

Calibration results

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Normalized Residuals

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Reprojection error (cam0) : mean: 1.75792087, median: 1.65059139, std: 0.92334382

Gyroscope error (imu0) : mean: 4.38768240, median: 2.63331149, std: 4.06224734

Accelerometer error (imu0) : mean: 27.25462860, median: 14.97626647, std: 29.58071375

Residuals

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Reprojection error (cam0) [px]: mean: 0.15725604, median: 0.14765481, std: 0.08259837

Gyroscope error (imu0) [rad/s]: mean: 0.01857217, median: 0.01114628, std: 0.01719467

Accelerometer error (imu0) [m/s^2]: mean: 1.00914107, median: 0.55451739, std: 1.09526765

Transformation (cam0):

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T\_ci: (imu0 to cam0):

[[-0.01257828 -0.99992088 0.00015927 -0.01279179]  
[-0.99990715 0.01257894 0.00523992 0.00111768]  
[-0.00524151 -0.00009335 -0.99998626 -0.00929450]  
[0.00000000 0.00000000 -0.00000000 1.00000000]]

T\_ic: (cam0 to imu0):

[[-0.01257828 -0.99990715 -0.00524151 0.00090796]  
[-0.99992088 0.01257894 -0.00009335 -0.01280570]  
[0.00015927 0.00523992 -0.99998626 -0.00929819]  
[0.00000000 0.00000000 0.00000000 1.00000000]]

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

0.00455801

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

[ -9.78784935 -0.01720956 -0.00150922]

Calibration configuration

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cam0

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Camera model: pinhole  
Focal length: [287.61725434, 287.55058258]  
Principal point: [321.47294623, 200.68500668]  
Distortion model: equi  
Distortion coefficients: [-0.00648975, 0.00859187, -0.00003451, -0.00176435]  
Type: random\_grid  
Targets: 4  
Target (rows, cols, seed): 22, 27, 43  
Target (rows, cols, seed): 27, 26, 42  
Target (rows, cols, seed): 22, 26, 44  
Target (rows, cols, seed): 22, 26, 45

## IMU configuration

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### IMU0:

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Model: scale-misalignment  
Update rate: 200.00000000  
Accelerometer:  
Noise density: 0.00261816  
Noise density (discrete): 0.03702641  
Random walk: 0.00078024

Gyroscope:  
Noise density: 0.00029930  
Noise density (discrete): 0.00423280  
Random walk: 0.00000642

$T_{i,b}$   
[[1.00000000 0.00000000 0.00000000 0.00000000]  
[0.00000000 1.00000000 0.00000000 0.00000000]  
[0.00000000 0.00000000 1.00000000 0.00000000]  
[0.00000000 0.00000000 0.00000000 1.00000000]]

time offset with respect to IMU0: 0.00000000 [s]

Gyroscope:

M:  
[[0.99694691 0.00000000 0.00000000]  
[-0.00031773 1.00064181 0.00000000]]

