Calibration results
==========
Normalized Residuals

Reprojection error (cam0):   mean 0.283711282251, median 0.217126491034, std: 0.259883116162
Gyroscope error (imu0):   mean 1.49905289154, median 1.2350474613, std: 1.73552878651
Accelerometer error (imu0):   mean 0.583929529255, median 0.470103473039, std: 0.469526906656

Residuals

Reprojection error (cam0) [px]:   mean 0.283711282251, median 0.217126491034, std: 0.259883116162
Gyroscope error (imu0) [rad/s]:   mean 0.00423996185985, median 0.00349324173988, std: 0.00490881669554
Accelerometer error (imu0) [m/s^2]: mean 0.0660640847794, median 0.0531861365832, std: 0.0531209055433

Transformation (cam0):

T_ci: (imu0 to cam0):
[[-0.00300079 -0.00525584 0.99998169 0.02218949]
 [-0.00309401 -0.99998135 -0.00526513 -0.00832195]
 [0.99999071 -0.00310976 0.00298447 -0.03439643]
 [0.   0.   0.   1.   ]]

T_ic: (cam0 to imu0):
[[-0.00300079 -0.00309401 0.99999071 0.03443695]
 [-0.00525584 -0.99998135 -0.00310976 -0.00831214]
 [0.99998169 -0.00526513 0.00298447 -0.02213025]
 [0.   0.   0.   1.   ]]

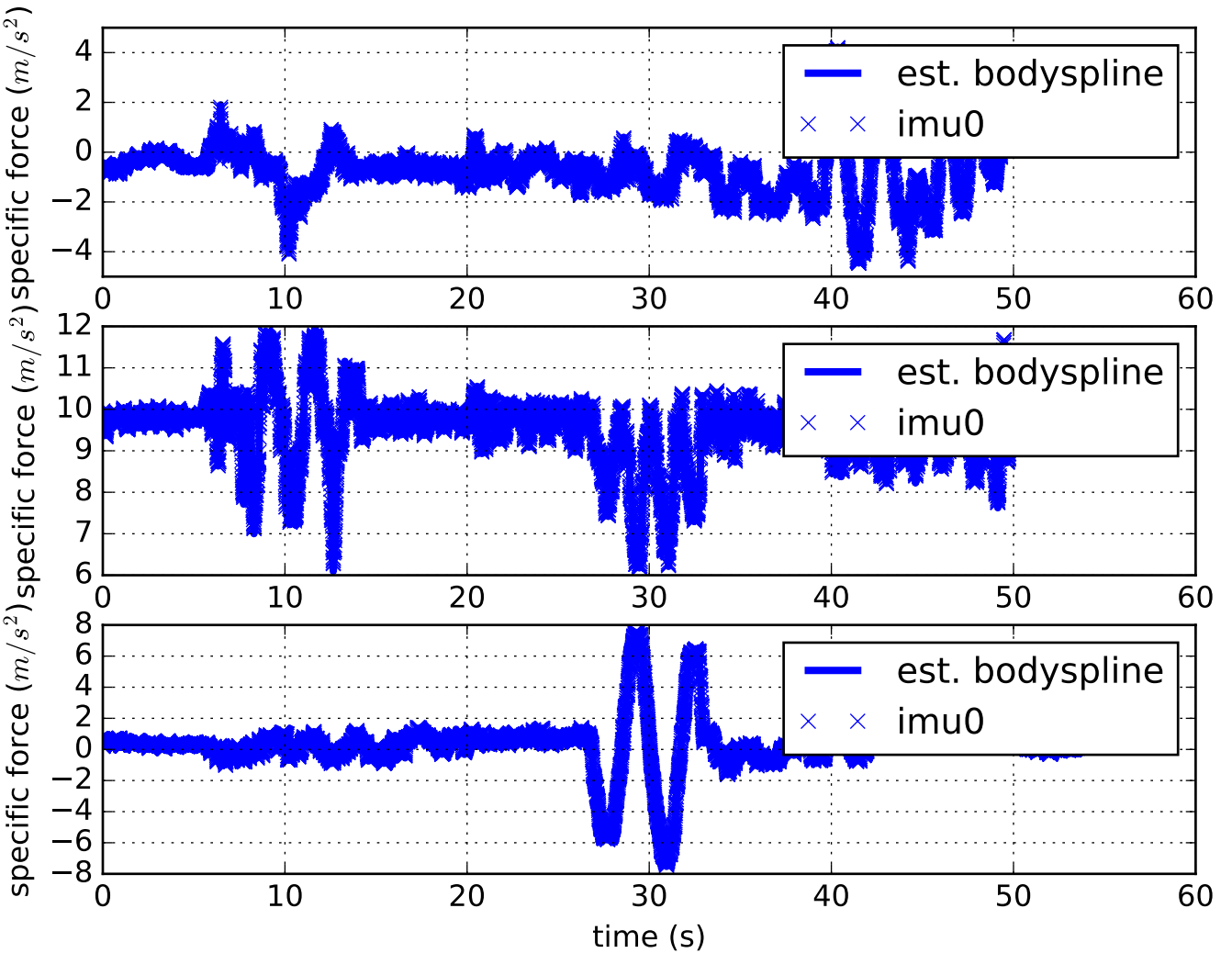
timeshift cam0 to imu0: [s] (t_imu = t_cam + shift)
-0.00025963125189613125

