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

Reprojection error (cam0):   mean 4.74686160217, median 4.29214905282, std: 2.57089884879
Gyroscope error (imu0):   mean 0.00120684403291, median 3.385115143e-08, std: 0.0116030837286
Accelerometer error (imu0):   mean 0.000316011793898, median 0.000316395814915, std: 7.08785104245e-06

Residuals

Reprojection error (cam0) [px]:   mean 4.74686160217, median 4.29214905282, std: 2.57089884879
Gyroscope error (imu0) [rad/s]:   mean 2.71007403056e-05, median 7.60157268824e-10, std: 0.000260557412805
Accelerometer error (imu0) [m/s^2]: mean 1.10771851712e-06, median 1.10906462888e-06, std: 2.48450975499e-08

Transformation (cam0):

T_ci: (imu0 to cam0):
[[-0.10462024 0.96766037 -0.22953871 0.00093508]
 [-0.11620117 0.21733038 0.96915674 0.00689422]
 [0.98770031 0.12806608 0.08970611 -0.00407774]
 [0.   0.   0.   1.   ]]

T_ic: (cam0 to imu0):
[[-0.10462024 -0.11620117 0.98770031 0.00492653]
 [0.96766037 0.21733038 0.12806608 -0.00188095]
 [-0.22953871 0.96915674 0.08970611 -0.00610114]
 [0.   0.   0.   1.   ]]

timeshift cam0 to imu0: [s] (t_imu = t_cam + shift)
0.0

Gravity vector in target coords: [m/s^2]
[3.05987926 9.30081977 -0.54800866]

