

## Calibration results

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### Normalized Residuals

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Reprojection error (cam0): mean 0.0900221638438, median 0.0858959586912, std: 0.0455284073545  
Reprojection error (cam1): mean 0.0904119385507, median 0.0856193765285, std: 0.0459722151443  
Gyroscope error (imu0): mean 0.492352480239, median 0.457407287956, std: 0.260773502421  
Accelerometer error (imu0): mean 0.58166556138, median 0.536778303244, std: 0.302528976141

### Residuals

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Reprojection error (cam0) [px]: mean 0.0900221638438, median 0.0858959586912, std: 0.0455284073545  
Reprojection error (cam1) [px]: mean 0.0904119385507, median 0.0856193765285, std: 0.0459722151443  
Gyroscope error (imu0) [rad/s]: mean 0.00111406648804, median 0.00103499454425, std: 0.00059006307813  
Accelerometer error (imu0) [m/s^2]: mean 0.0230327811187, median 0.0212553363802, std: 0.01197953627

### Transformation (cam0):

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T\_ci: (imu0 to cam0):

```
[[ -0.99951888  0.02980491 -0.00858293  0.04723244]
 [  0.00755691 -0.03436795 -0.99938068 -0.04759354]
 [ -0.03008143 -0.99896472  0.03412618 -0.06737808]
 [  0.          0.          0.          1.         ]]
```

T\_ic: (cam0 to imu0):

```
[[ -0.99951888  0.00755691 -0.03008143  0.04554255]
 [  0.02980491 -0.03436795 -0.99896472 -0.07035177]
 [ -0.00858293 -0.99938068  0.03412618 -0.04485932]
 [  0.          0.          0.          1.         ]]
```

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

0.0

### Transformation (cam1):

-----

T\_ci: (imu0 to cam1):

```
[[ -0.99951201  0.03028386 -0.00765703 -0.05372031]
 [  0.00805879  0.01316672 -0.99988084 -0.04620916]
 [ -0.03017943 -0.99945461 -0.01340435 -0.07102281]
```

[ 0. 0. 0. 1. ]]

T\_ic: (cam1 to imu0):

[[-0.99951201 0.00805879 -0.03017943 -0.05546514]  
[ 0.03028386 0.01316672 -0.99945461 -0.06874879]  
[-0.00765703 -0.99988084 -0.01340435 -0.04756701]  
[ 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):

[[ 0.99999946 -0.00094173 -0.00044706 -0.10102768]  
[ 0.00091943 0.99886998 -0.04751762 -0.00191447]  
[ 0.0004913 0.04751718 0.9988703 -0.00148254]  
[ 0. 0. 0. 1. ]]

baseline norm: 0.101056688907 [m]

Gravity vector in target coords: [m/s^2]  
[ 0.03442423 -9.69481826 -1.47571568]

Calibration configuration

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cam0

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Camera model: ds  
Focal length: [156.91907398528585, 156.8869743181161]  
Principal point: [254.9906063487737, 256.976661072472]  
DS xi: -0.179553309206  
DS alpha: 0.591873708003  
Distortion model: none  
Distortion coefficients: []  
Type: aprilgrid  
Tags:  
 Rows: 6

