

## Calibration results

=====

### Normalized Residuals

Reprojection error (cam0): mean 0.415417243143, median 0.308160263243, std: 0.366059682995  
Gyroscope error (imu0): mean 0.356050598364, median 0.196189835589, std: 0.418745920836  
Accelerometer error (imu0): mean 0.520959614219, median 0.443092948609, std: 0.335985579051

### Residuals

Reprojection error (cam0) [px]: mean 0.415417243143, median 0.308160263243, std: 0.366059682995  
Gyroscope error (imu0) [rad/s]: mean 0.000304661330856, median 0.00016787348957, std: 0.000358307  
Accelerometer error (imu0) [m/s<sup>2</sup>]: mean 0.0120305844316, median 0.0102323999477, std: 0.007758956

### Transformation (cam0):

#### T\_ci: (imu0 to cam0):

```
[[ -0.00805101 -0.99995402 -0.00520985  0.00862262]
 [ -0.99996409  0.00803709  0.00268737  0.03494746]
 [ -0.00264538  0.0052313  -0.99998282 -0.00309492]
 [  0.          0.          0.          1.          ]]
```

#### T\_ic: (cam0 to imu0):

```
[[ -0.00805101 -0.99996409 -0.00264538  0.03500744]
 [ -0.99995402  0.00803709  0.0052313  0.00835754]
 [ -0.00520985  0.00268737 -0.99998282 -0.00314387]
 [  0.          0.          0.          1.          ]]
```

timeshift cam0 to imu0: [s] (t\_imu = t\_cam + shift)  
0.00730417650054

Gravity vector in target coords: [m/s<sup>2</sup>]  
[ 0.0300861 -9.80606521 -0.0927512 ]

Calibration configuration

-----  
Camera model: pinhole  
Focal length: [512.1268330516533, 511.53701227774224]  
Principal point: [316.509524920082, 241.36710135094637]  
Distortion model: radtan  
Distortion coefficients: [0.05896353430176743, -0.07305775642387477, -0.0019191716545278968, -0.0019191716545278968, -0.0019191716545278968, -0.0019191716545278968]  
Type: aprilgrid  
Tags:  
 Rows: 6  
 Cols: 6  
 Size: 0.088 [m]  
 Spacing 0.0264 [m]

#### IMU configuration

=====

#### IMU0:

-----  
Model: scale-misalignment  
Update rate: 100.0  
Accelerometer:  
 Noise density: 0.00230931229663  
 Noise density (discrete): 0.0230931229663  
 Random walk: 9.75428032827e-05  
Gyroscope:  
 Noise density: 8.55668638828e-05  
 Noise density (discrete): 0.000855668638828  
 Random walk: 1.70244307891e-06

#### 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]

Gyroscope:

[-0.00086663 0.00152188 0.99386254]]

A [(rad/s)/(m/s<sup>2</sup>):

[[ -0.00000241 -0.00022861 0.00028943]

[ 0.00048329 -0.00000569 0.00002149]

[ 0.00002668 -0.00003956 0.00004518]]

C\_gyro\_i:

[[ 0.99996315 -0.00618085 -0.00595795]

[ 0.00622493 0.99995317 0.00740951]

[ 0.00591188 -0.00744632 0.9999548 ]]

Accelerometer:

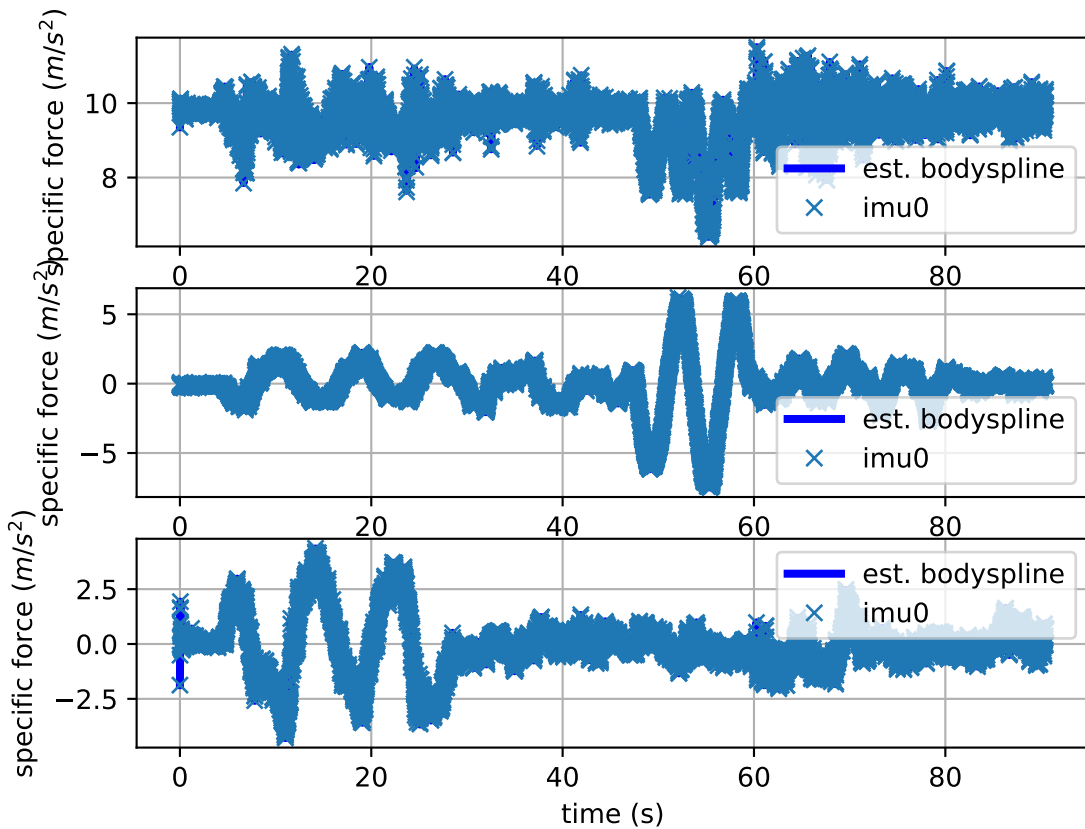
M:

[[ 1.0012172 0. 0. ]]

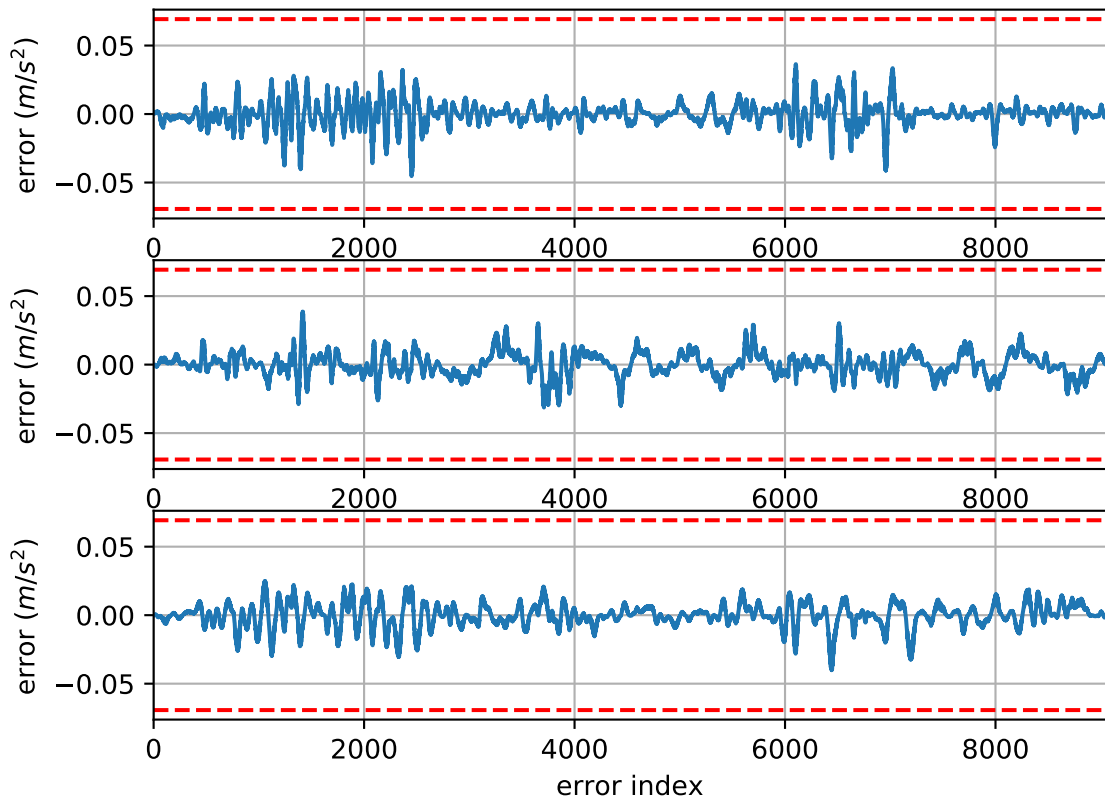
[ 0.00054192 1.00162878 0. ]]