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

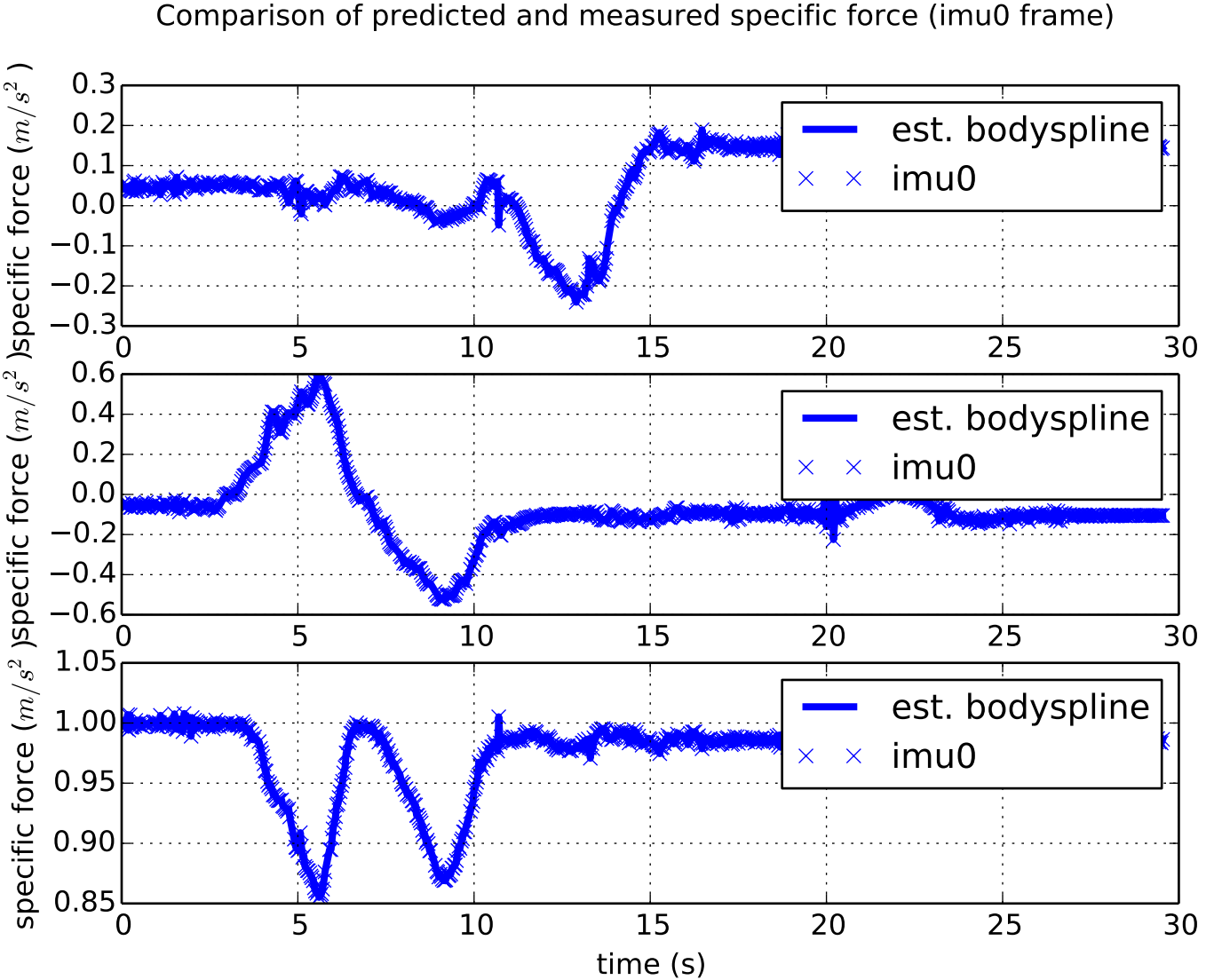
cam0

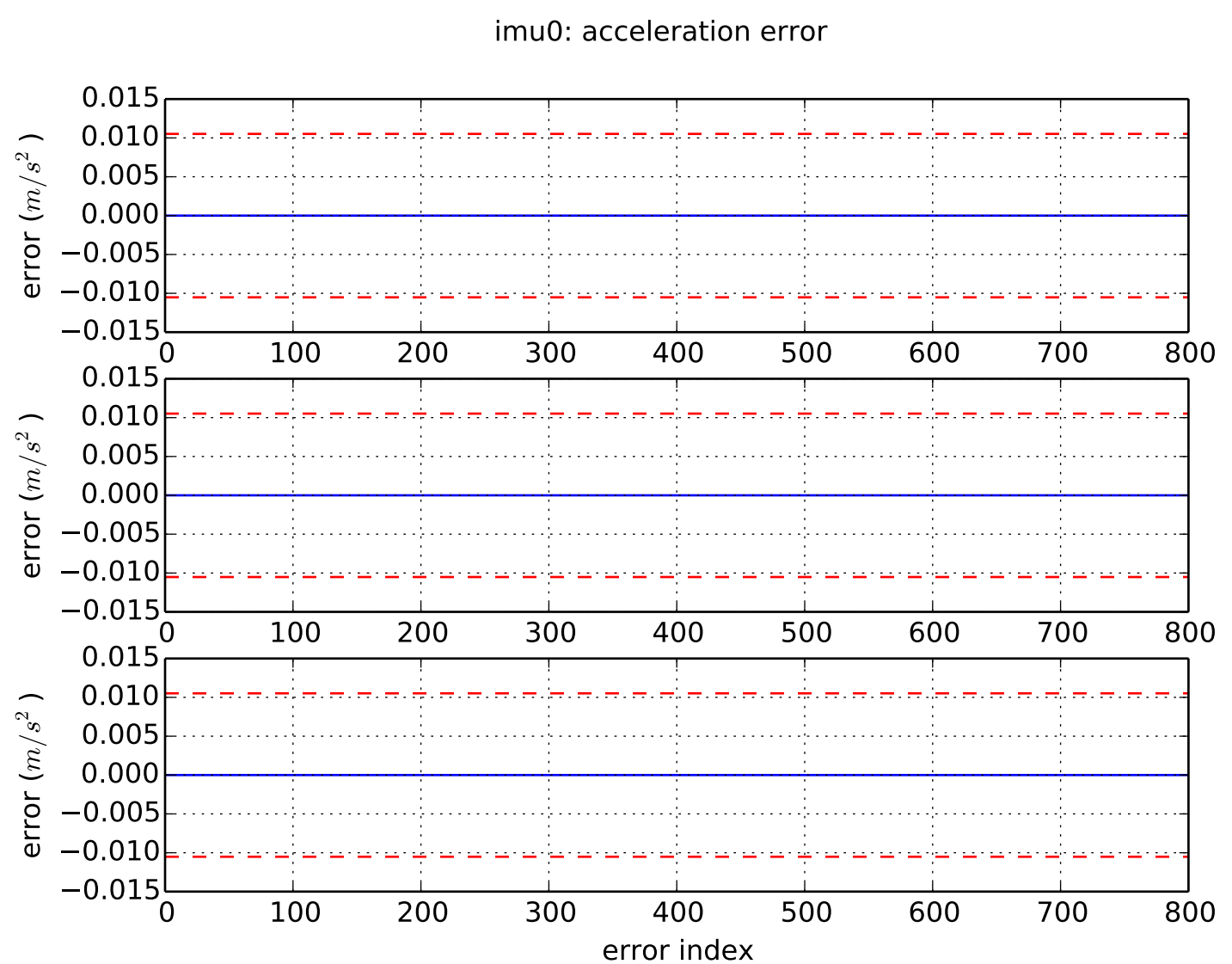
  Camera model: pinhole
  Focal length: [206.6688, 206.9523]
  Principal point: [326.0185, 205.8282]
  Distortion model: equidistant
  Distortion coefficients: [1.2828, 0.0304, 0.0166, -0.0138]
  Type: aprilgrid
  Tags:
    Rows: 6
    Cols: 6
    Size: 0.067 [m]
    Spacing 0.0199995 [m]

