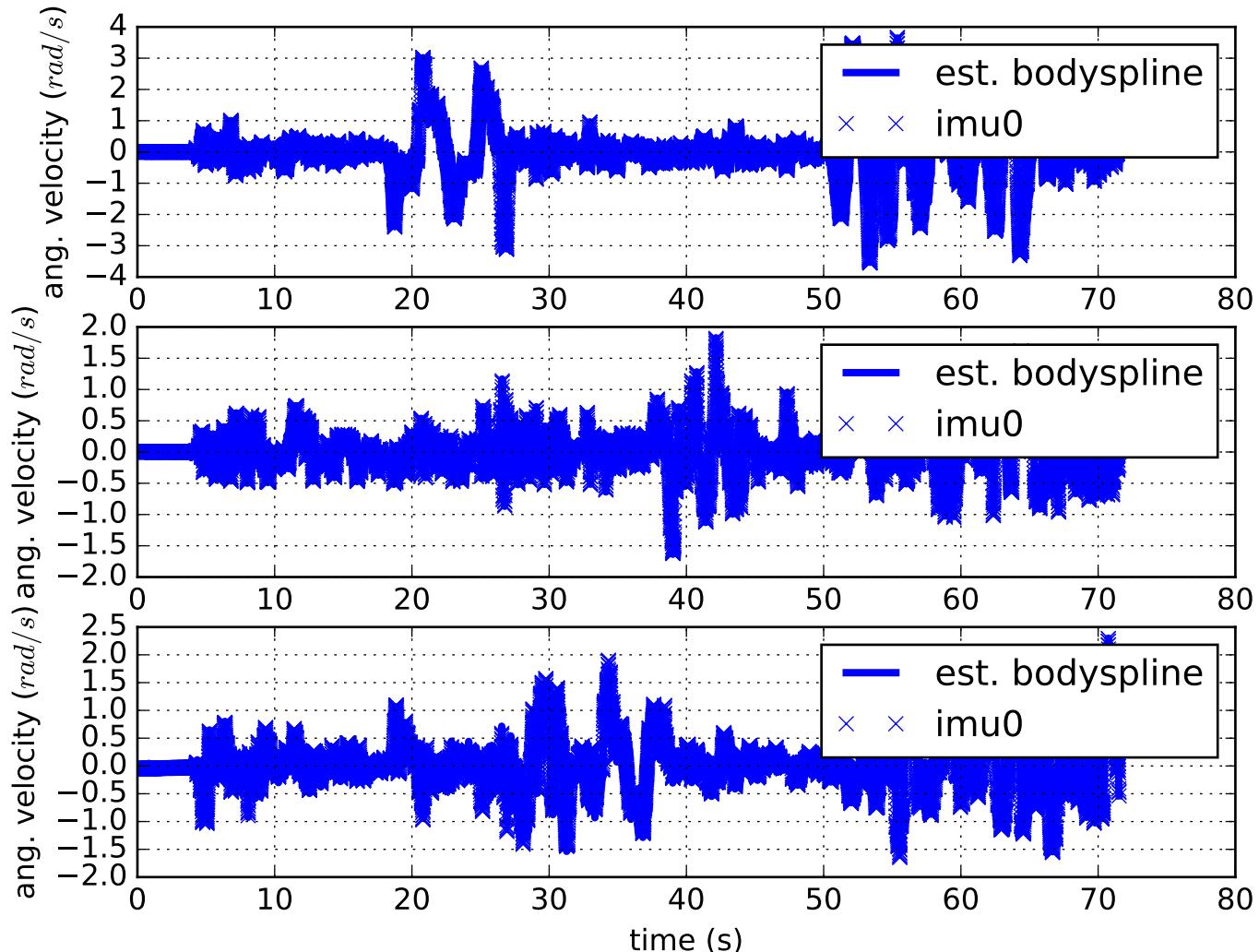
imu0: acceleration error



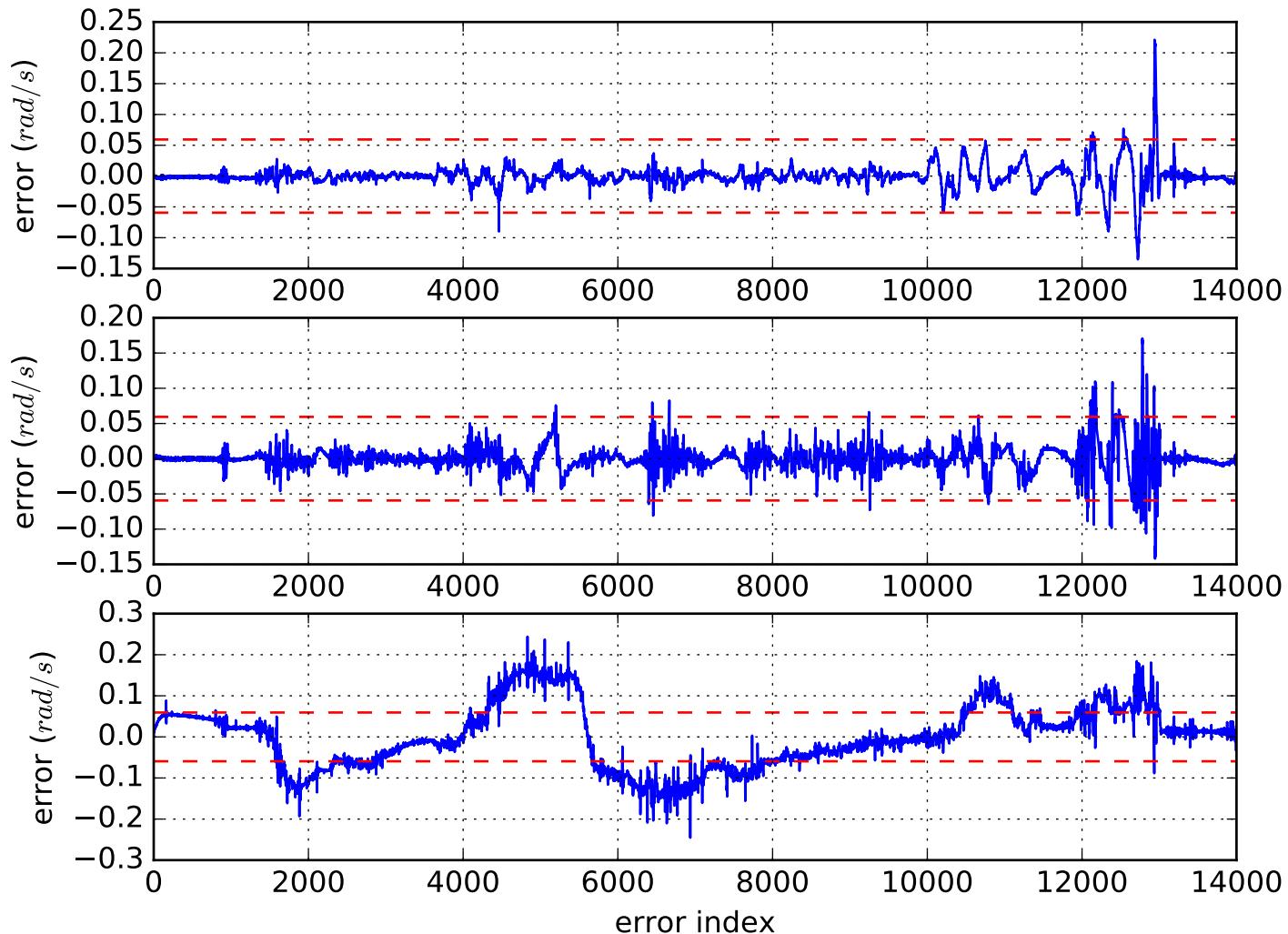