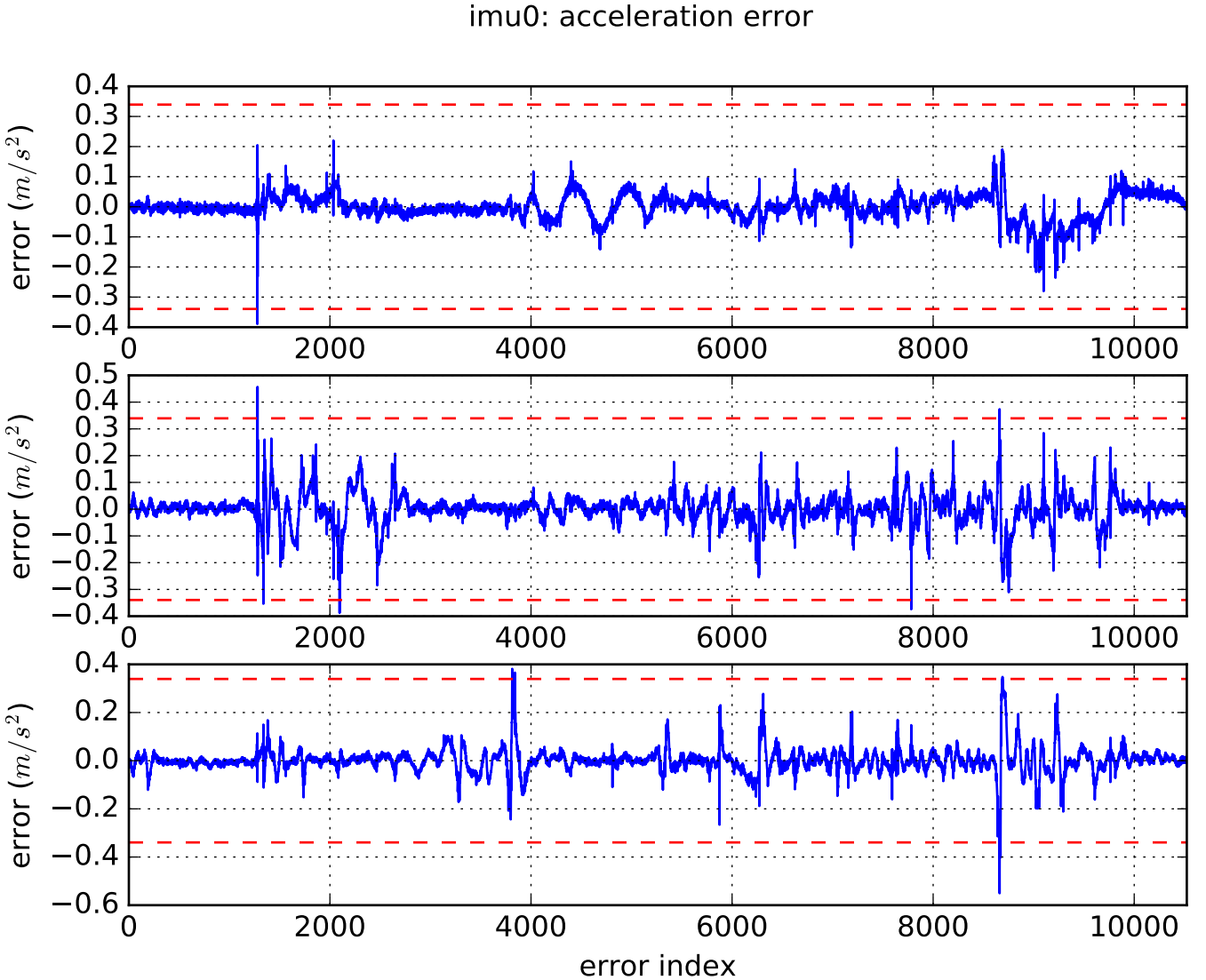
Gravity vector in target coords: [m/s^2]
[0.03041738 -9.77099203 -0.83379396]