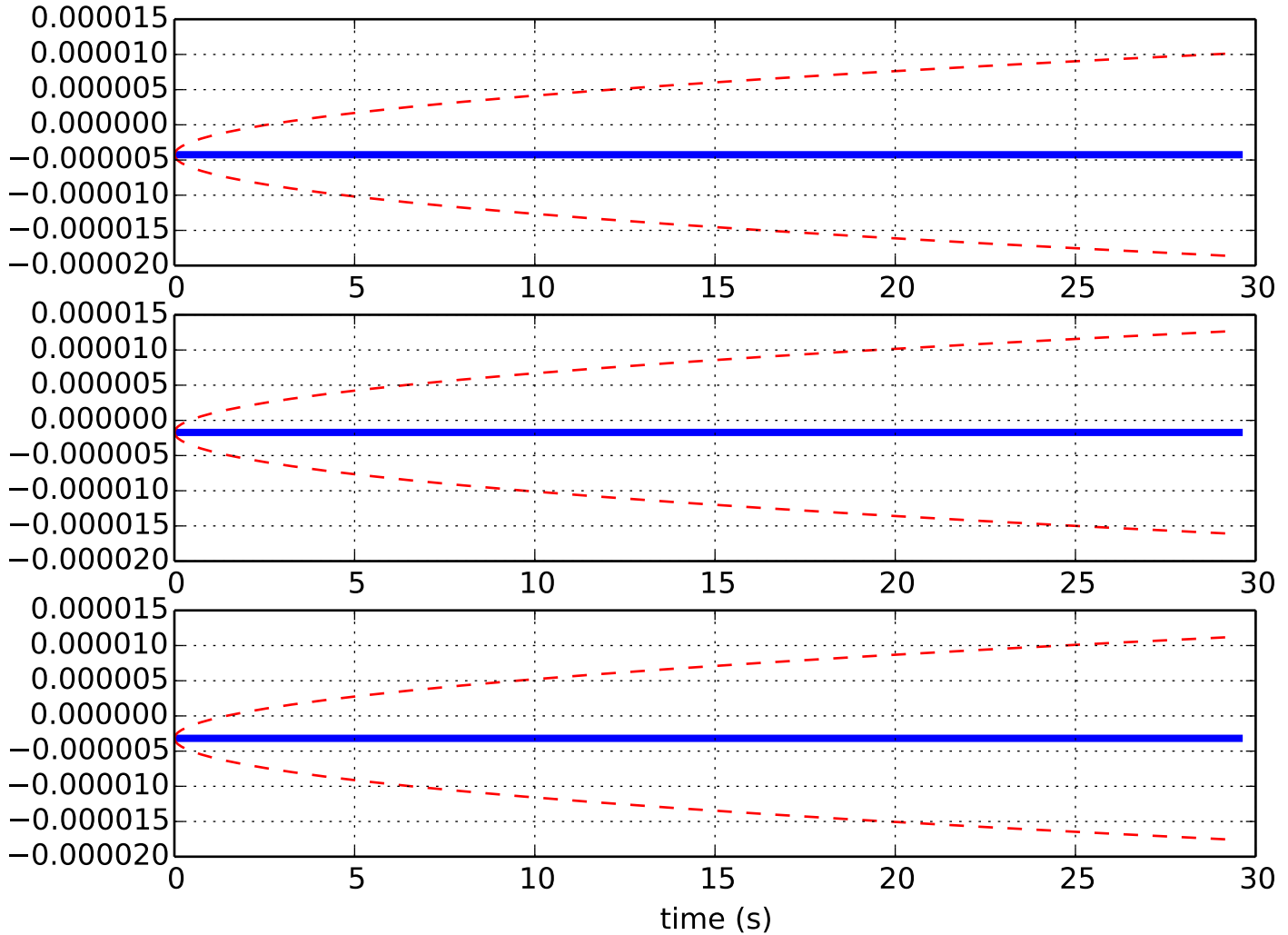
IMU configuration
==========

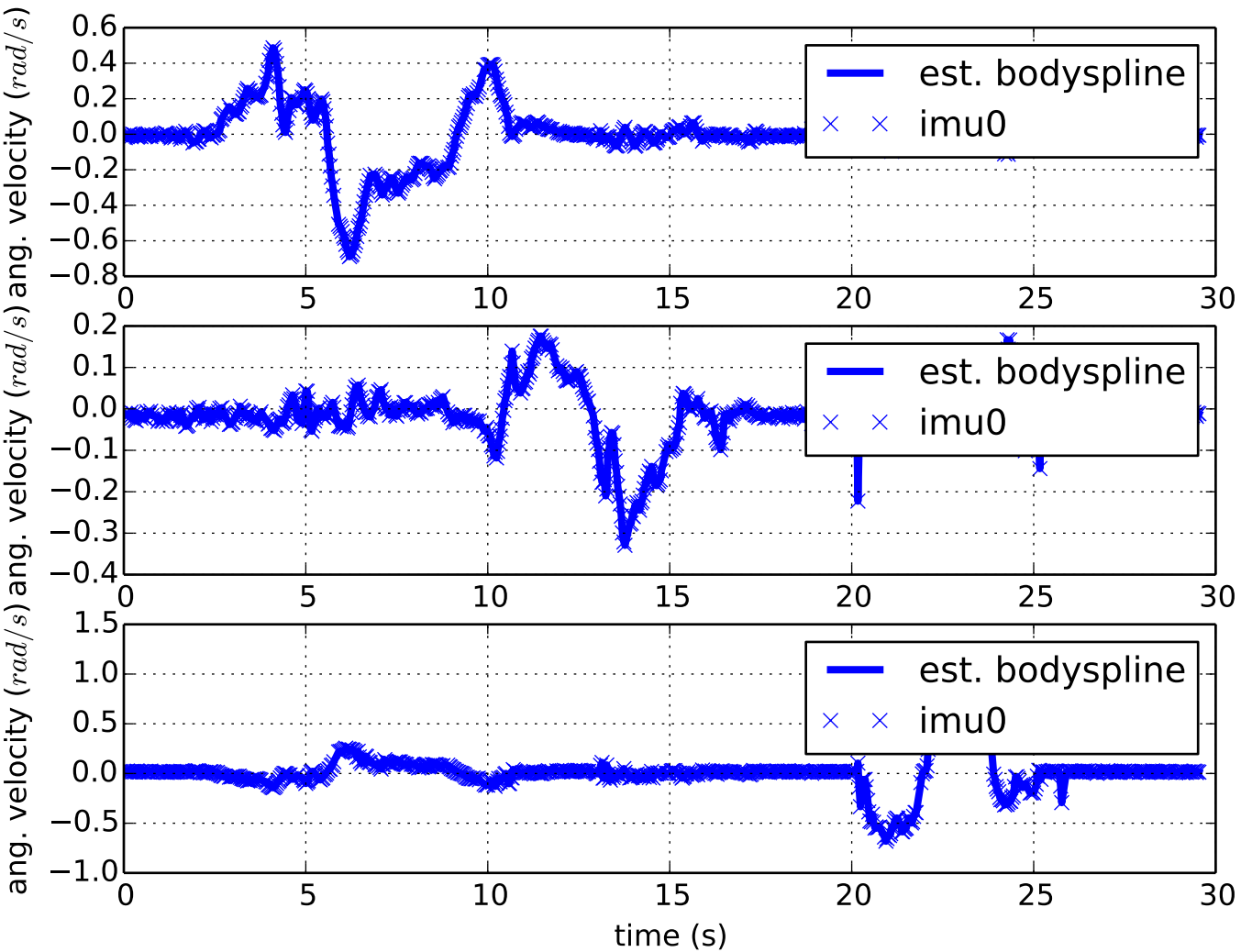
IMU0:

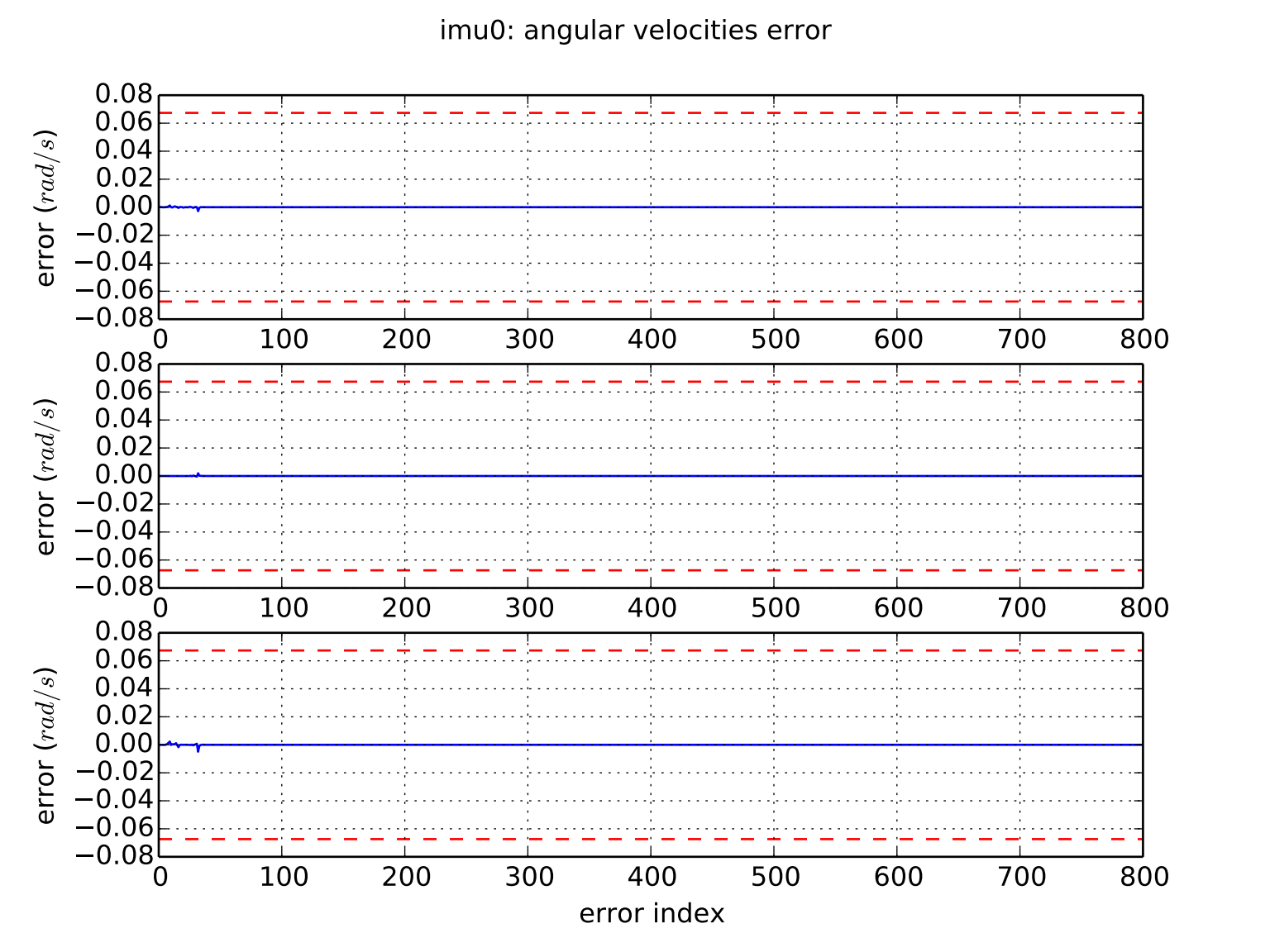
  Model: calibrated
  Update rate: 29.998
  Accelerometer:
    Noise density: 0.00064
    Noise density (discrete): 0.00350530751861
    Random walk: 8.86e-07
  Gyroscope:
    Noise density: 0.0041
    Noise density (discrete): 0.0224558762911
    Random walk: 5.7e-07
  T_i_b
    [[1. 0. 0. 0.]
     [0. 1. 0. 0.]
     [0. 0. 1. 0.]
     [0. 0. 0. 1.]]
  time offset with respect to IMU0: 0.0 [s]