# imu0: estimated accelerometer bias (imu frame)



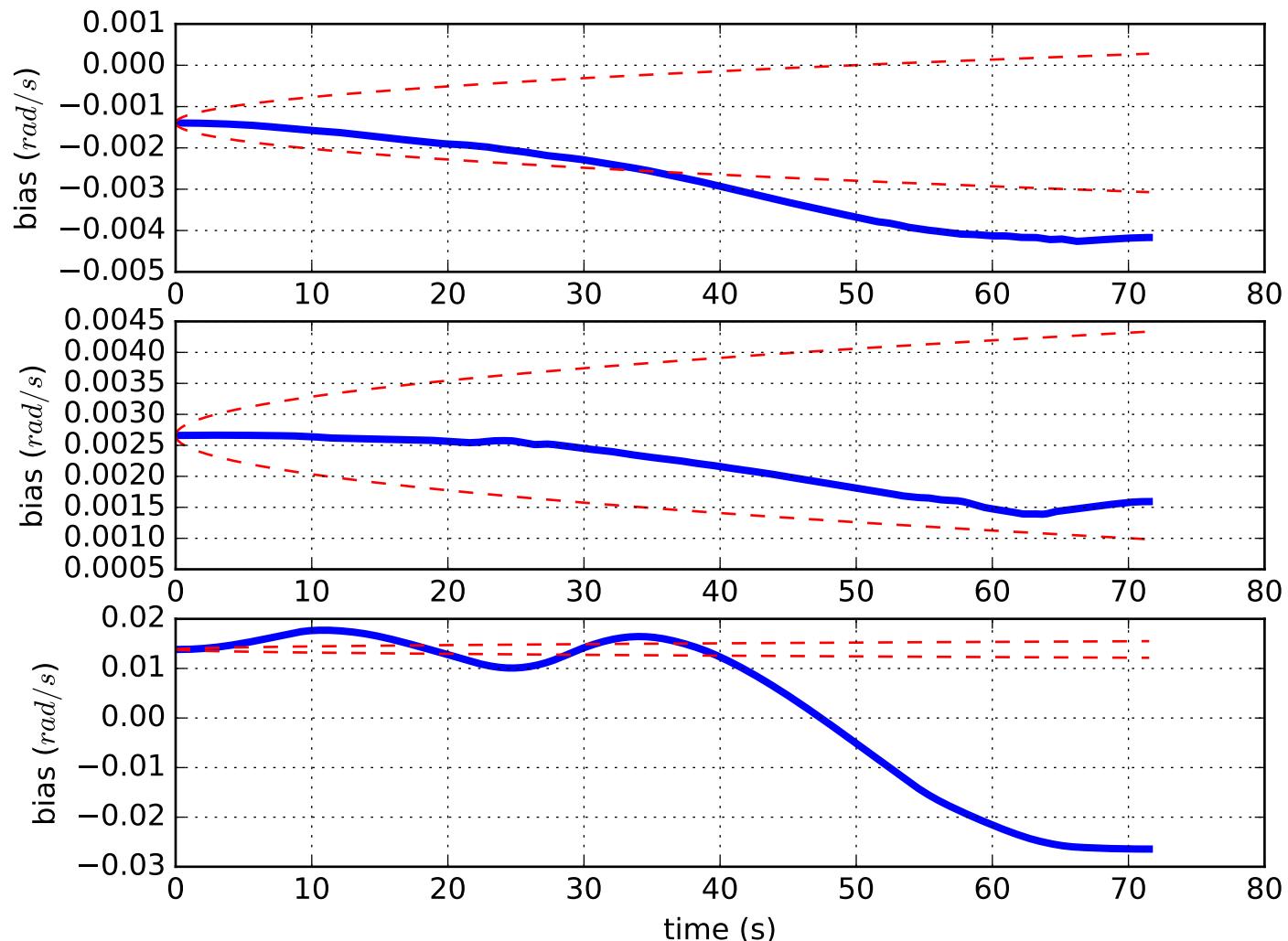
Comparison of predicted