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

Reprojection error (cam0):   mean 0.232150836017, median 0.208991617955, std: 0.134318815037
Gyroscope error (imu0):   mean 0.139171780986, median 0.114271492755, std: 0.0991372149904
Accelerometer error (imu0):   mean 0.283276067765, median 0.25673665825, std: 0.172956876027

Residuals

Reprojection error (cam0) [px]:   mean 0.232150836017, median 0.208991617955, std: 0.134318815037
Gyroscope error (imu0) [rad/s]:   mean 0.00984093100849, median 0.00808021474235, std: 0.00701005969877
Accelerometer error (imu0) [m/s^2]: mean 0.0400612856928, median 0.0363080464055, std: 0.0244597959783

Transformation (cam0):

T_ci: (imu0 to cam0):
[[-0.99974437 0.02157998 0.00674564 0.05638892]
 [-0.01994364 -0.70114247 -0.71274223 -0.04521202]
 [-0.01065131 -0.71269457 0.70139362 0.05555302]
 [0.   0.   0.   1.   ]]

T_ic: (cam0 to imu0):
[[-0.99974437 -0.01994364 -0.01065131 0.05606453]
 [0.02157998 -0.70114247 -0.71269457 0.0066754]
 [0.00674564 -0.71274223 0.70139362 -0.07156943]
 [0.   0.   0.   1.   ]]

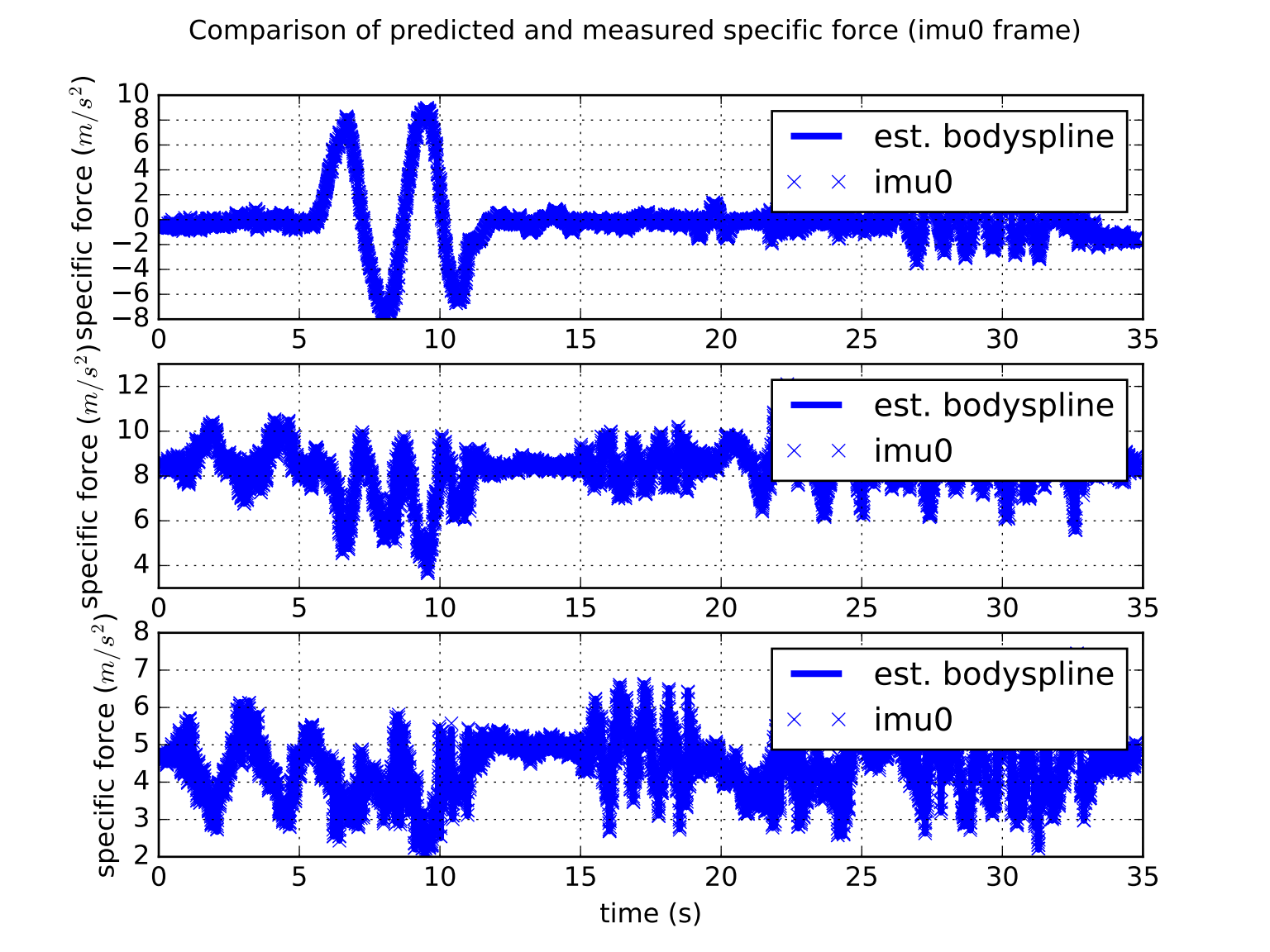
timeshift cam0 to imu0: [s] (t_imu = t_cam + shift)
0.00423513646707