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

cam1

-----  
Camera model: ds  
Focal length: [158.07951163596704, 158.0407231578646]  
Principal point: [252.61689565854763, 255.07930289485037]  
DS xi: -0.170221709935  
DS alpha: 0.593589942459  
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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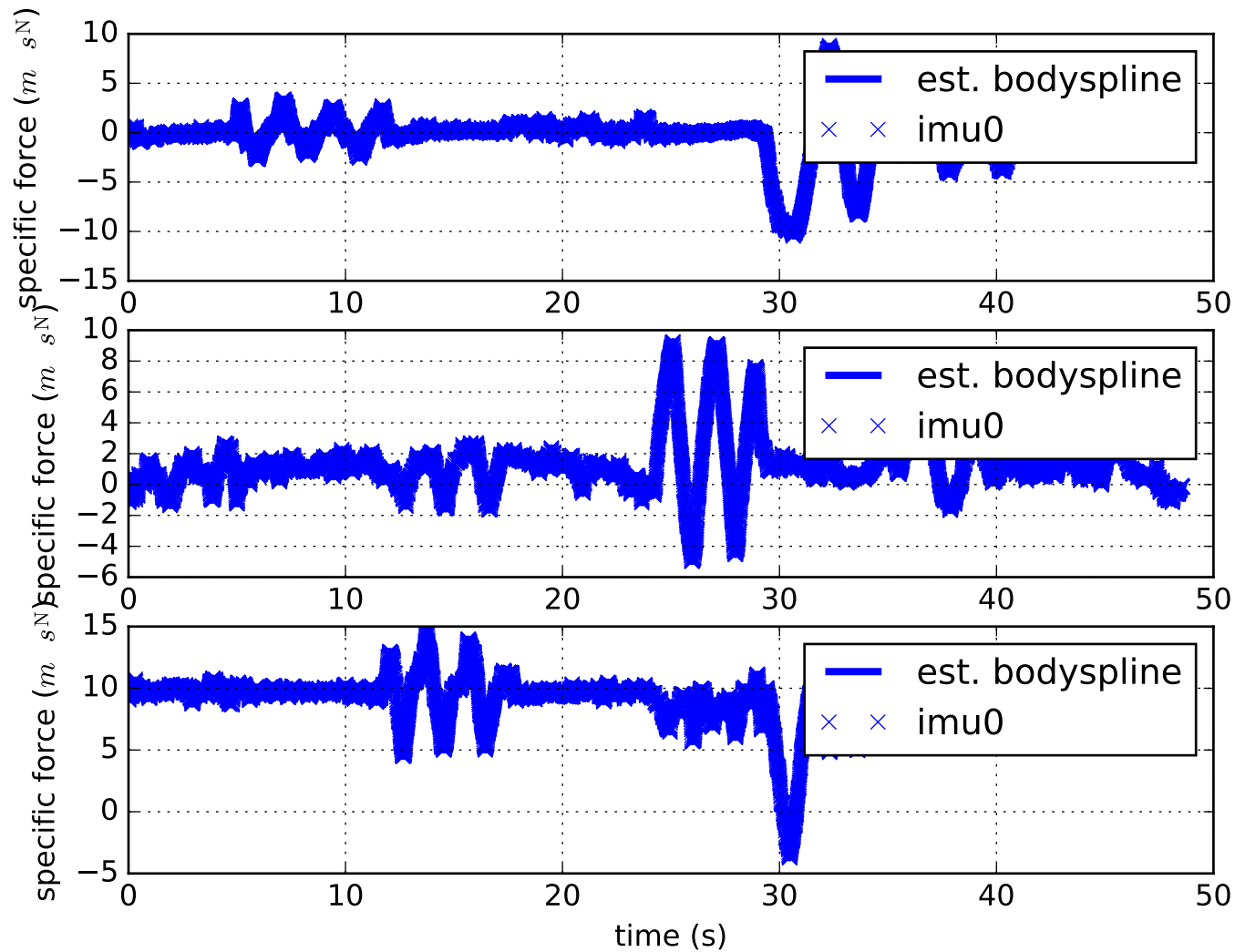
IMU0:

-----  
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.]