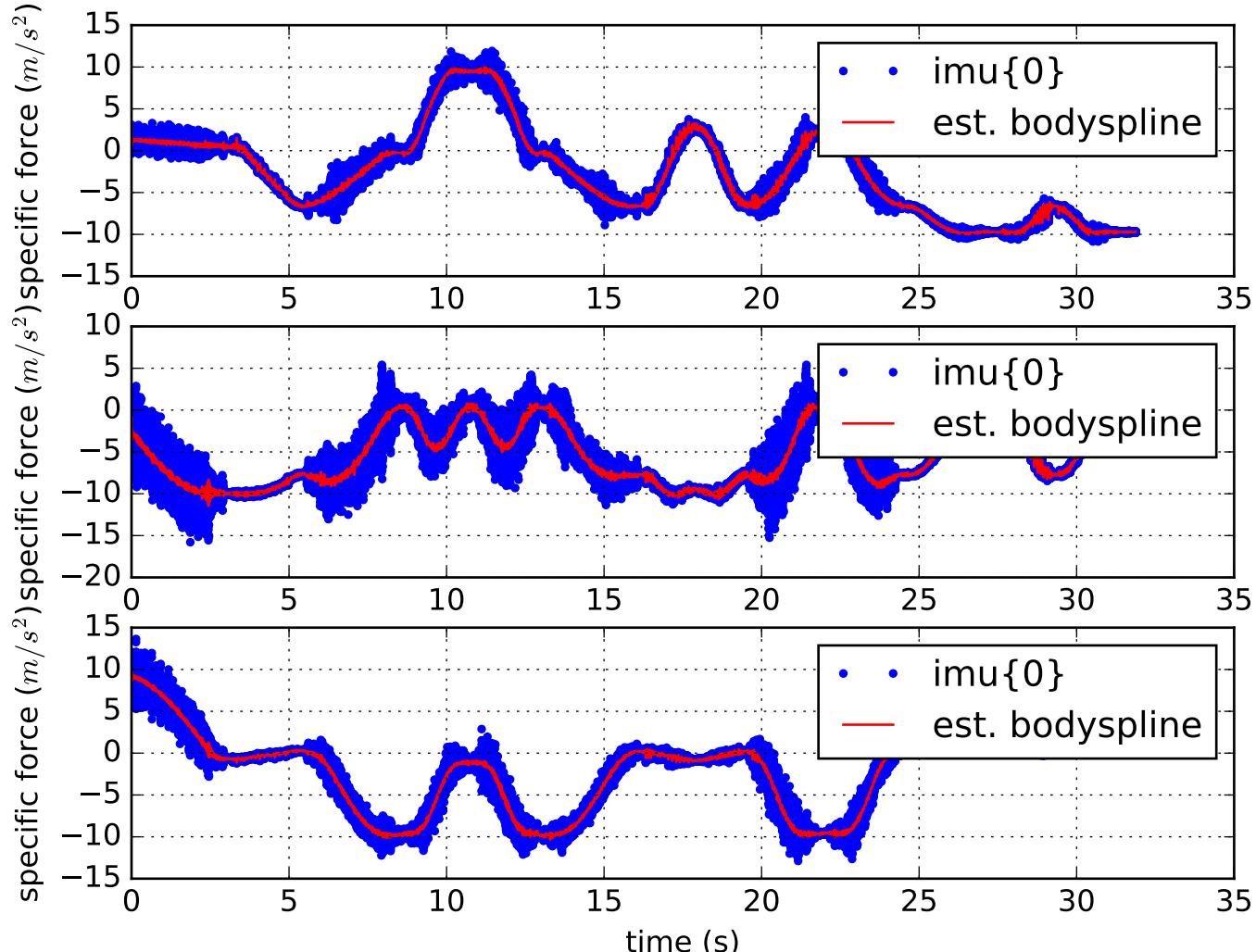
```
[-0.00106964 0.00130442 1.00068547]]  
A [(rad/s)/(m/s^2)]:  
[[0.00000897 0.00000286 0.00001422]  
 [-0.00001092 0.00000603 -0.00000043]  
 [-0.00000254 0.00000292 -0.00000266]]  
C_gyro_i:  
[[0.99979007 -0.02047449 -0.00078577]  
 [0.02047204 0.99978589 -0.00301117]  
 [0.00084726 0.00299446 0.99999516]]
```

Accelerometer:

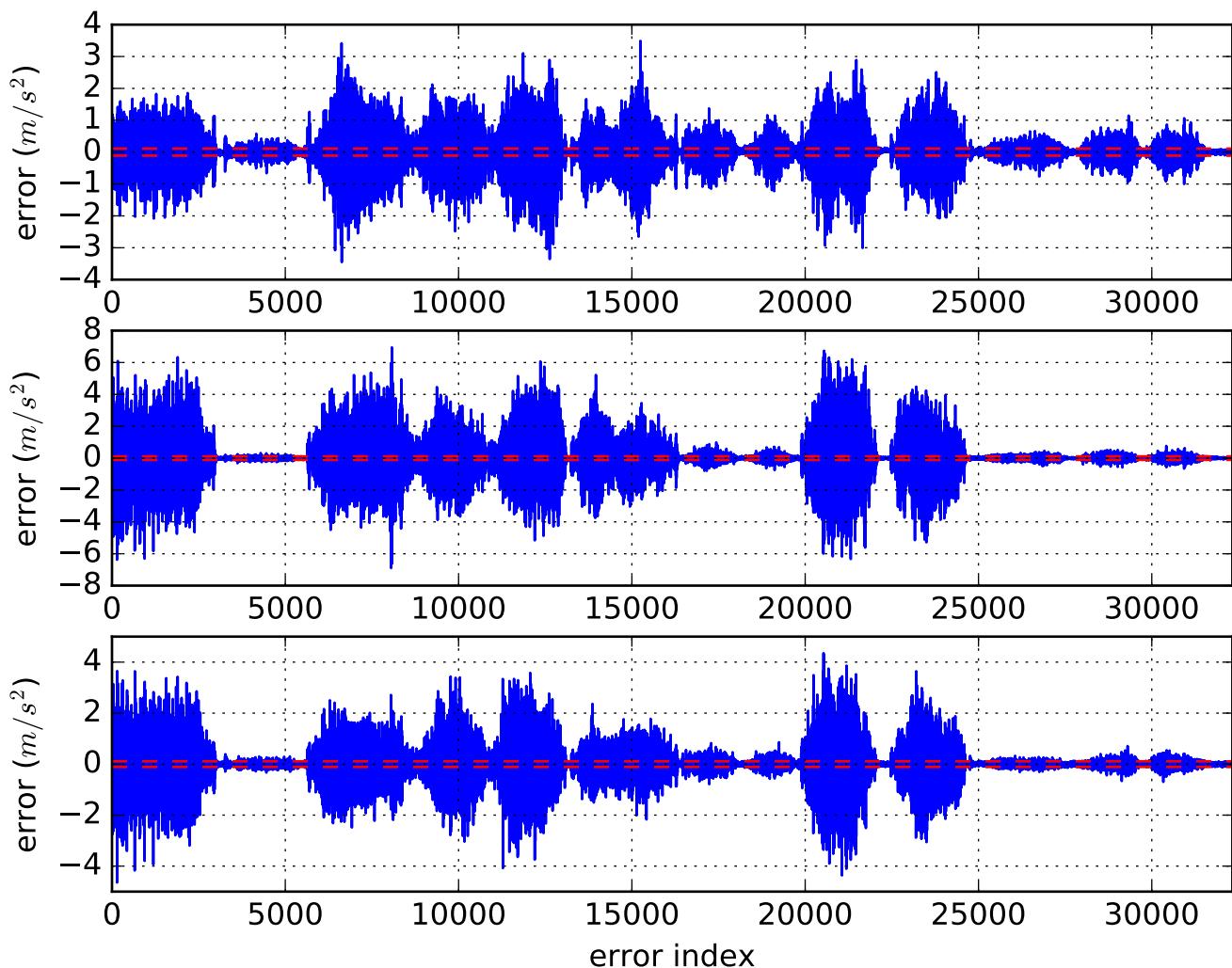
M:

```
[[0.99741228 0.00000000 0.00000000]  
 [0.01983147 1.00173326 0.00000000]  
 [-0.02274288 0.00323410 0.99548835]]
```