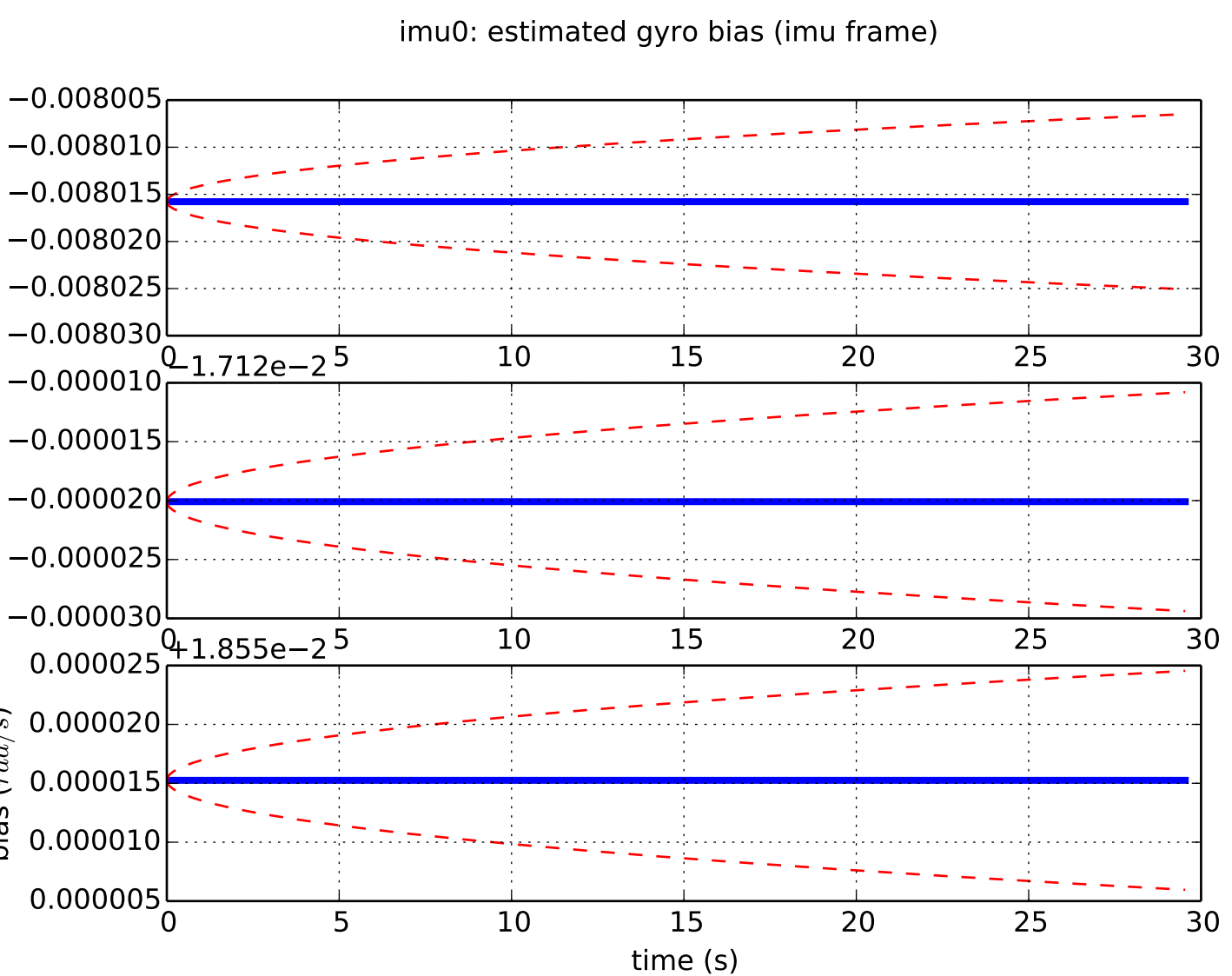

Comparison of predicted and measured specific force (imu0 frame)
specific force (m/s^2)
est. bodyspline
imu0
time (s)