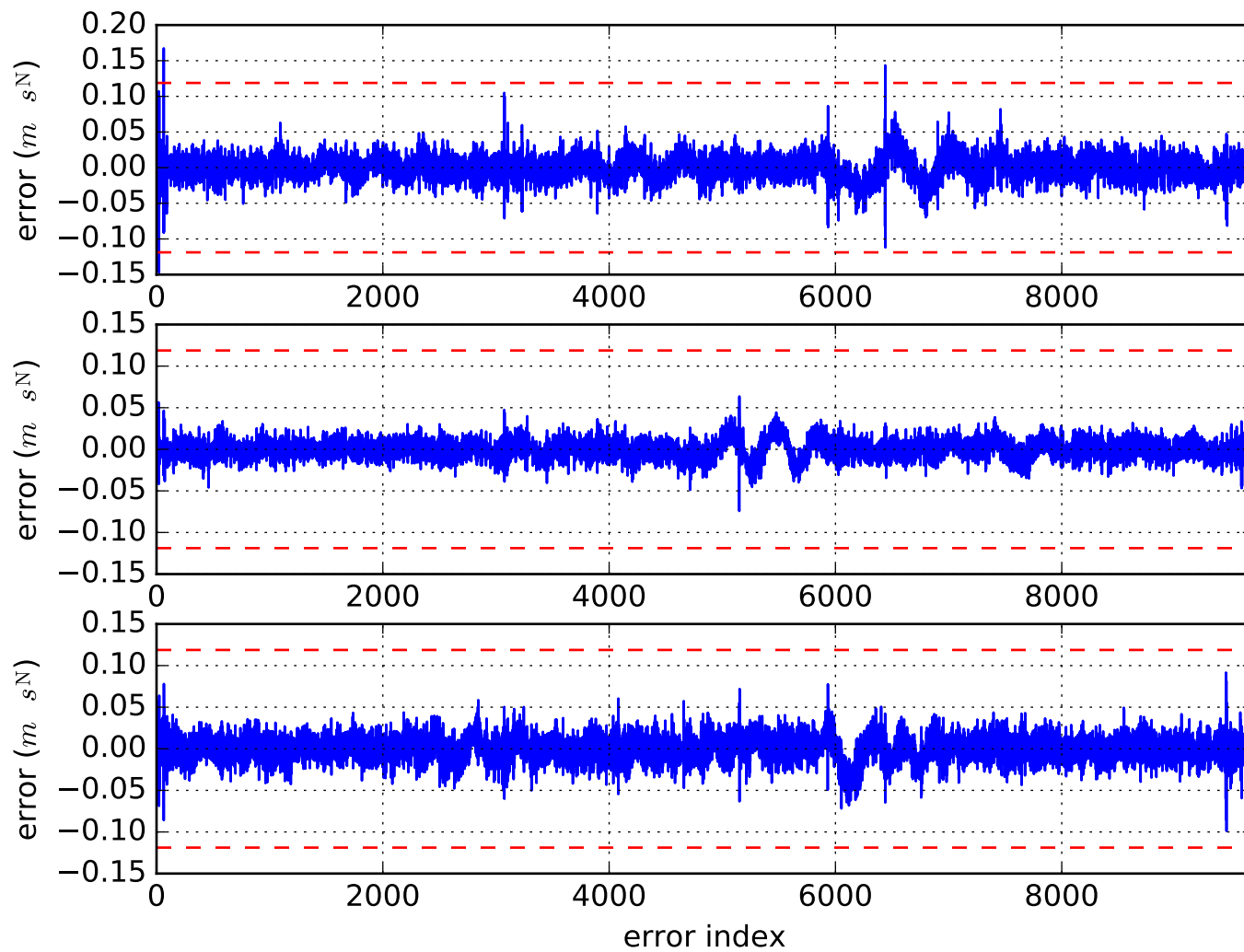
```
[ 0.  1.  0.  0.]  
[ 0.  0.  1.  0.]  
[ 0.  0.  0.  1.]
```

time offset with respect to IMU0: 0.0 [s]