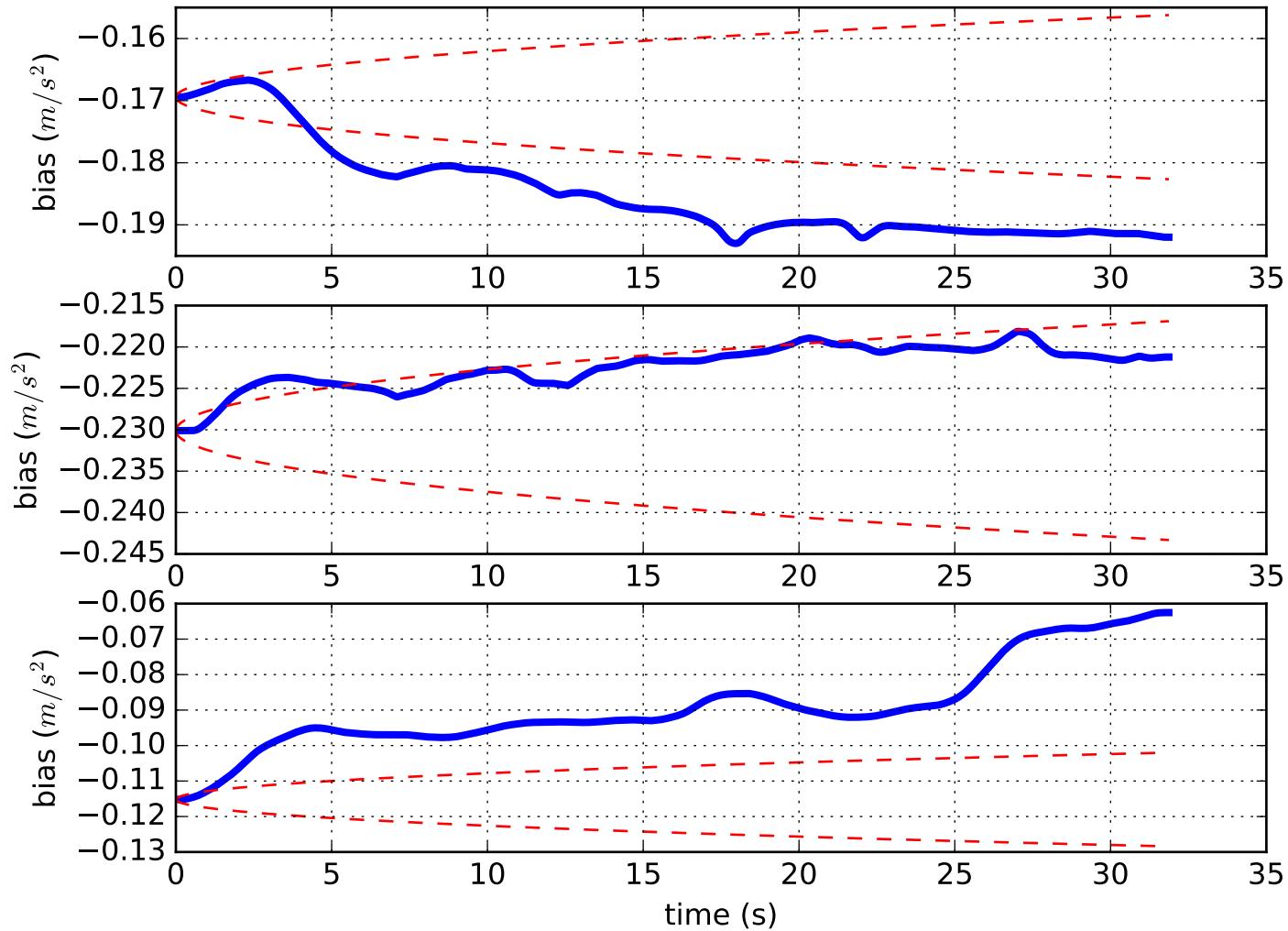
Comparison of predicted and measured specific force (imu0 frame)