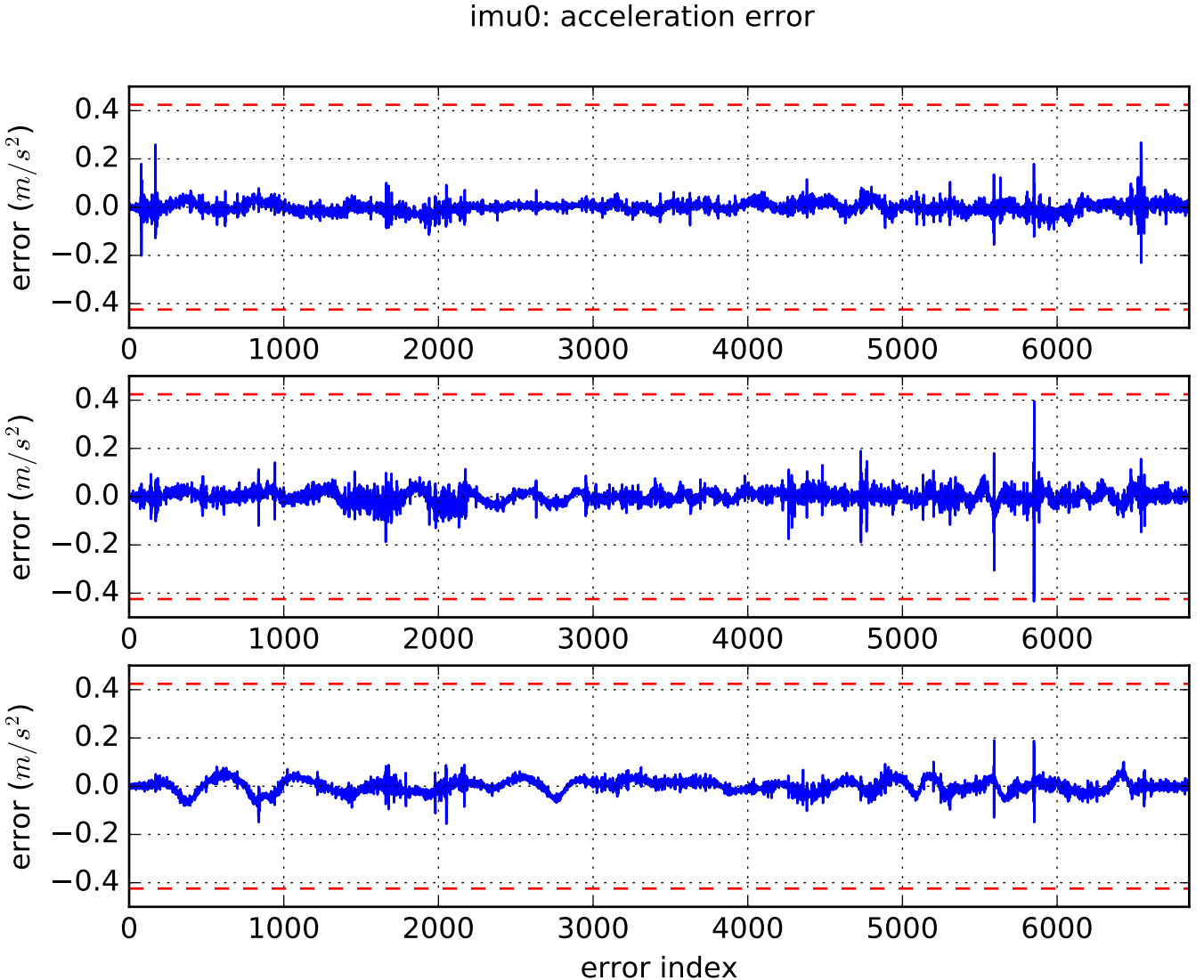
Gravity vector in target coords: [m/s^2]
[-0.11915959 -9.79905678 -0.36429396]