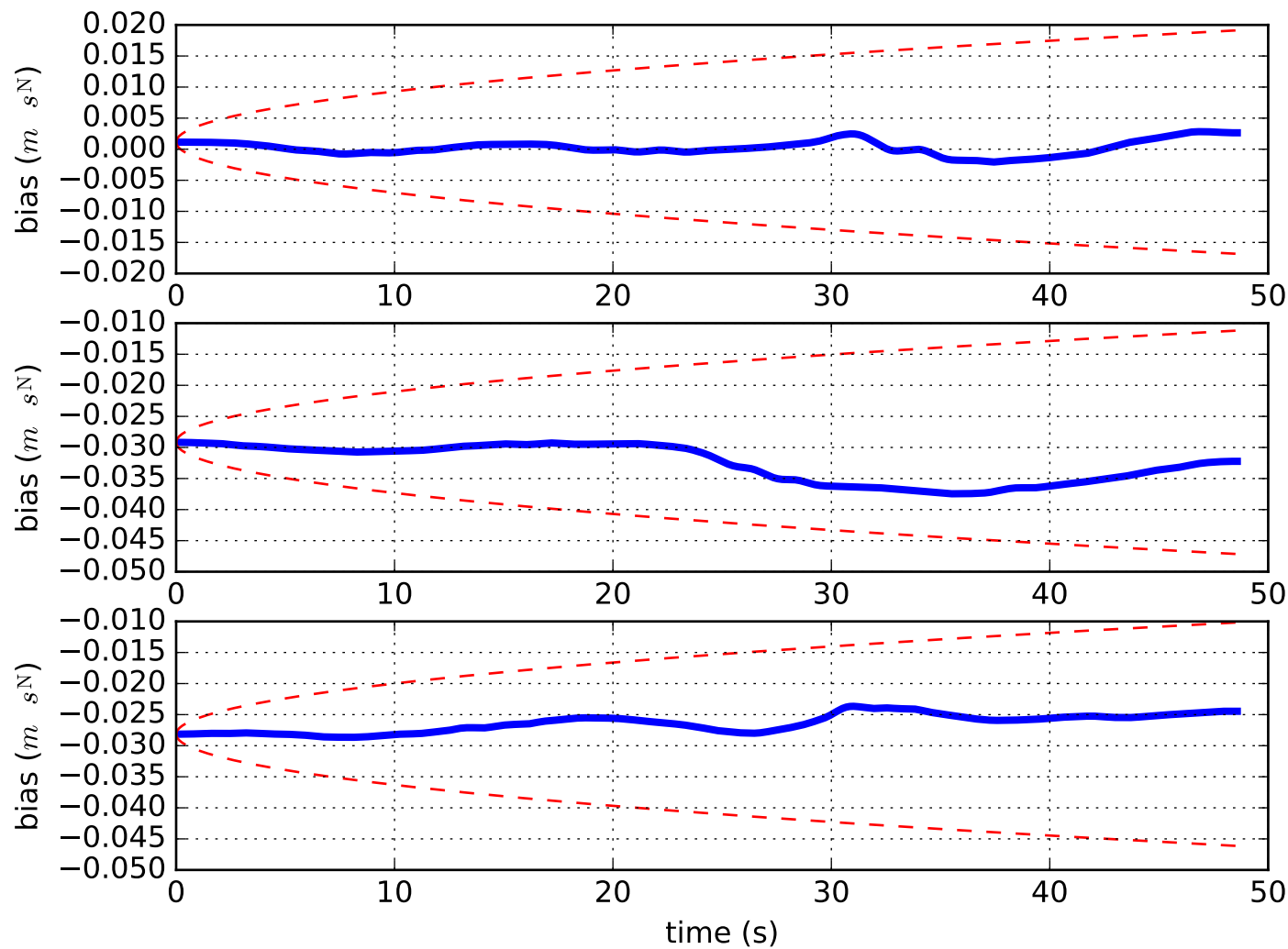
Comparison of predicted and measured specific force (imu0 frame)