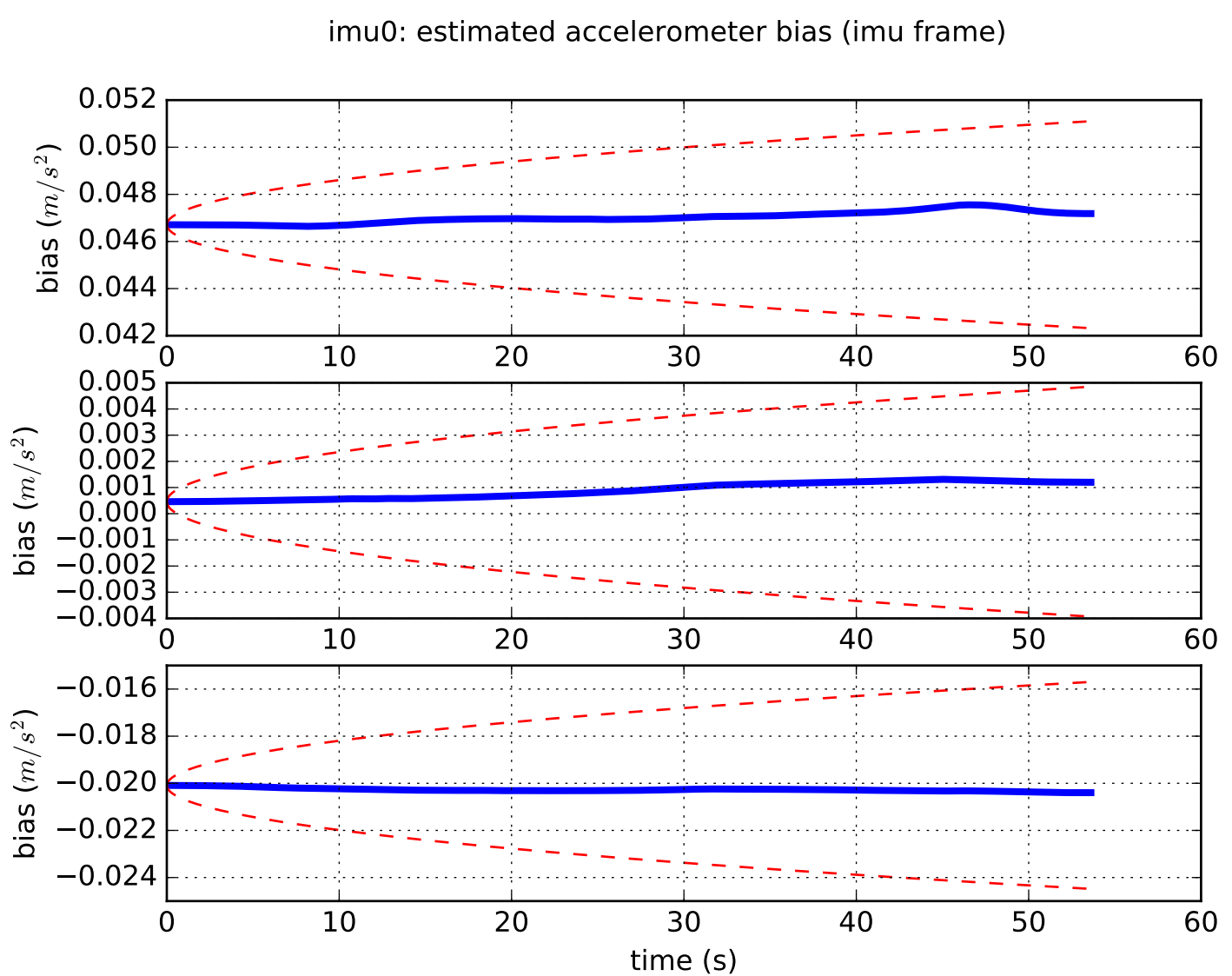
Calibration configuration
==========

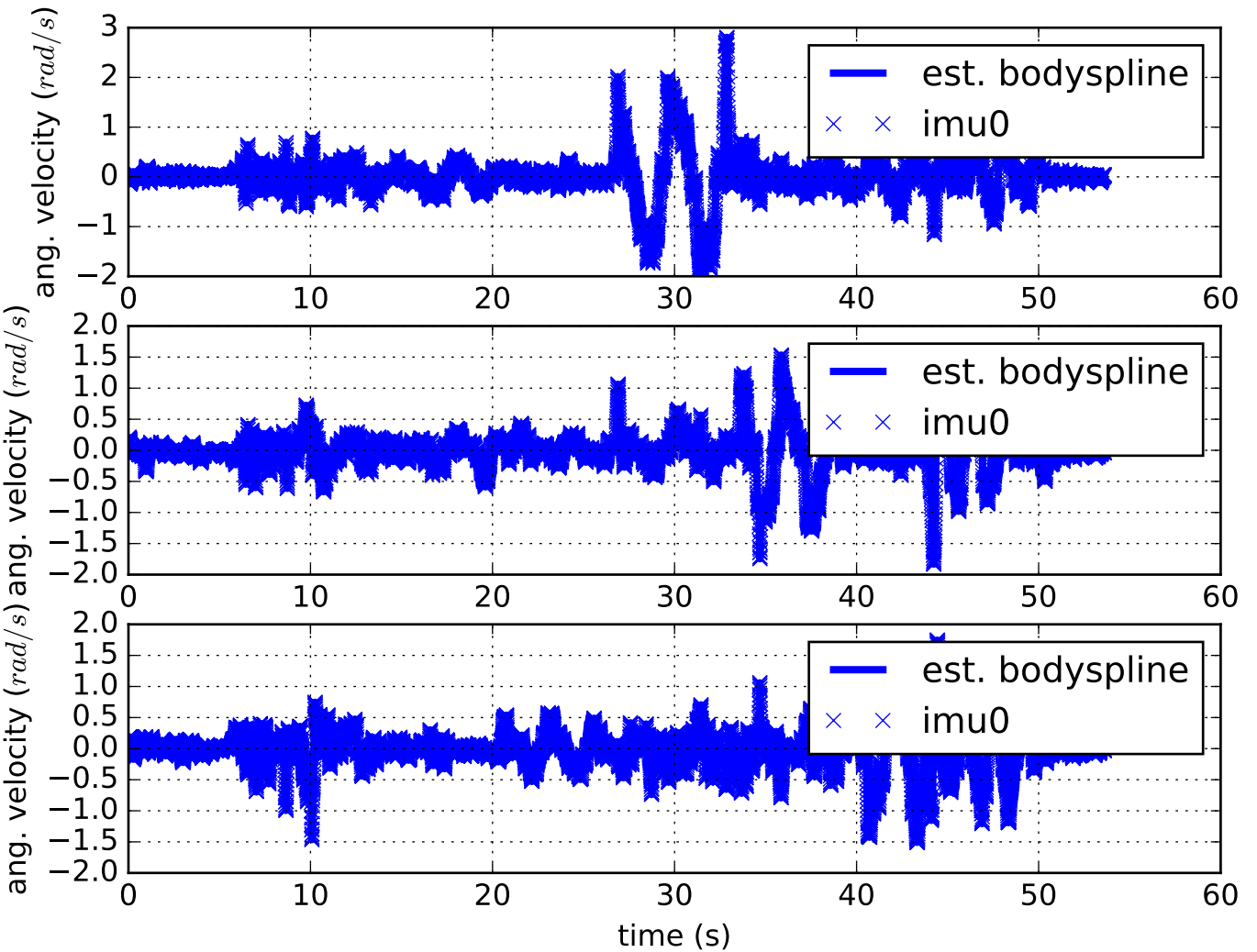
cam0

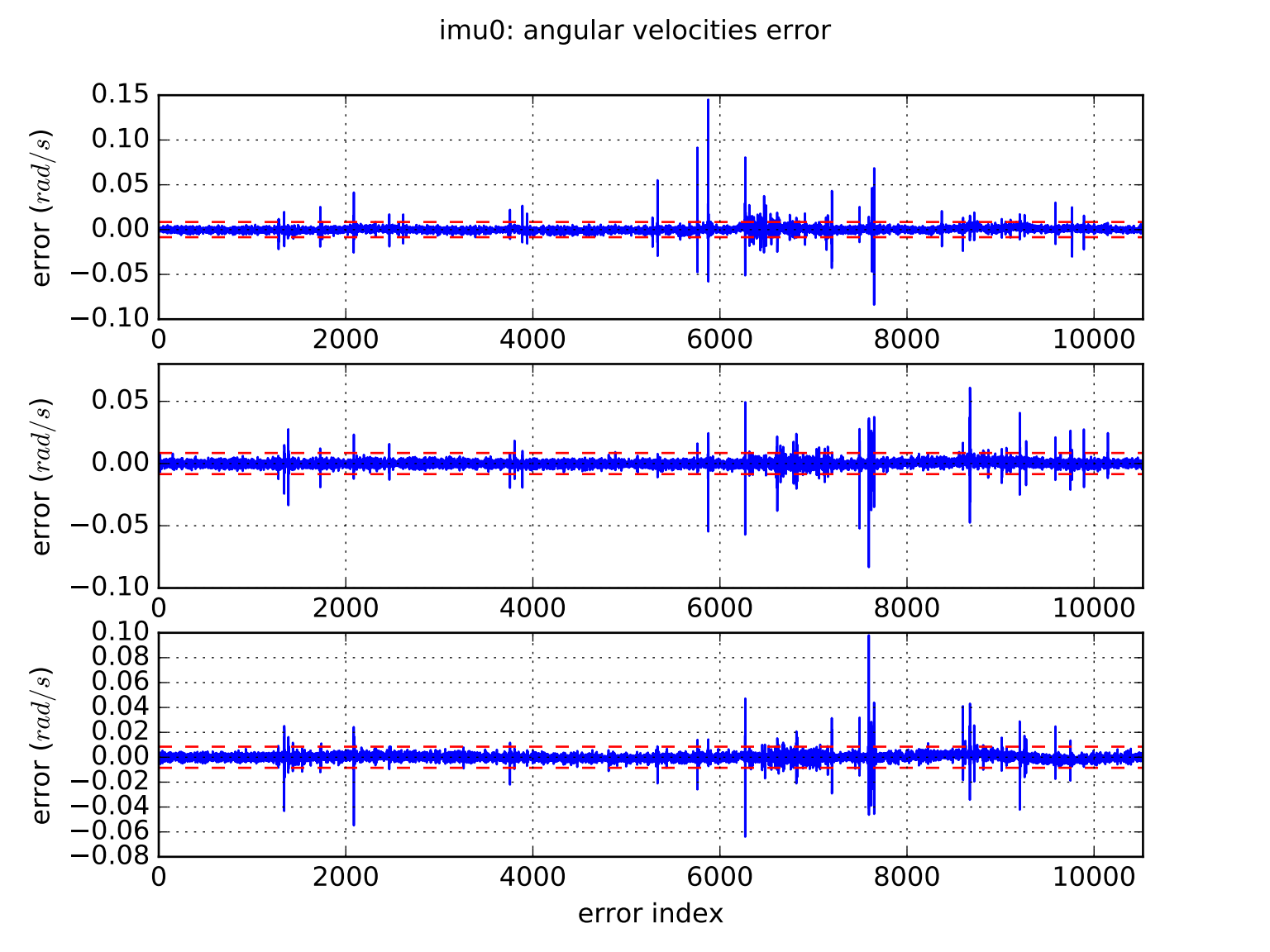
```
-----
  Camera model: pinhole
  Focal length: [306.2289138632509, 306.23142661593863]
  Principal point: [358.1670383963926, 279.7492693707437]
  Distortion model: equidistant
  Distortion coefficients: [0.02412803828081601, 0.00038973037641540435, 0.005484431467327144, -0.00043717843426692394]
  Type: aprilgrid
  Tags:
    Rows: 6
    Cols: 6
    Size: 0.088 [m]
    Spacing 0.0264 [m]



IMU configuration
==================

IMU0:
----------------------------
  Model: calibrated
  Update rate: 200.0
  Accelerometer:
    Noise density: 0.008
    Noise density (discrete): 0.11313708499
    Random walk: 0.0002
  Gyroscope:
    Noise density: 0.0002
    Noise density (discrete): 0.00282842712475
    Random walk: 4e-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]
```