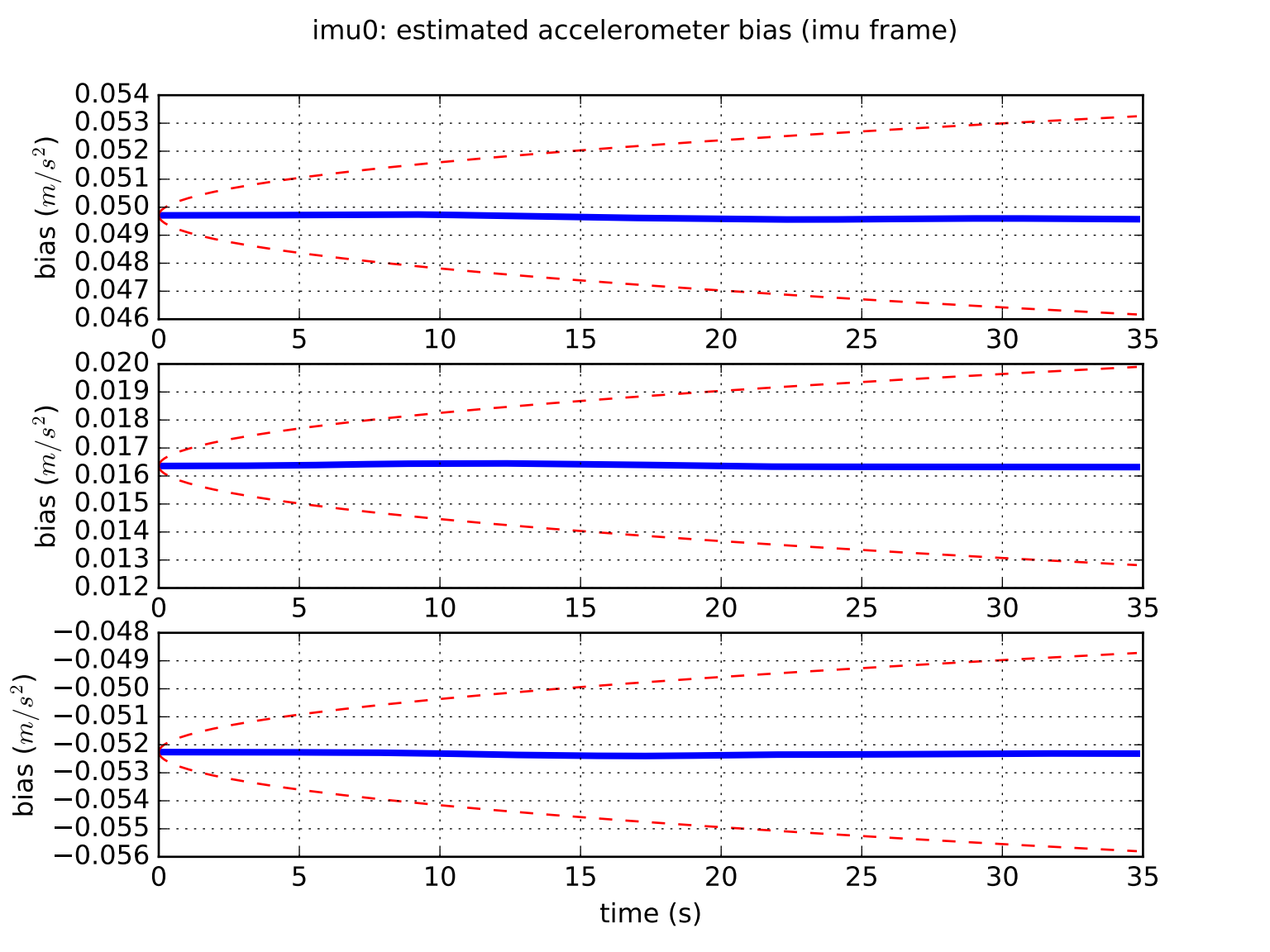
Calibration configuration
==========

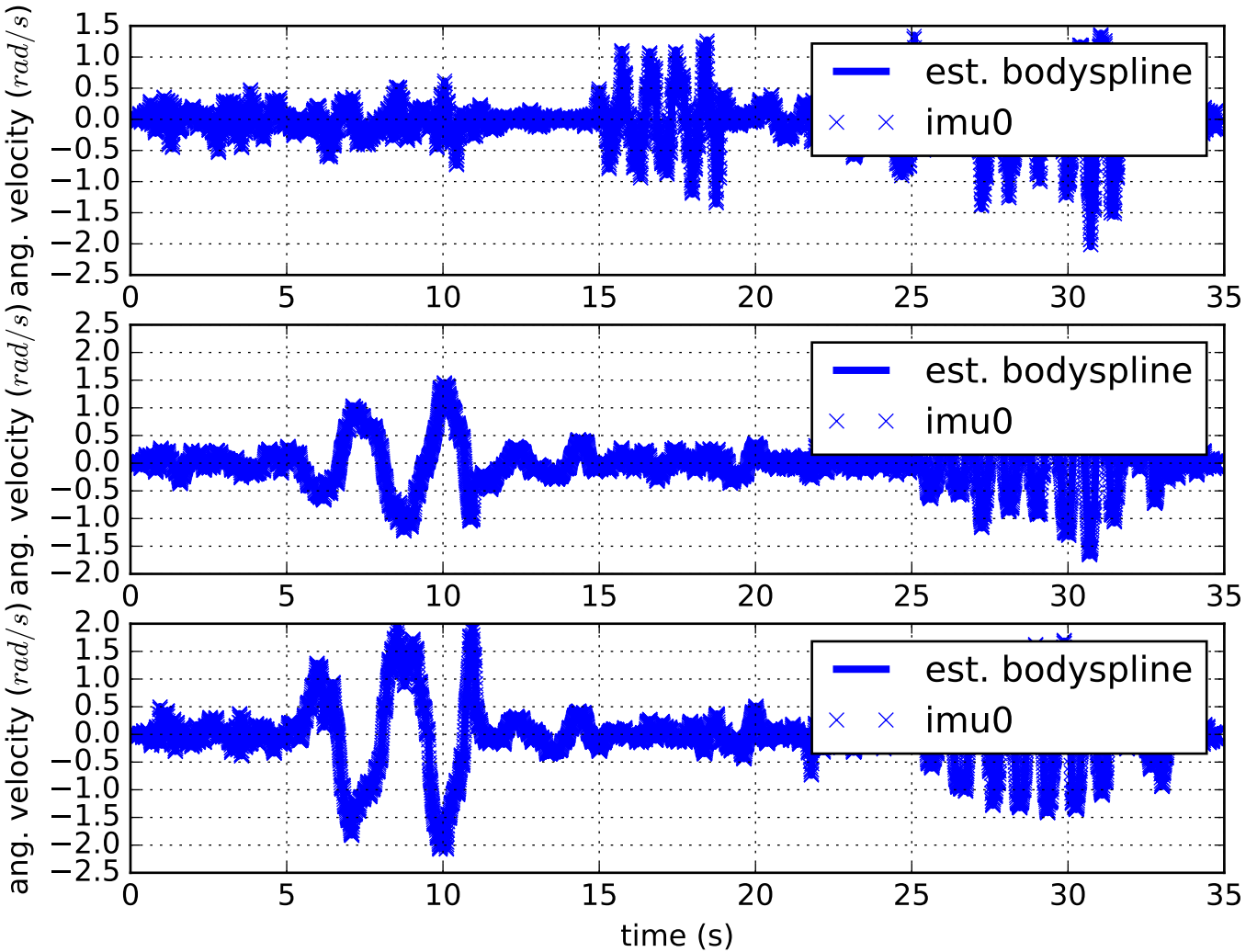
cam0

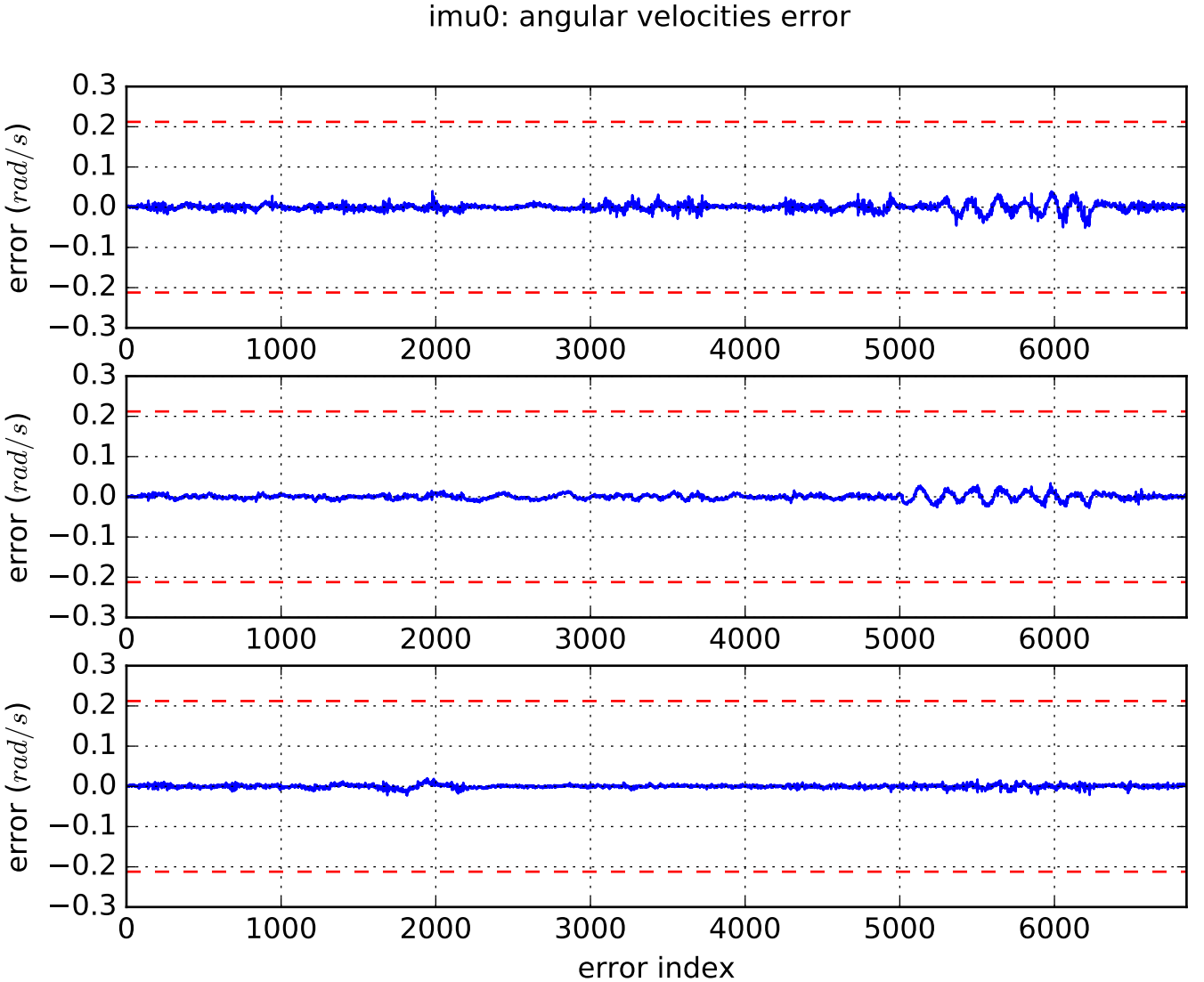
```
---
  Camera model: pinhole
  Focal length: [745.6611364111554, 740.1310157292193]
  Principal point: [389.7047996015777, 244.00818182147964]
  Distortion model: equidistant
  Distortion coefficients: [0.45599854665109363, 1.317363351306019, -11.34359462879492, 23.186742249077955]
  Type: aprilgrid
  Tags:
    Rows: 6
    Cols: 6
    Size: 0.083 [m]
    Spacing 0.0249 [m]



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

IMU0:
----------------------------
  Model: calibrated
  Update rate: 200.0
  Accelerometer:
    Noise density: 0.01
    Noise density (discrete): 0.141421356237
    Random walk: 0.0002
  Gyroscope:
    Noise density: 0.005
    Noise density (discrete): 0.0707106781187
    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]
```