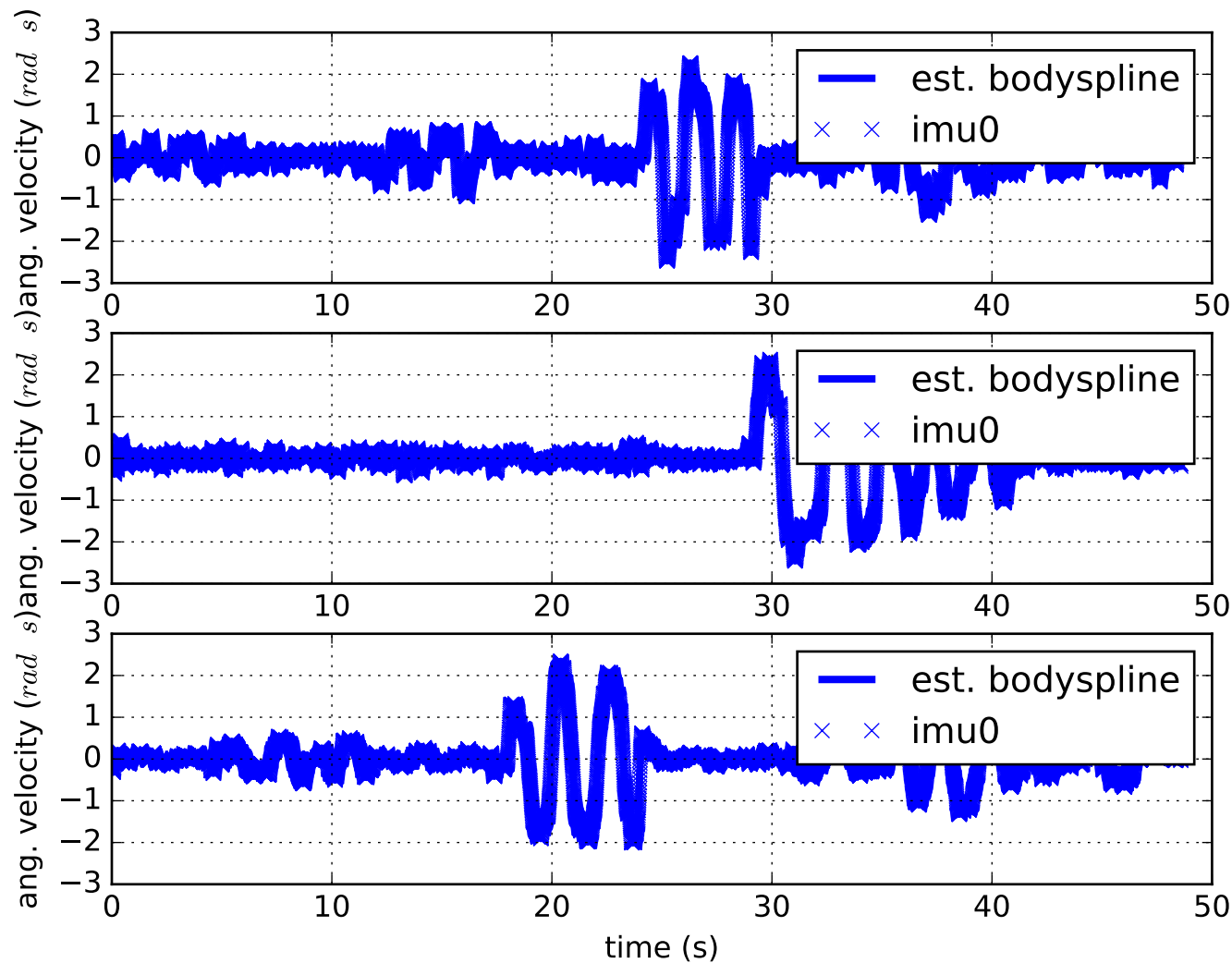
imu0: acceleration error



imu0: estimated accelerometer bias (imu frame)

