

## Calibration results

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### Normalized Residuals

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Reprojection error (cam0): mean 0.374447430408, median 0.3162459707, std: 0.256521598106  
Reprojection error (cam1): mean 0.392303932328, median 0.332749608281, std: 0.265266448554  
Gyroscope error (imu0): mean 1.09435831721, median 0.985884305328, std: 0.604954134437  
Accelerometer error (imu0): mean 1.40327021198, median 1.23240540888, std: 0.901912229099

### Residuals

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Reprojection error (cam0) [px]: mean 0.374447430408, median 0.3162459707, std: 0.256521598106  
Reprojection error (cam1) [px]: mean 0.392303932328, median 0.332749608281, std: 0.265266448554  
Gyroscope error (imu0) [rad/s]: mean 0.0026260633359, median 0.00236576502134, std: 0.00145167067071  
Accelerometer error (imu0) [m/s^2]: mean 0.0396904753091, median 0.0348576888716, std: 0.0255099301292

### Transformation (cam0):

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T\_ci: (imu0 to cam0):  
[[ 0.01490698 0.99971333 -0.01873604 0.06886872]  
 [-0.999886 0.01494935 0.00212307 -0.01560503]  
 [ 0.00240255 0.01870225 0.99982221 -0.00609508]  
 [ 0. 0. 0. 1. ]]

T\_ic: (cam0 to imu0):  
[[ 0.01490698 -0.999886 0.00240255 -0.01661524]  
 [ 0.99971333 0.01494935 0.01870225 -0.0685017 ]  
 [-0.01873604 0.00212307 0.99982221 0.00741746]  
 [ 0. 0. 0. 1. ]]

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

0.0

### Transformation (cam1):

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T\_ci: (imu0 to cam1):  
[[ 0.01266441 0.99971371 -0.02030065 -0.04127141]  
 [-0.99978434 0.01299426 0.01619966 -0.01508406]  
 [ 0.01645881 0.02009111 0.99966267 -0.00630897]

[ 0. 0. 0. 1. ]]

T\_ic: (cam1 to imu0):

[[ 0.01266441 -0.99978434 0.01645881 -0.01445429]  
[ 0.99971371 0.01299426 0.02009111 0.04158235]  
[-0.02030065 0.01619966 0.99966267 0.00571336]  
[ 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):

[[ 0.99999626 0.002239 -0.00156972 -0.1101145 ]  
[-0.00221675 0.99989901 0.01403776 0.00075762]  
[ 0.00160099 -0.01403423 0.99990023 -0.00054376]  
[ 0. 0. 0. 1. ]]

baseline norm: 0.110118451015 [m]

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

[-0.01171454 -9.55683454 -2.19890866]

Calibration configuration

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cam0

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Camera model: eucm

Focal length: [459.5222085017225, 458.2138718164207]

Principal point: [365.26162215569695, 248.54388097826927]

EUCM alpha: 0.595892329189

EUCM beta: 1.11043751082

Distortion model: none

Distortion coefficients: []

Type: aprilgrid

Tags:

Rows: 6

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

cam1

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Camera model: eucm  
Focal length: [458.4354415003356, 457.0971442827047]  
Principal point: [378.90931399590977, 255.22608606722073]  
EUCM alpha: 0.593391743445  
EUCM beta: 1.11457124799  
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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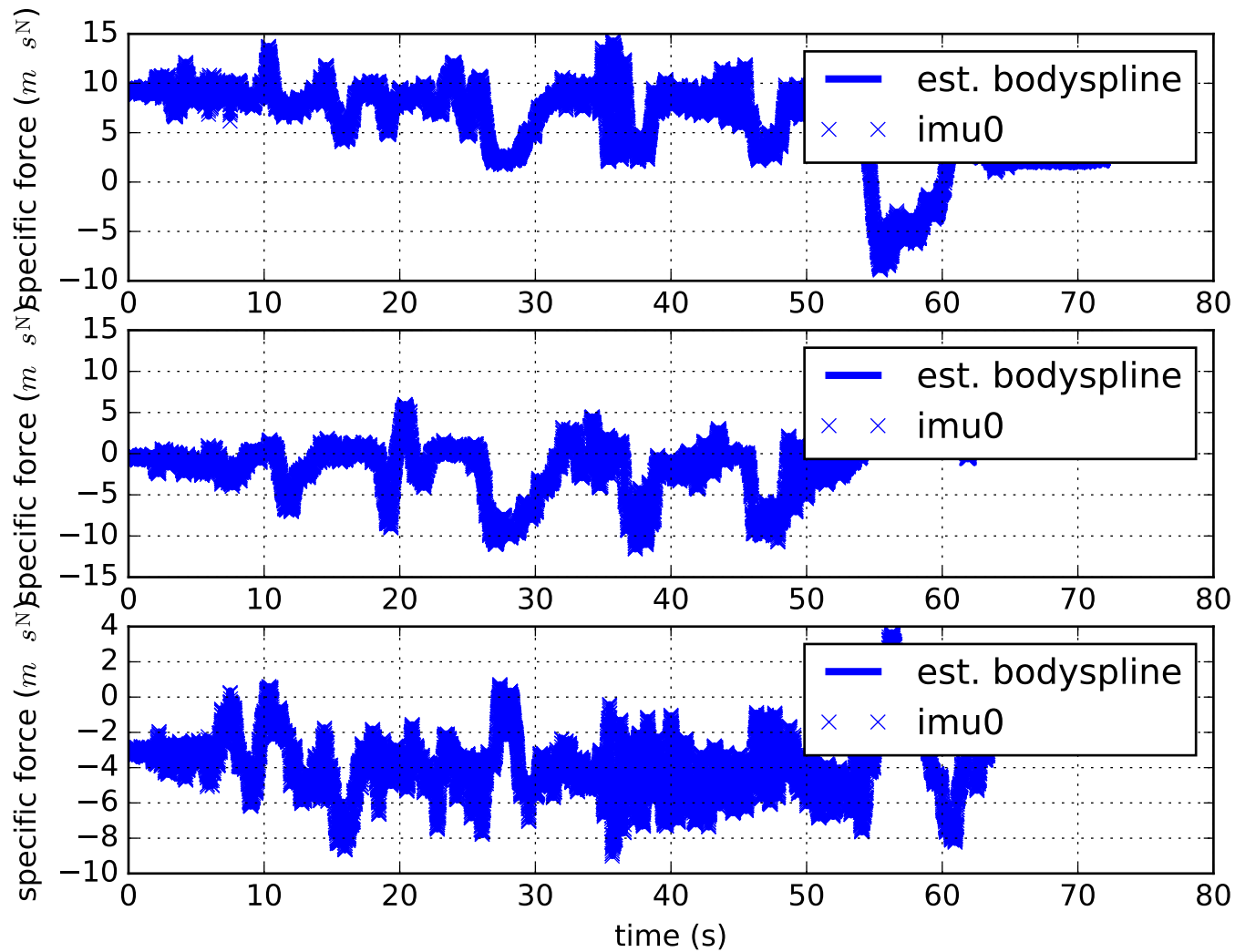
IMU0:

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Model: calibrated  
Update rate: 200.0  
Accelerometer:  
 Noise density: 0.002  
 Noise density (discrete): 0.0282842712475  
 Random walk: 0.003  
Gyroscope:  
 Noise density: 0.00016968  
 Noise density (discrete): 0.00239963757263  
 Random walk: 1.9393e-05  
T\_i\_b  
[[ 1. 0. 0. 0.]