[ 0.00176049 -0.00245979 0.99617053]]

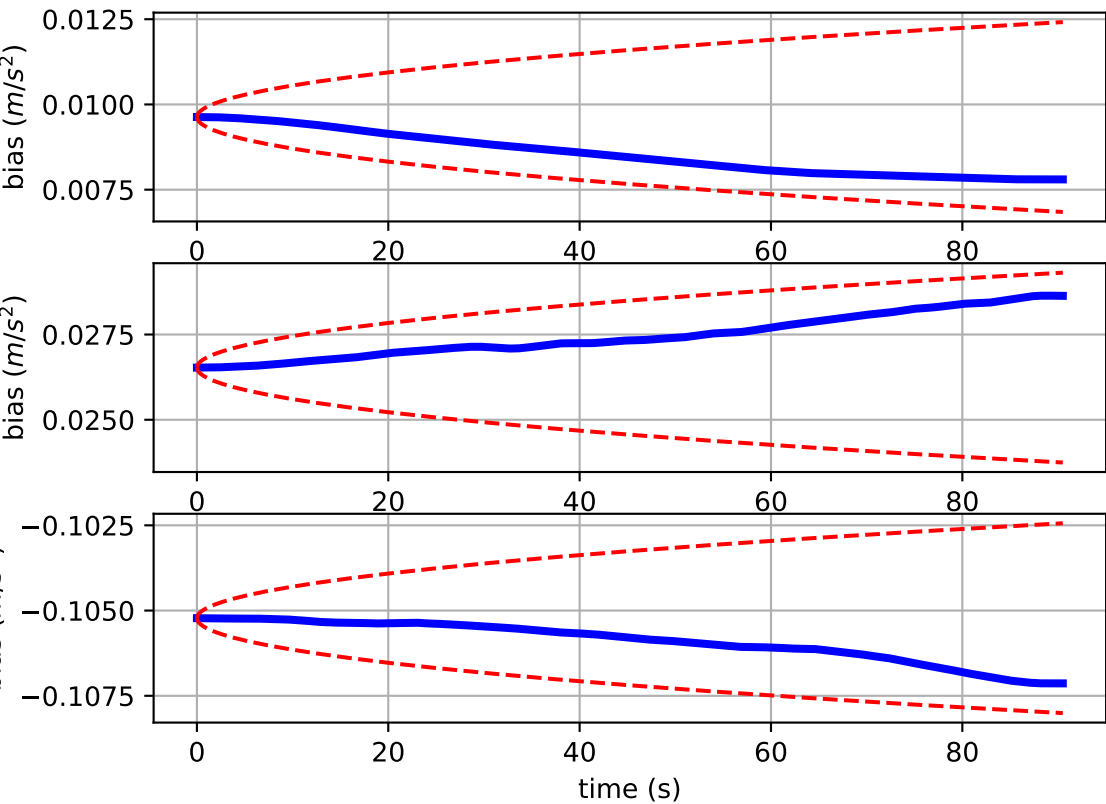
# Comparison of predicted and measured specific force (imu0 frame)