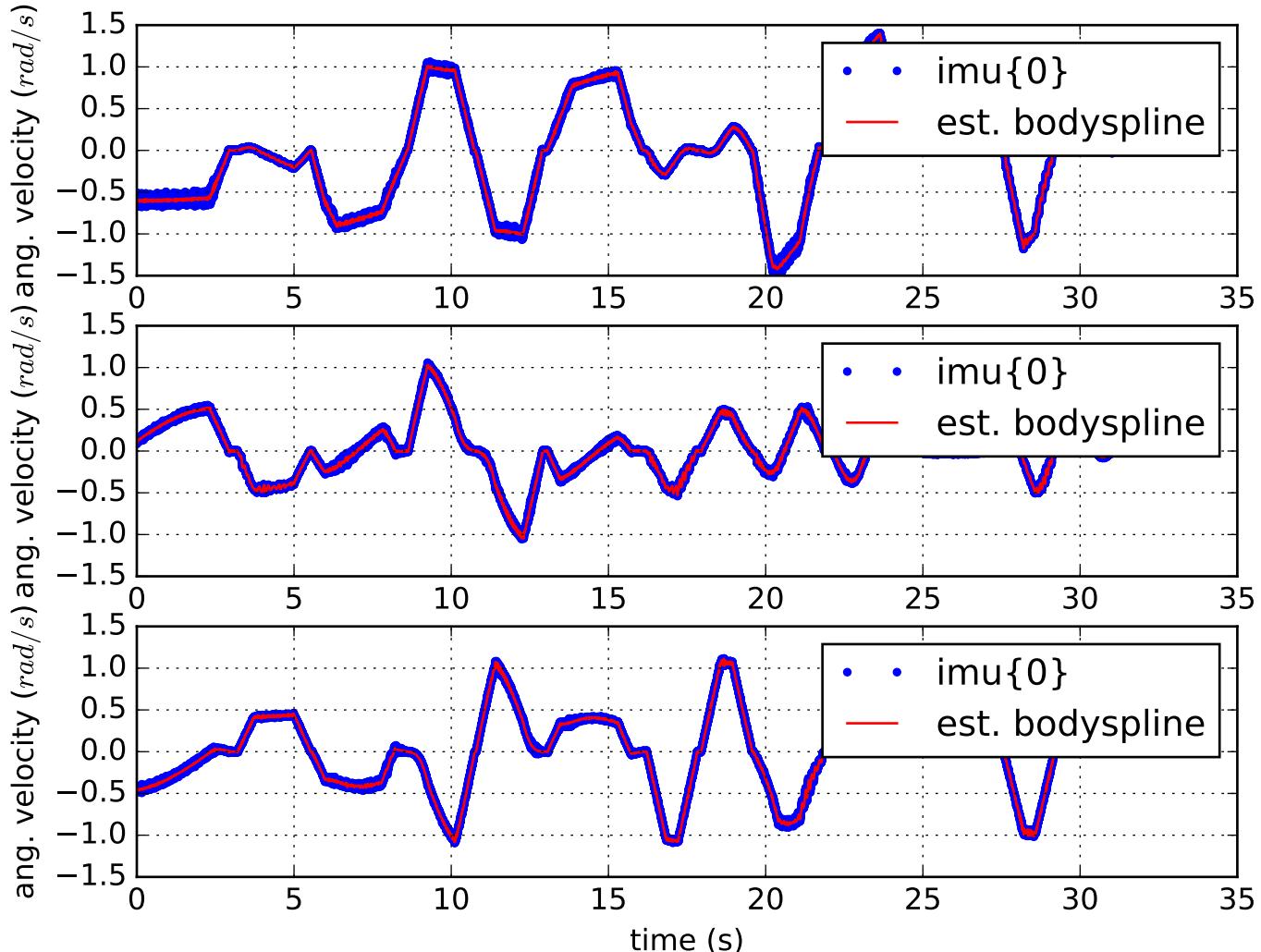
imu0: acceleration error