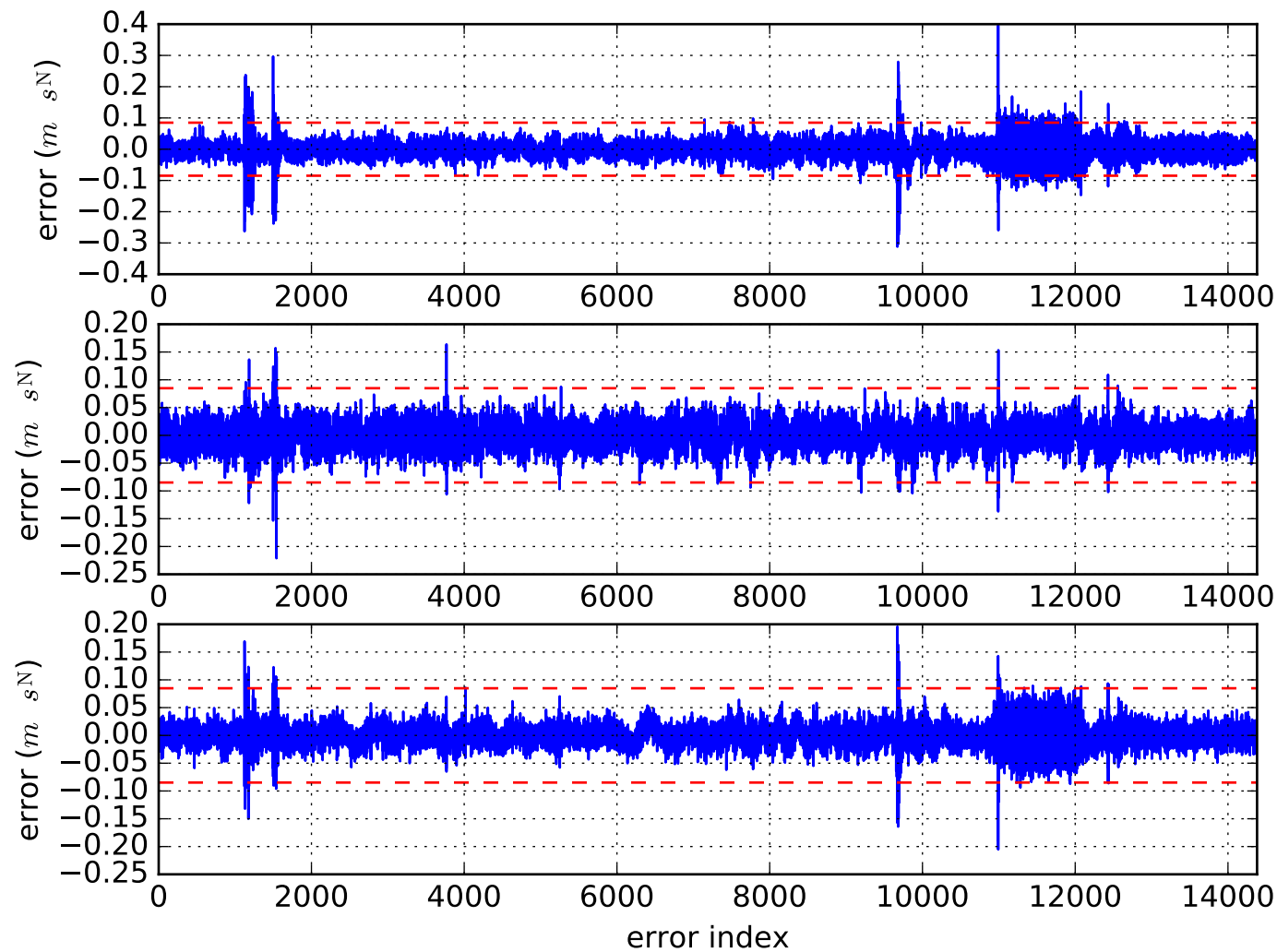
```
[ 0.  1.  0.  0.]  
[ 0.  0.  1.  0.]  
[ 0.  0.  0.  1.]
```

time offset with respect to IMU0: 0.0 [s]