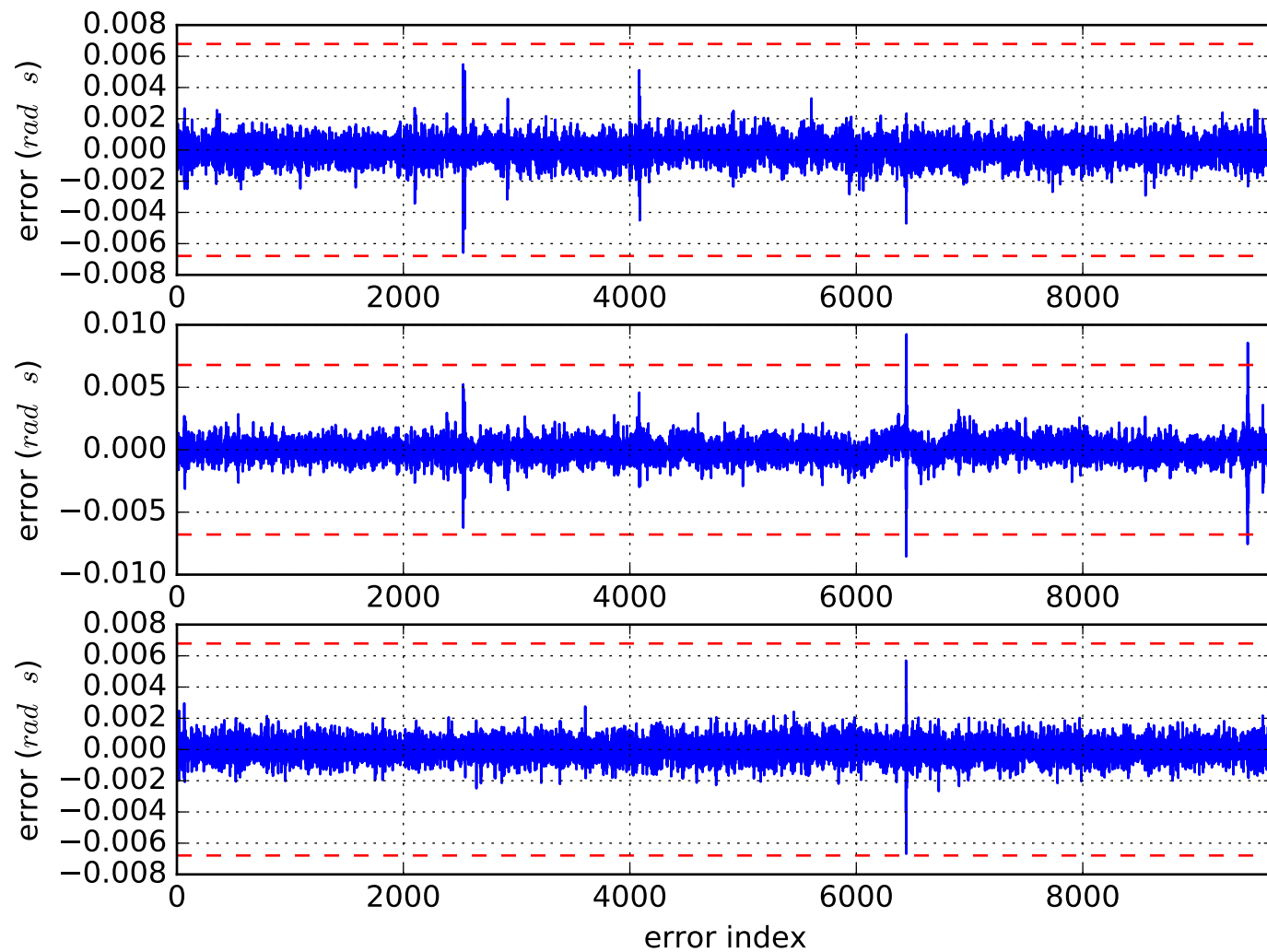


Comparison of predicted and measured angular velocities (body frame)