and measured angular velocities (body frame)



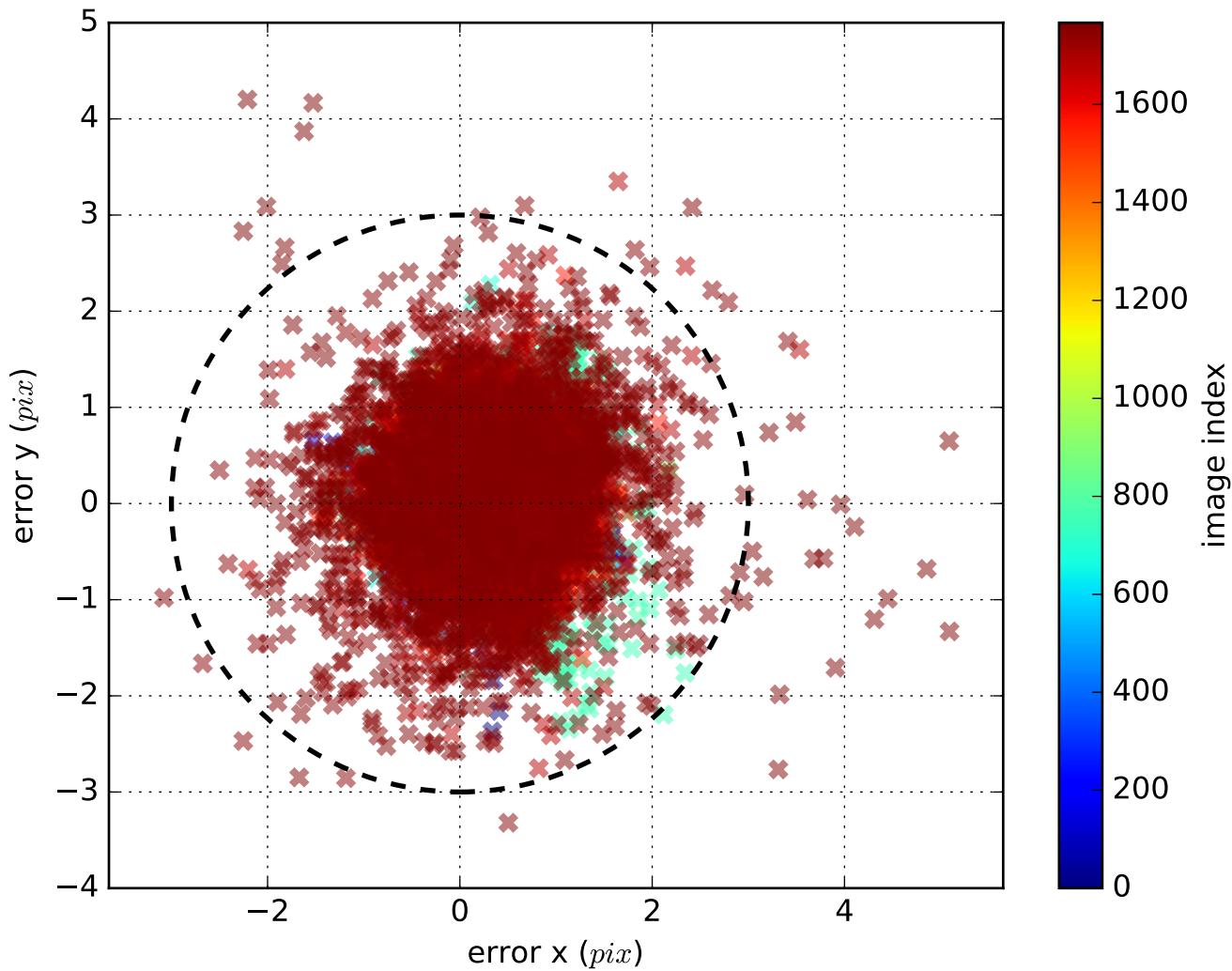
# imu0: angular velocities error



# imu0: estimated gyro bias (imu frame)



cam0: reprojection errors



cam1: reprojection errors