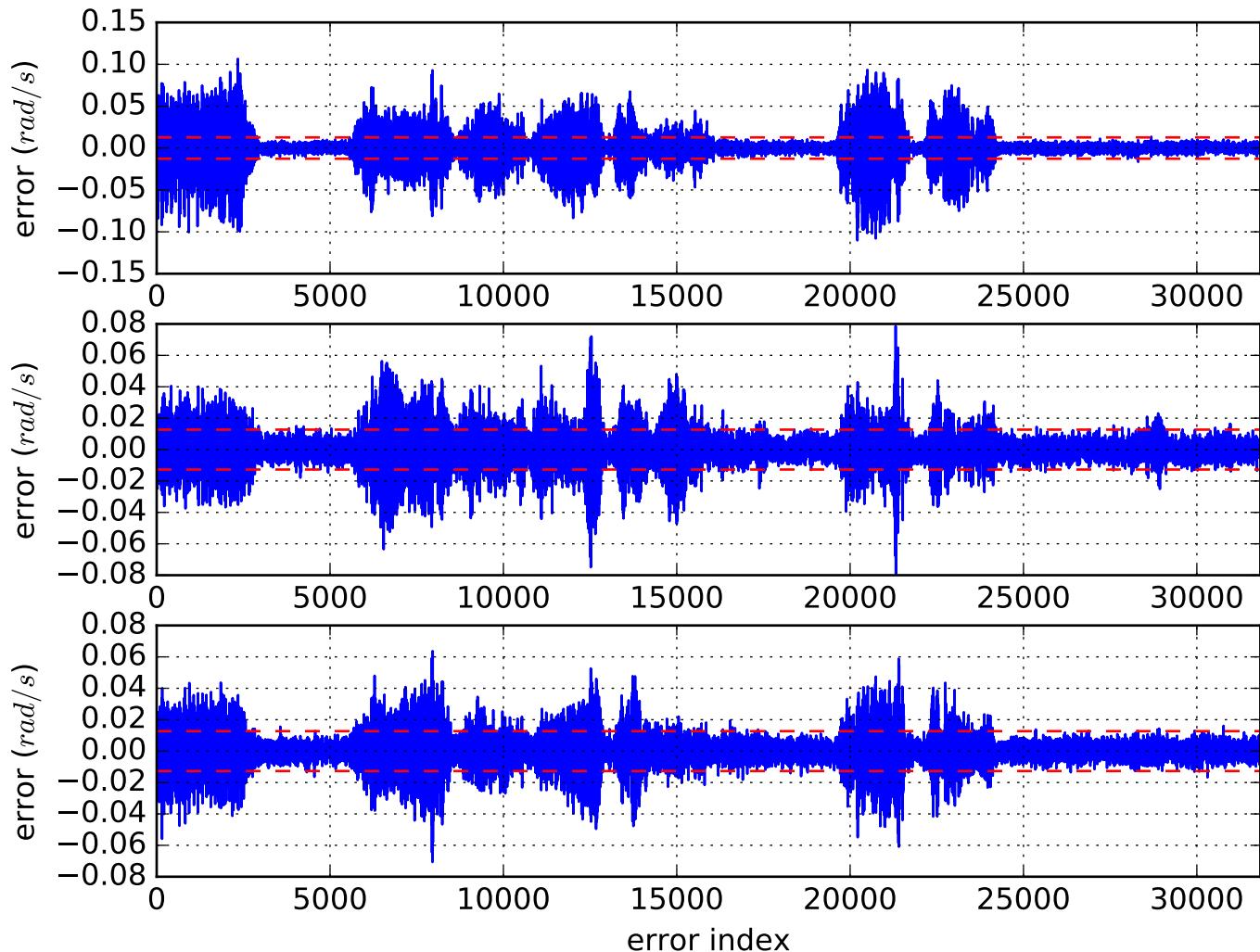
# imu0: estimated accelerometer bias (imu frame)