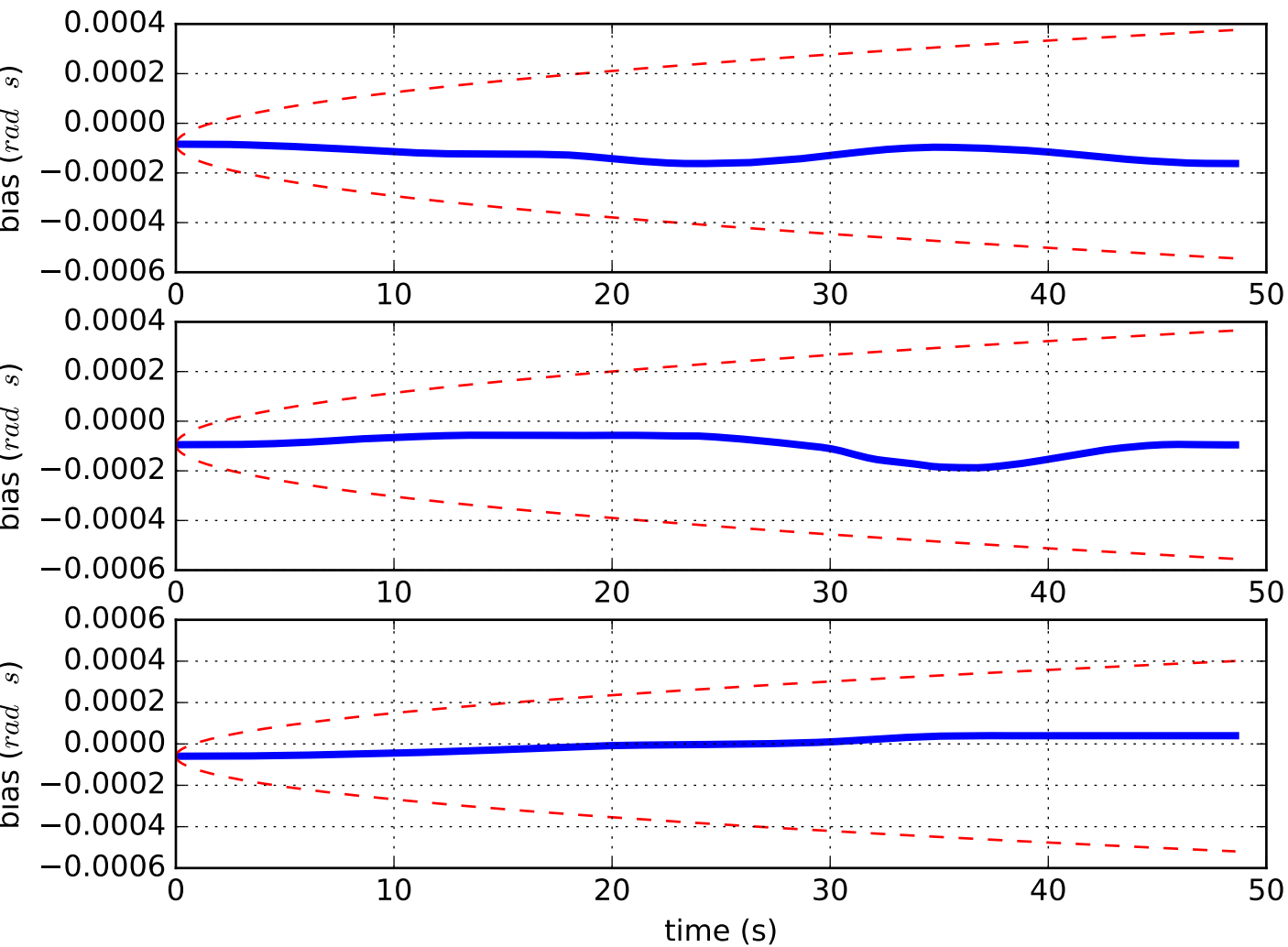




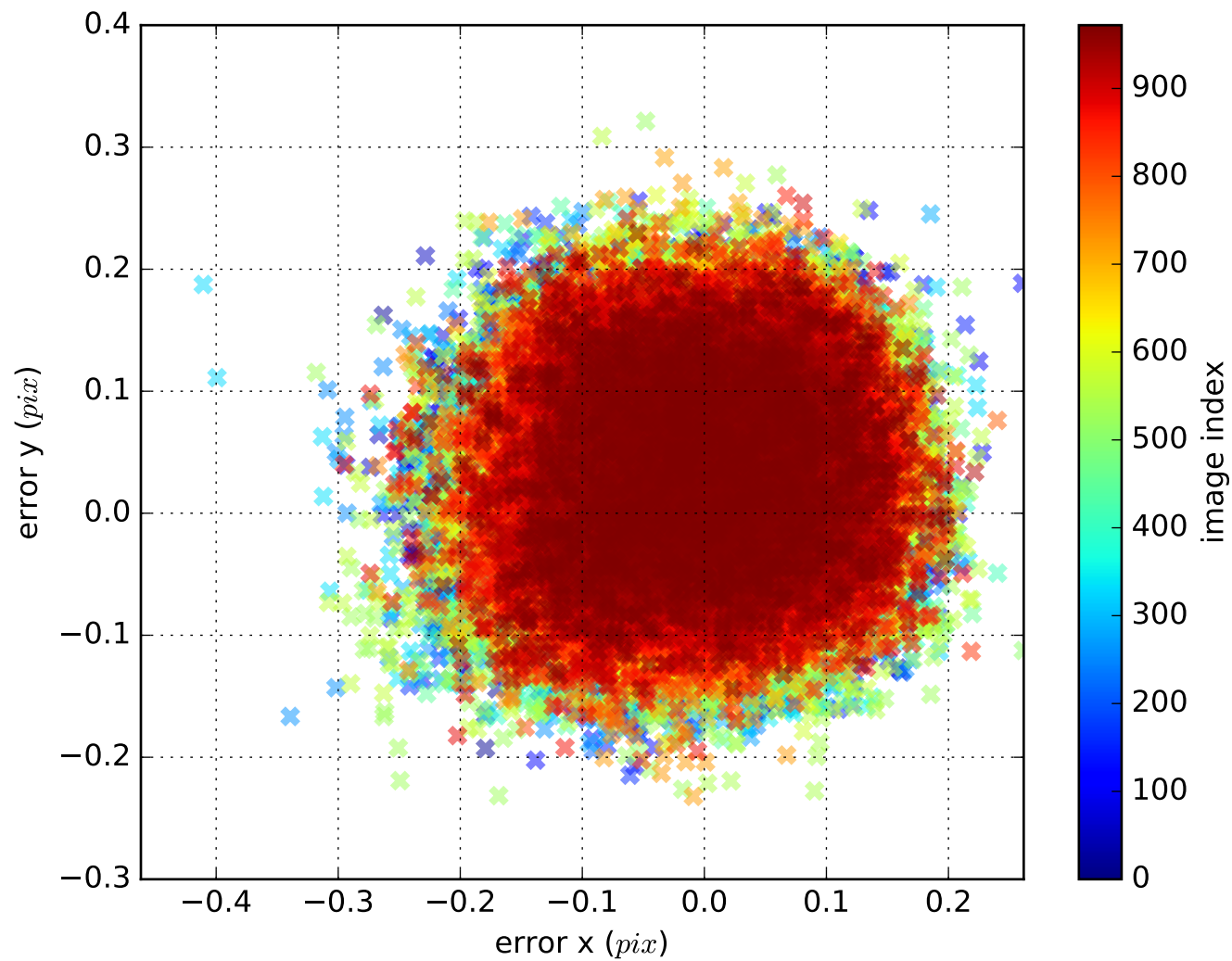
imu0: angular velocities error



imu0: estimated gyro bias (imu frame)



cam0: reprojection errors



cam1: reprojection errors