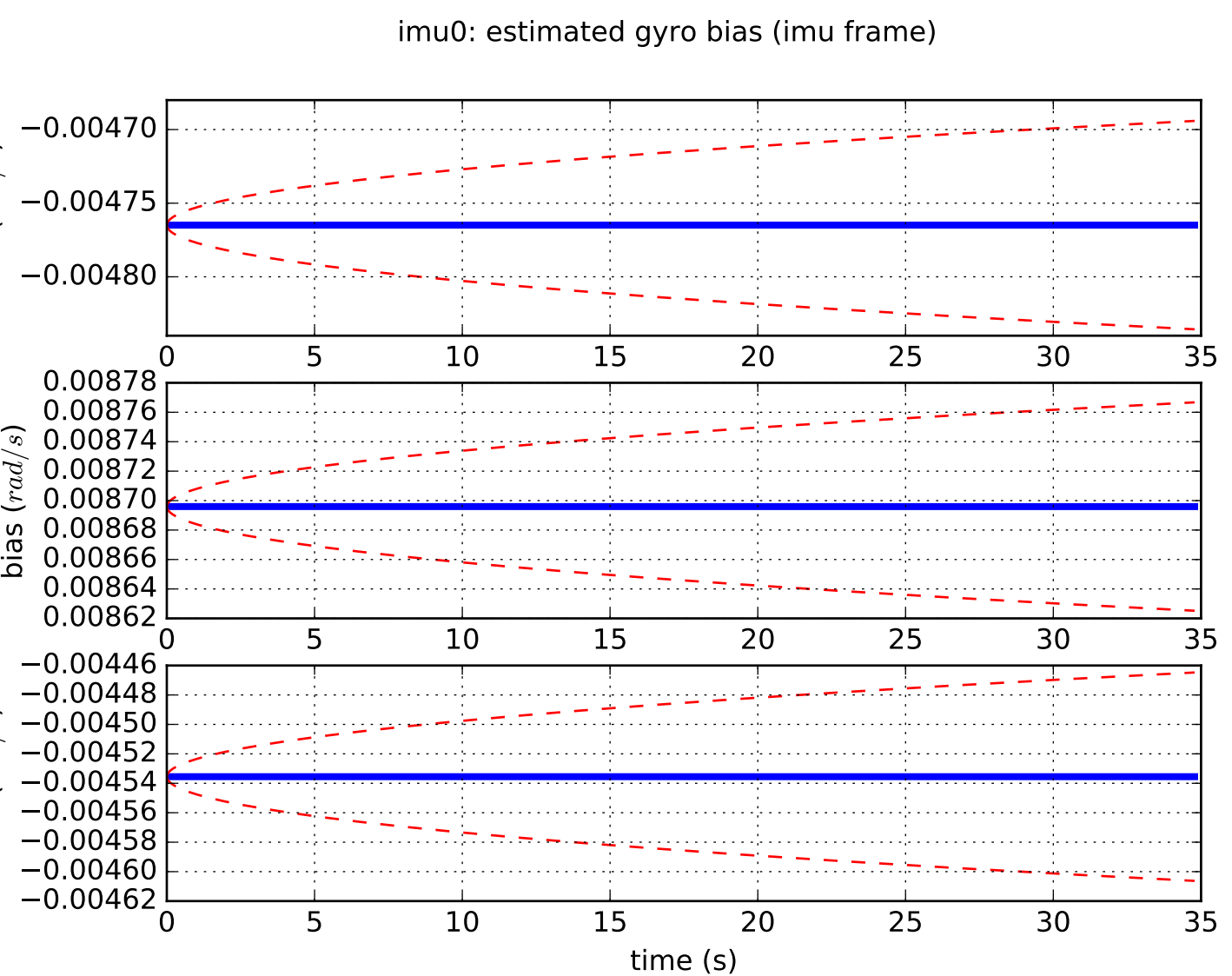

Comparison of predicted and measured specific force (imu0 frame)
specific force (m/s^2)
est. bodyspline
imu0
time (s)