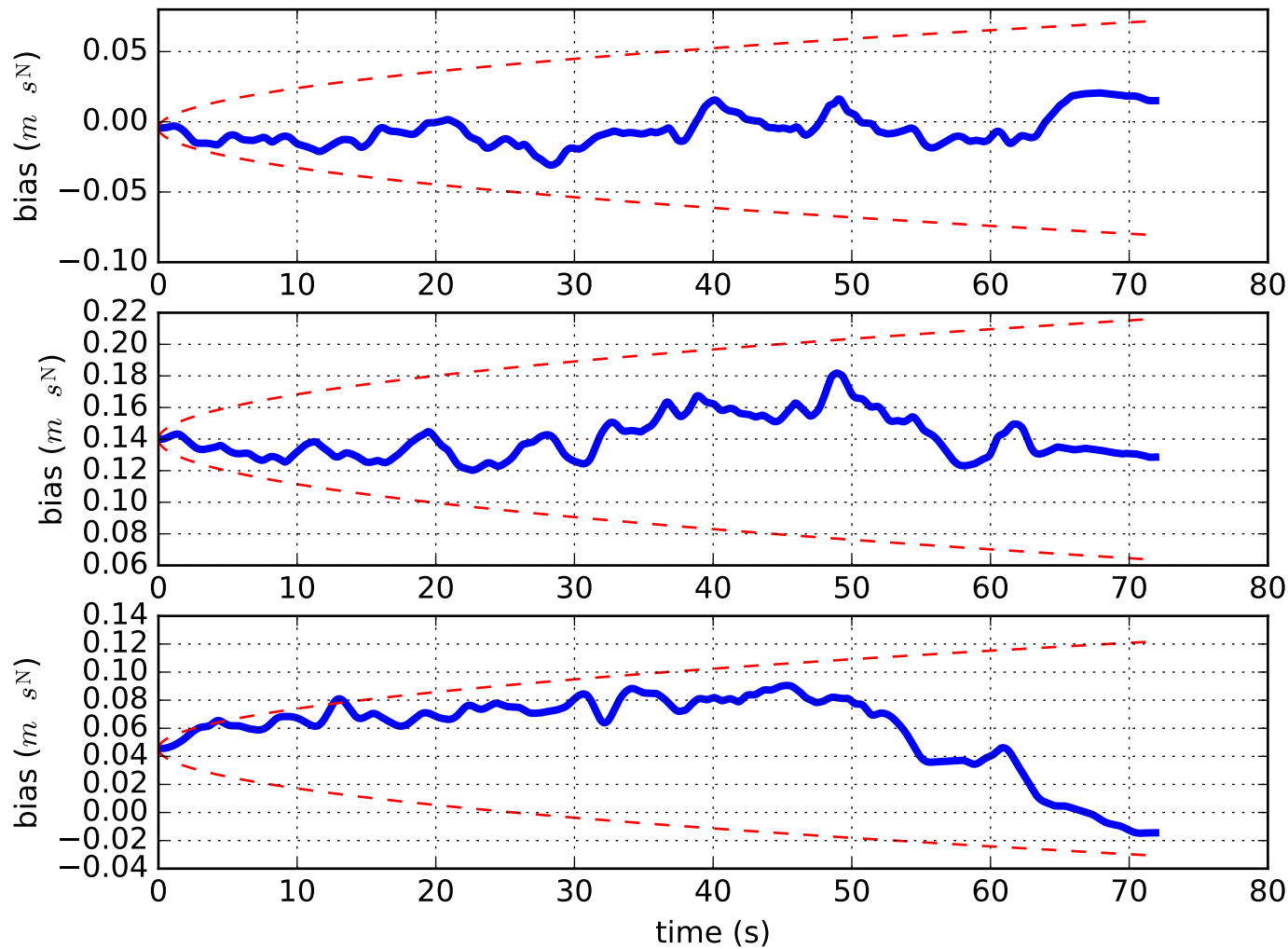
Comparison of predicted and measured specific force (imu0 frame)