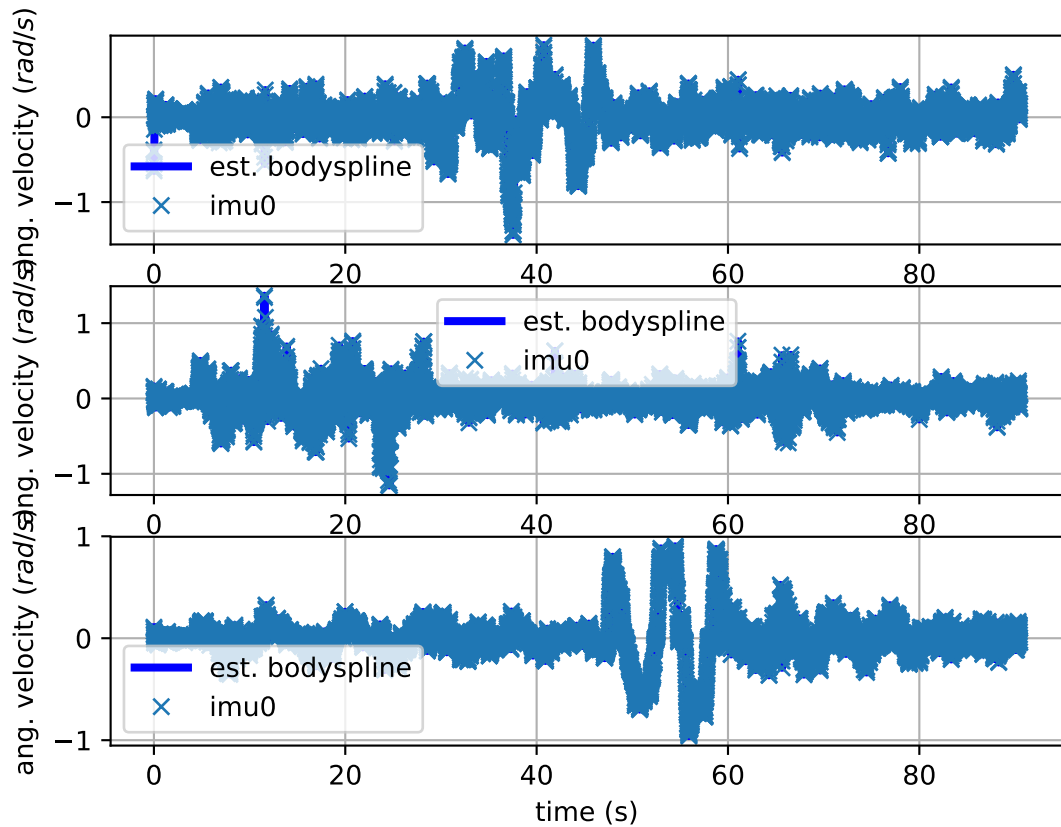
# imu0: acceleration error



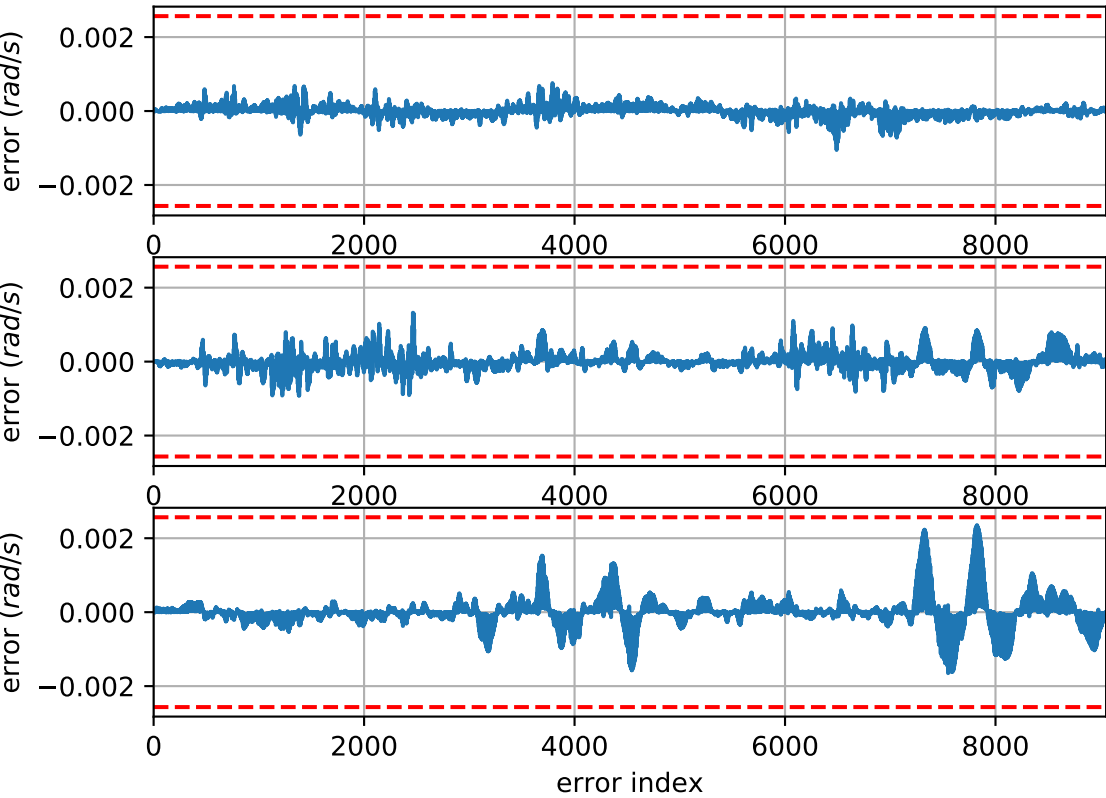
imu0: estimated accelerometer bias (imu frame)