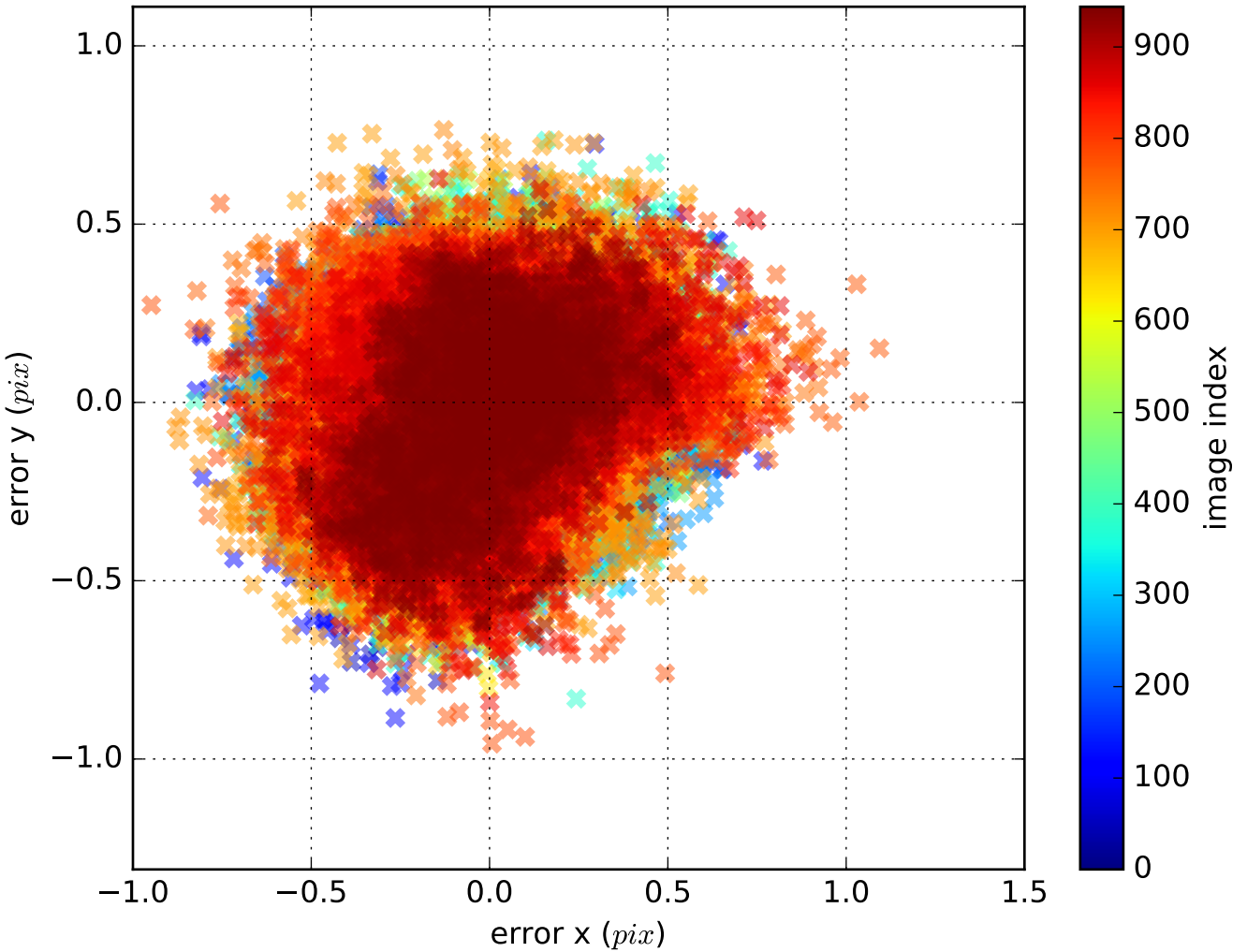

imu0: acceleration error
error (m/s^2)
0.4
0.2
0.0
−0.2
−0.4
0
1000
2000
3000
4000
5000
6000
error index


imu0: estimated accelerometer bias (imu frame)
bias (m/s^2)
0.054
0.053
0.052
0.051
0.050
0.049
0.048
0.047
0.046
0
5
10
15
20
25
30
35
bias (m/s^2)
0.020
0.019
0.018
0.017
0.016
0.015
0.014
0.013
0.012
bias (m/s^2)
−0.048
−0.049
−0.050
−0.051
−0.052
−0.053
−0.054
−0.055
−0.056
time (s)


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


imu0: angular velocities error
error (rad/s)
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
0
1000
2000
3000
4000
5000
6000
error index


imu0: estimated gyro bias (imu frame)
−0.00470
−0.00475
−0.00480
0.00878
0.00876
0.00874
0.00872
0.00870
0.00868
0.00866
0.00864
0.00862
bias (rad/s)
−0.00446
−0.00448
−0.00450
−0.00452
−0.00454
−0.00456
−0.00458
−0.00460
−0.00462
0
5
10
15
20
25
30
35
time (s)


cam0: reprojection errors
1.0
0.5
0.0
−0.5
−1.0
error y (pix)
−1.0
−0.5
0.0
0.5
1.0
1.5
error x (pix)
900
800
700
600
500
400
300
200
100
0
image index