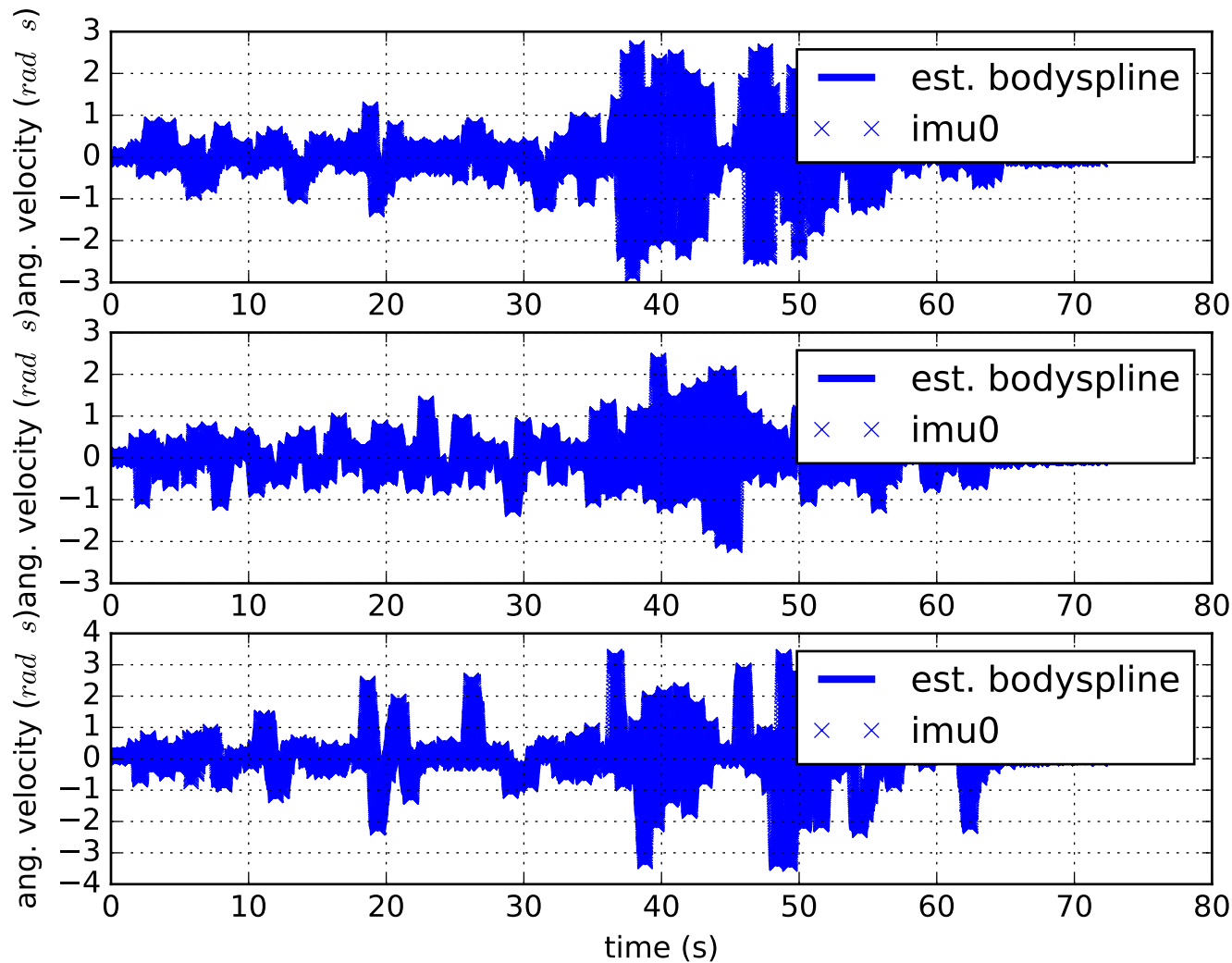
imu0: acceleration error



imu0: estimated accelerometer bias (imu frame)