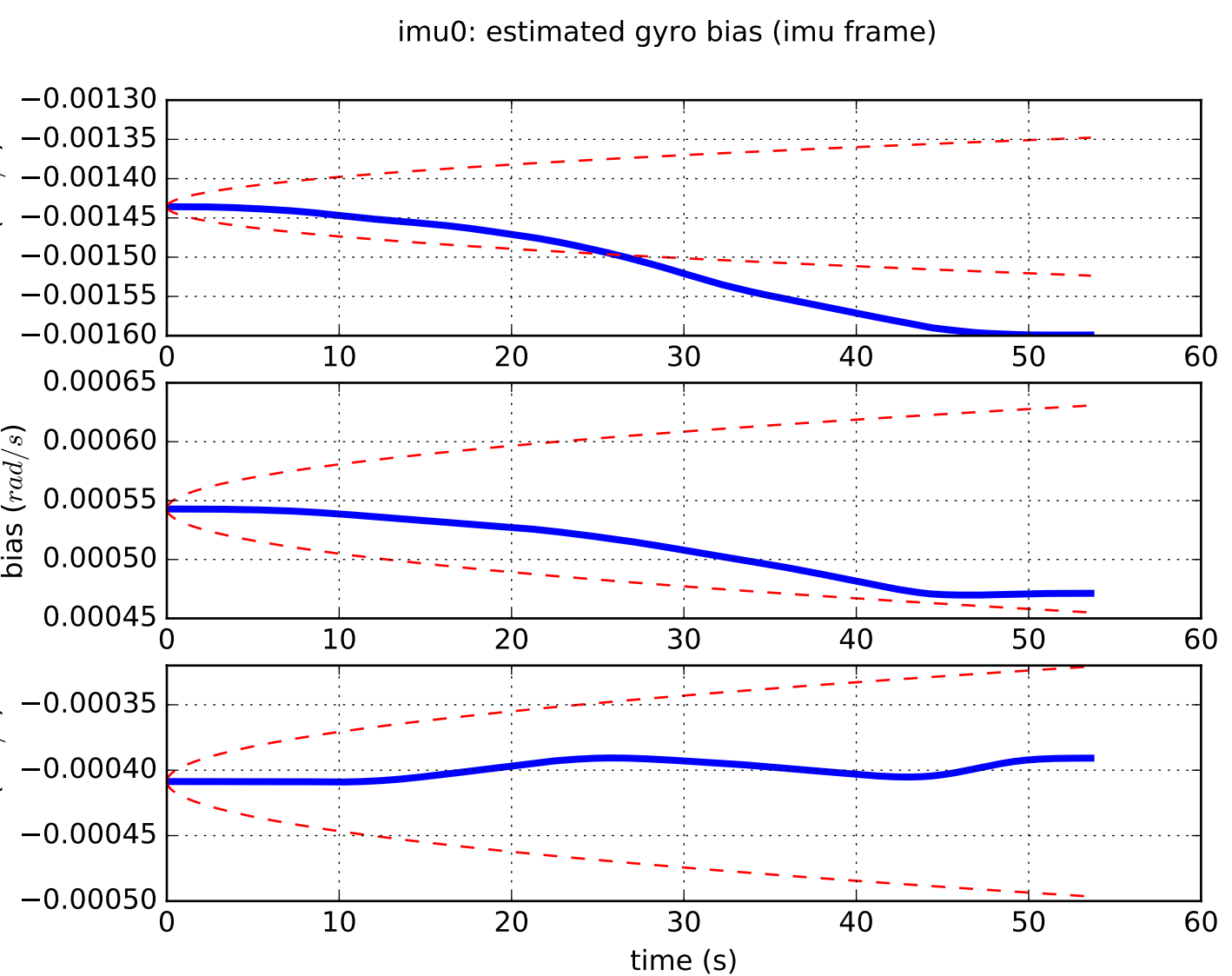

Comparison of predicted and measured specific force (imu0 frame)
specific force (m/s^2)
est. bodyspline
imu0
time (s)