# Comparison of predicted and measured angular velocities (body frame)

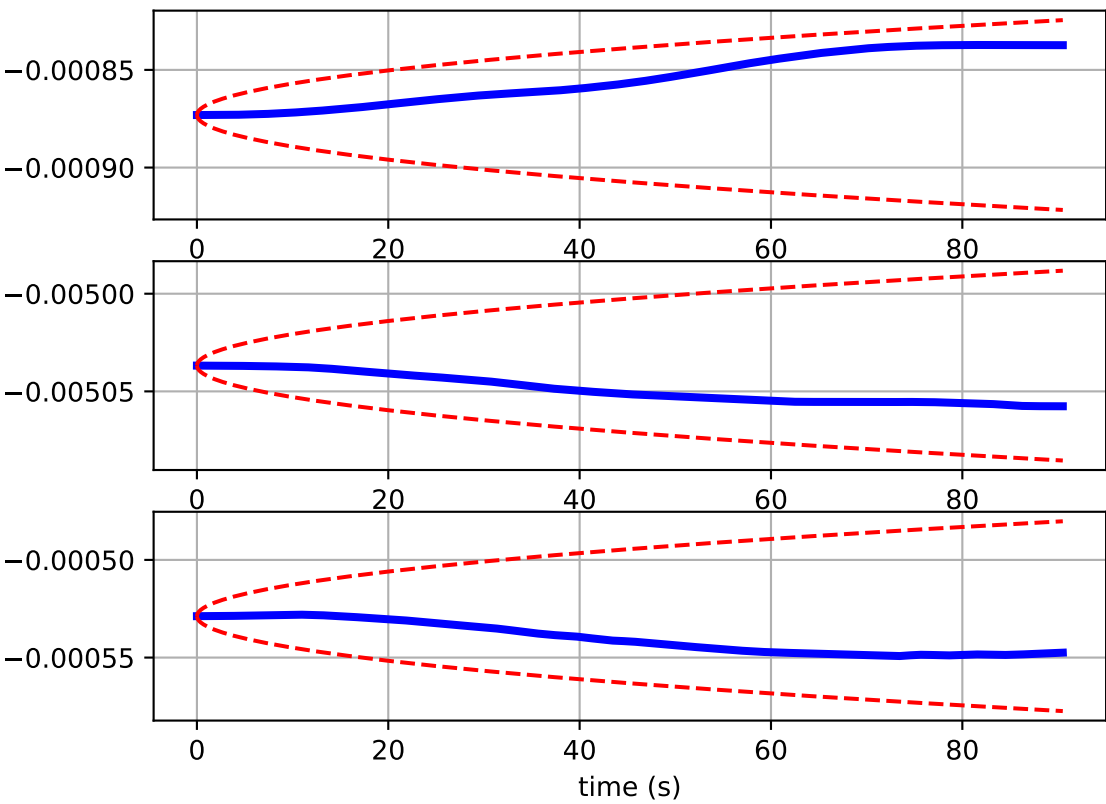


imu0: angular velocities error





imu0: estimated gyro bias (imu frame)



cam0: reprojection errors