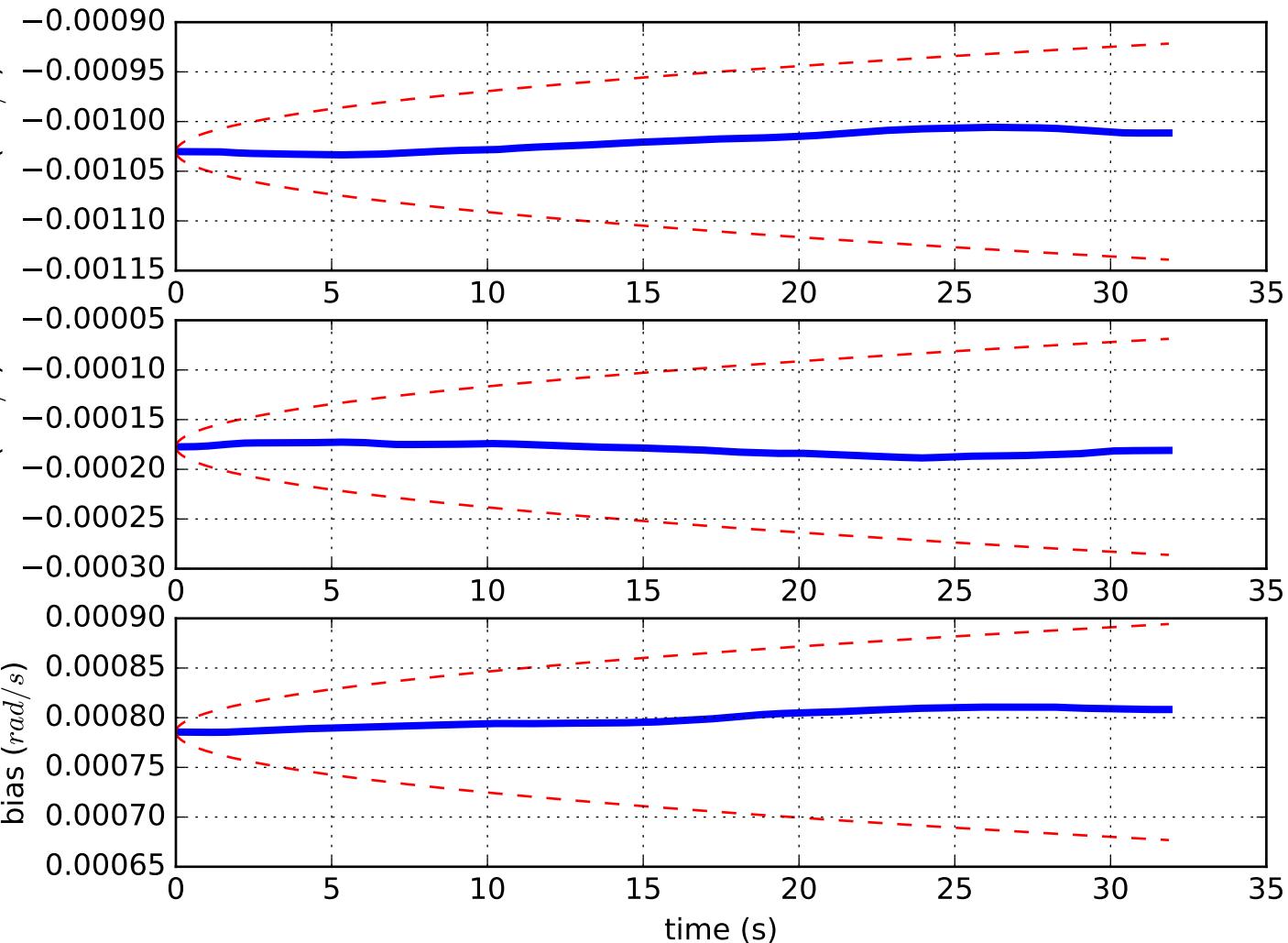
Comparison of predicted and measured angular velocities (body frame)



# imu0: angular velocities error



# imu0: estimated gyro bias (imu frame)



cam0: reprojection errors