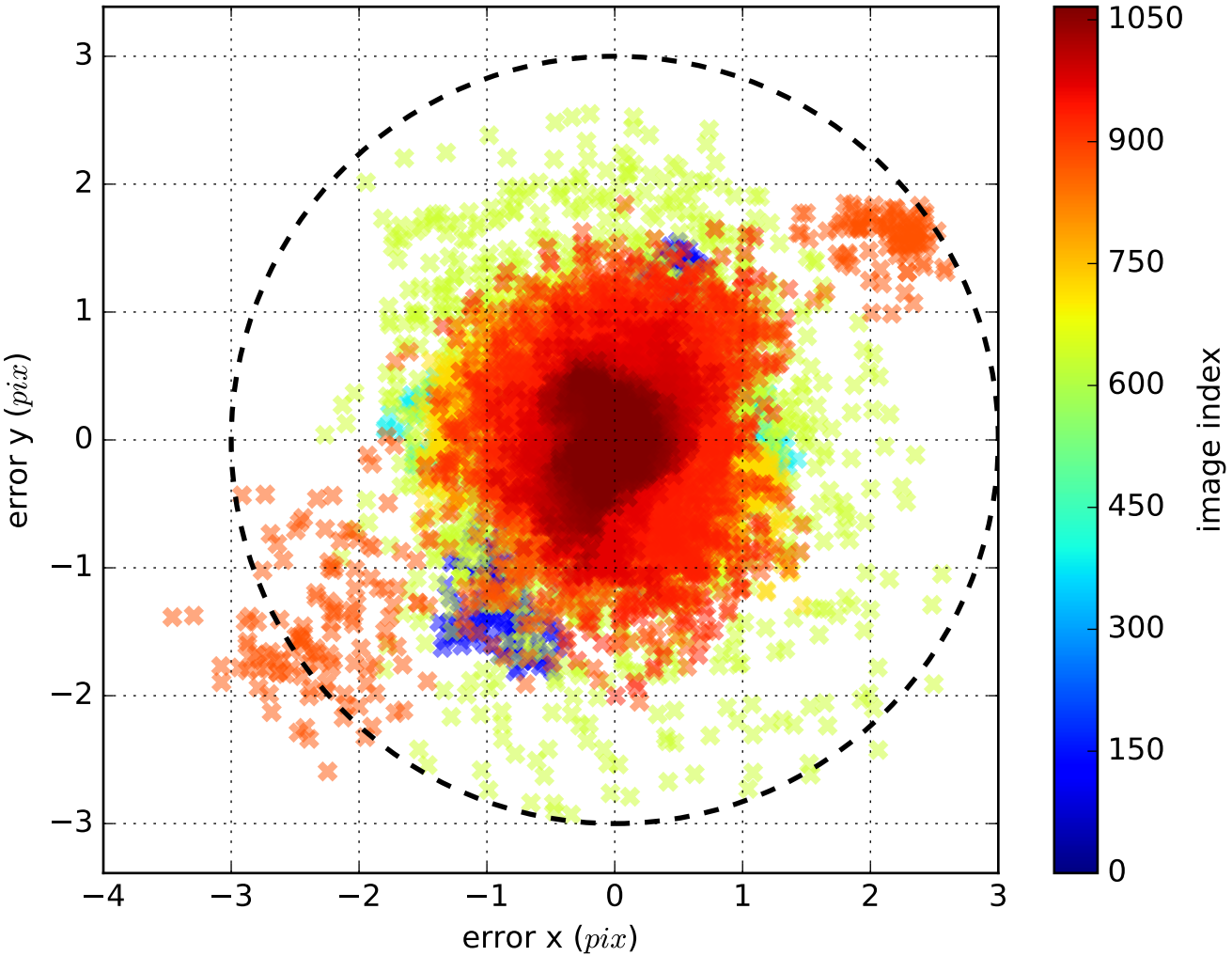

imu0: acceleration error
error (m/s^2)
error (m/s^2)
error (m/s^2)
error index
0
2000
4000
6000
8000
10000


imu0: estimated accelerometer bias (imu frame)
bias (m/s^2)
0.052
0.050
0.048
0.046
0.044
0.042
0
10
20
30
40
50
60
bias (m/s^2)
0.005
0.004
0.003
0.002
0.001
0.000
−0.001
−0.002
−0.003
−0.004
bias (m/s^2)
−0.016
−0.018
−0.020
−0.022
−0.024
time (s)


Comparison of predicted and measured angular velocities (body frame)
ang. velocity (rad/s)
ang. velocity (rad/s)
ang. velocity (rad/s)
est. bodyspline
imu0
est. bodyspline
imu0
est. bodyspline
imu0
time (s)


imu0: angular velocities error
error (rad/s)
0.15
0.10
0.05
0.00
−0.05
−0.10
0
2000
4000
6000
8000
10000
error (rad/s)
0.05
0.00
−0.05
−0.10
0
2000
4000
6000
8000
10000
error (rad/s)
0.10
0.08
0.06
0.04
0.02
0.00
−0.02
−0.04
−0.06
−0.08
0
2000
4000
6000
8000
10000
error index


imu0: estimated gyro bias (imu frame)
−0.00130
−0.00135
−0.00140
−0.00145
−0.00150
−0.00155
−0.00160
0.00065
0.00060
0.00055
0.00050
0.00045
−0.00035
−0.00040
−0.00045
−0.00050
0
10
20
30
40
50
60
bias (rad/s)
time (s)


cam0: reprojection errors
error x (pix)
error y (pix)
image index
1050
900
750
600
450
300
150
0
−4
−3
−2
−1
0
1
2
3