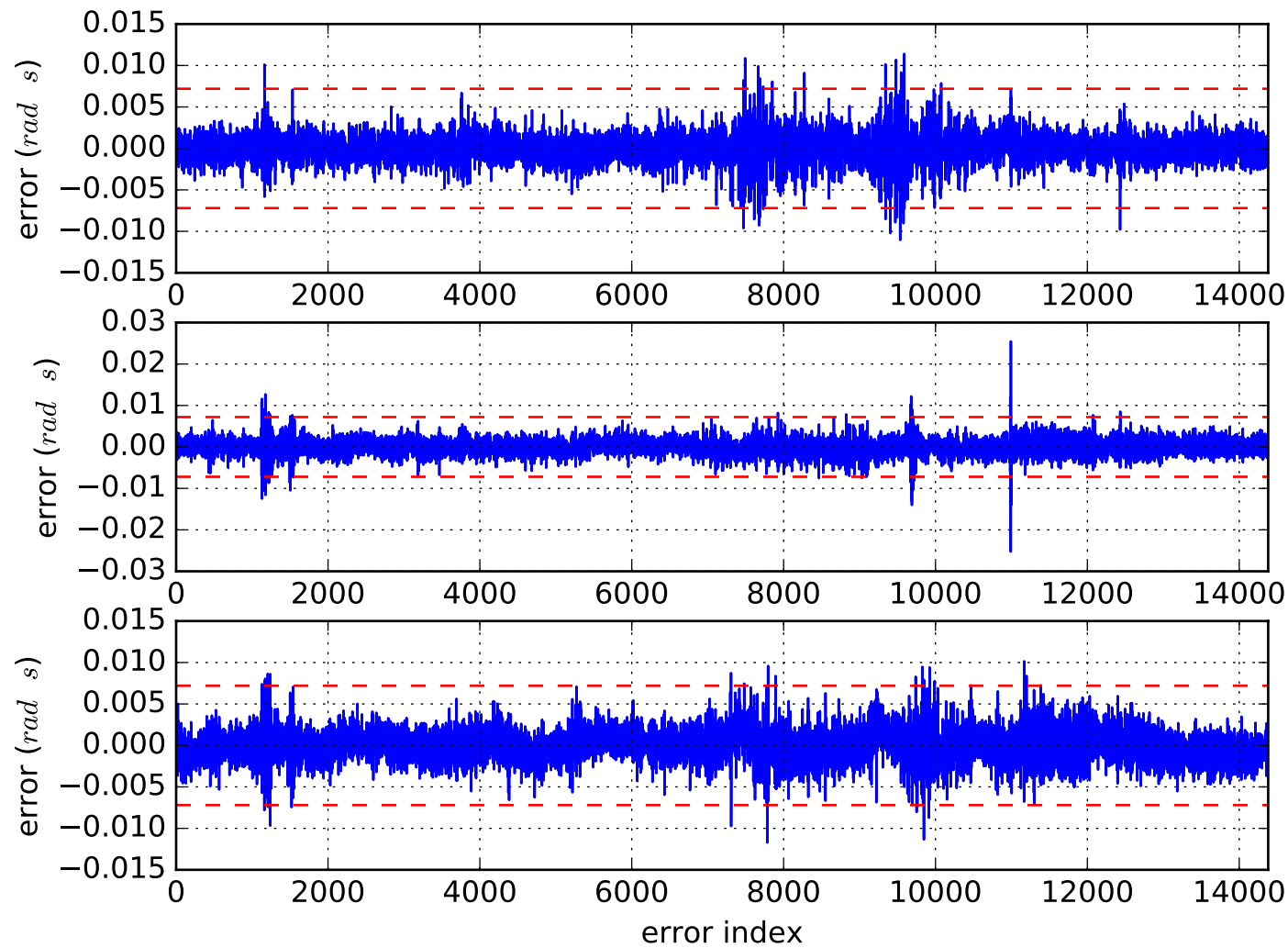


Comparison of predicted and measured angular velocities (body frame)

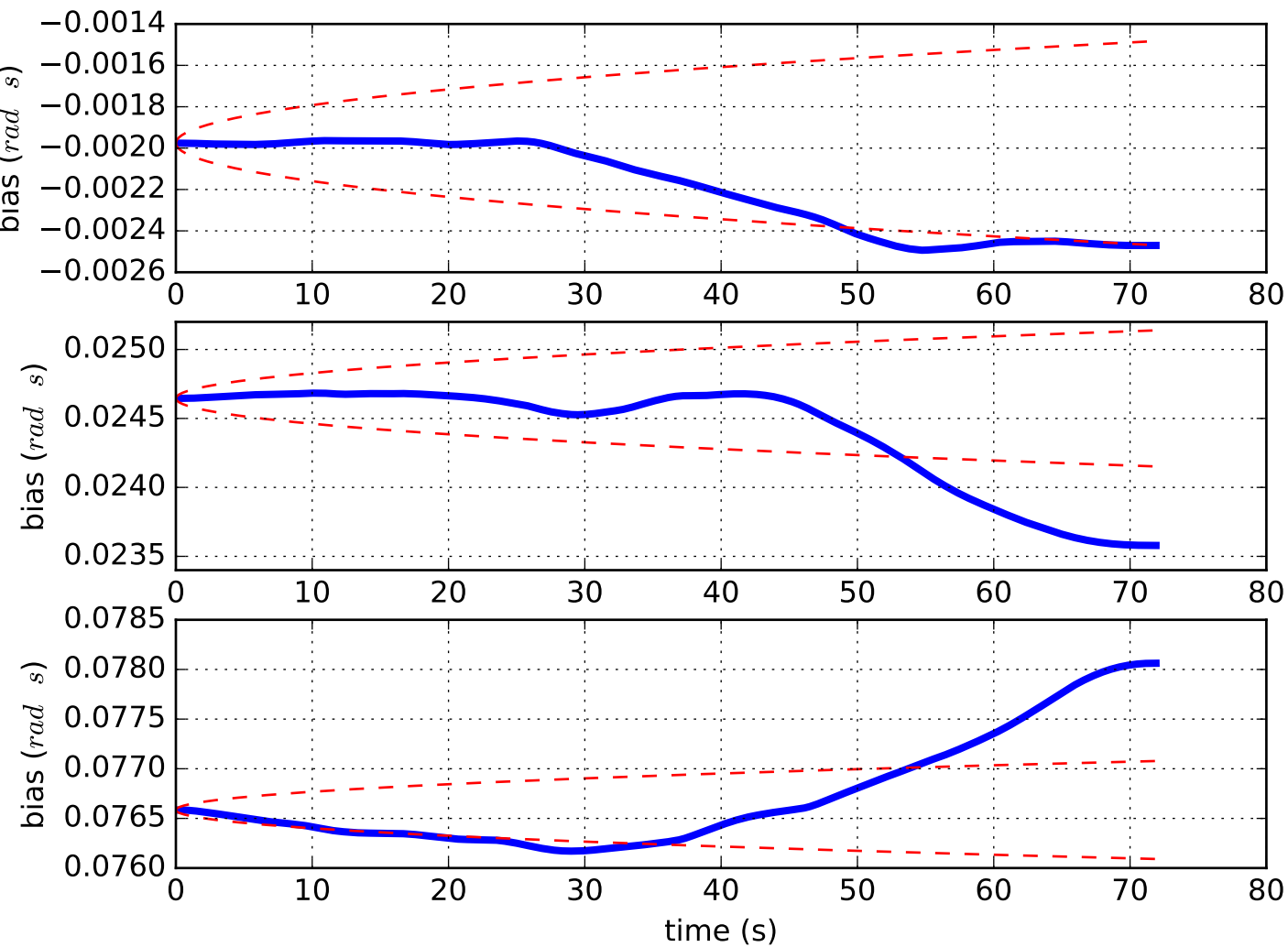




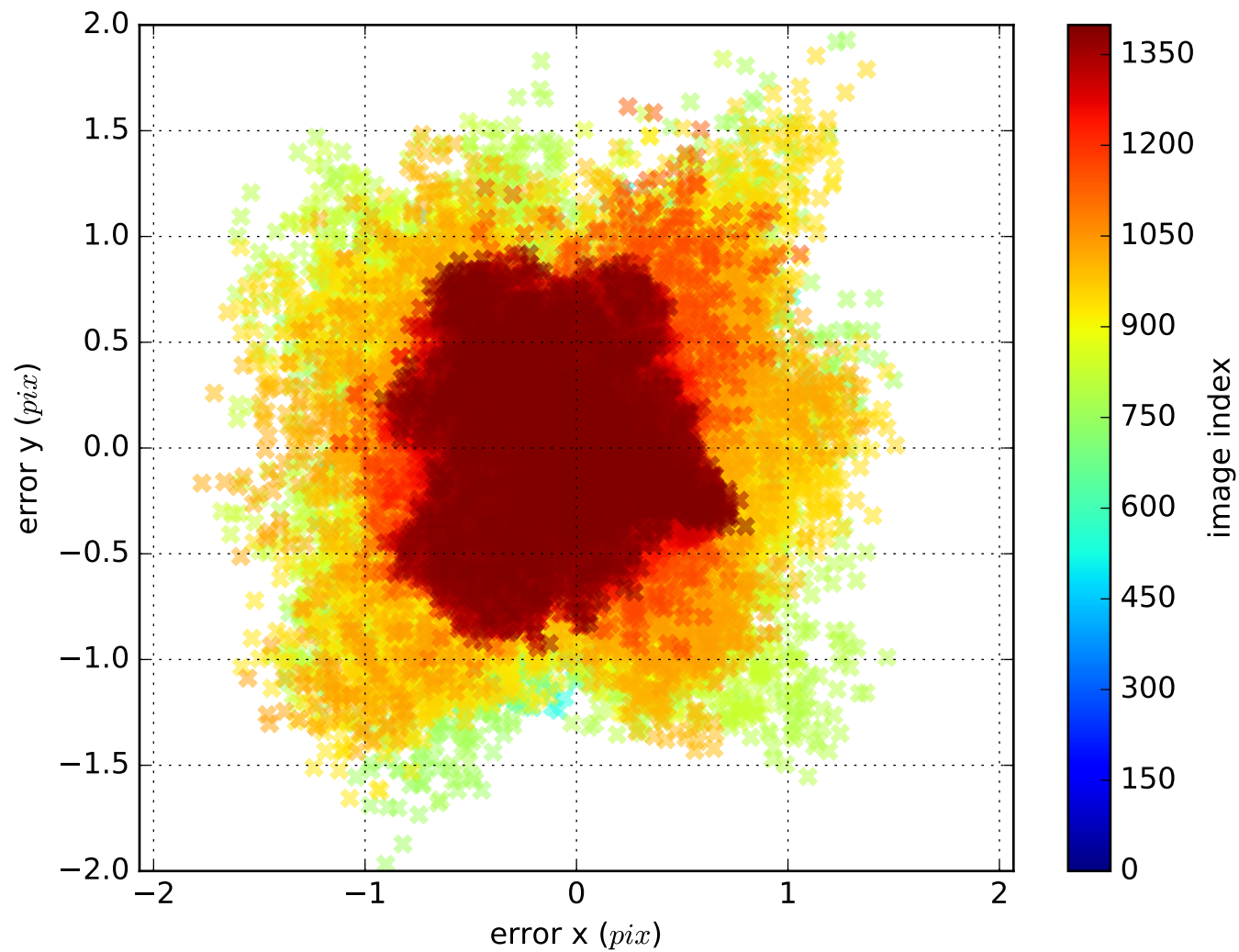
imu0: angular velocities error



imu0: estimated gyro bias (imu frame)



cam0: reprojection errors



cam1: reprojection errors