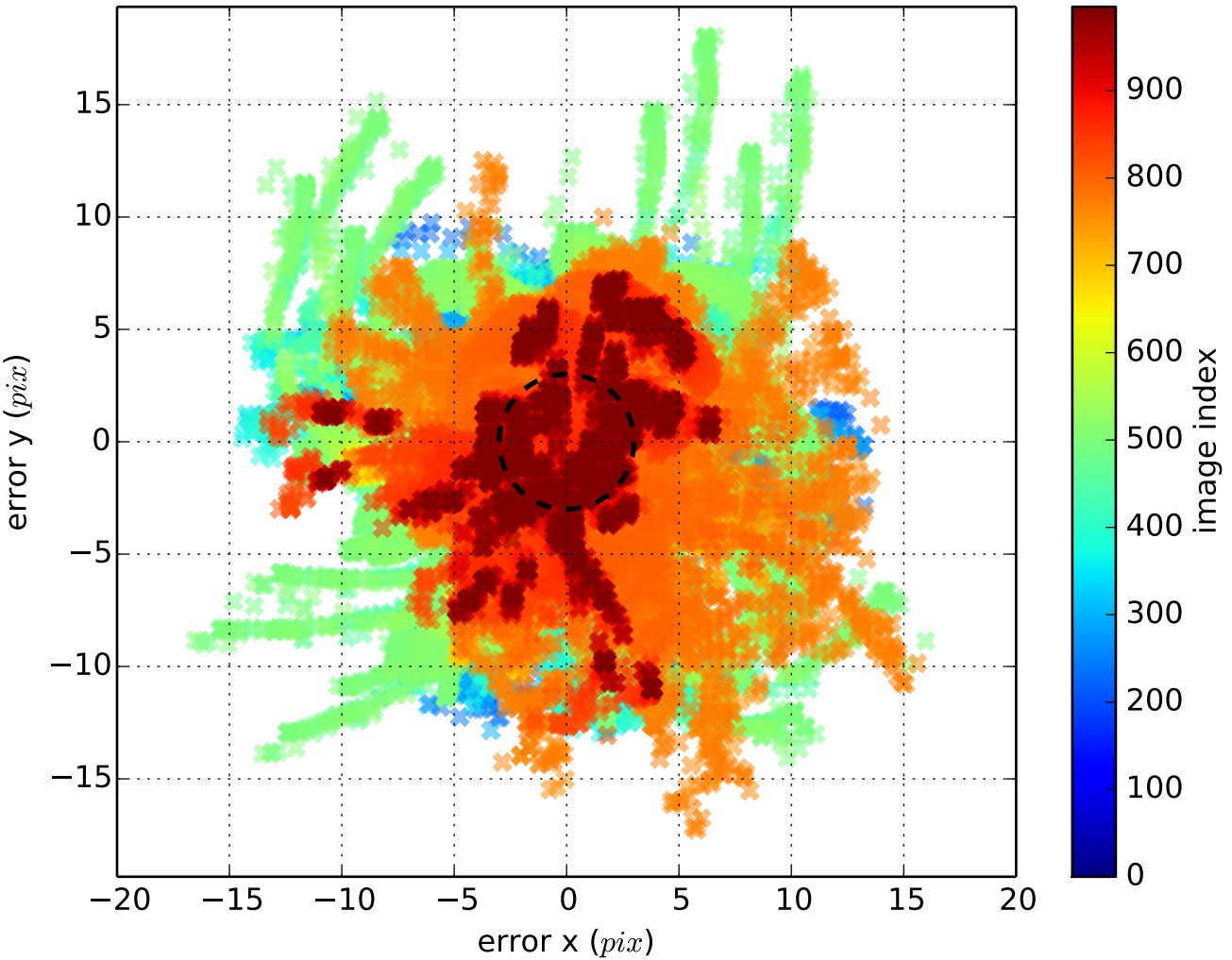

imu0: acceleration error
error (m/s^2)
0.015
0.010
0.005
0.000
−0.005
−0.010
−0.015
0
100
200
300
400
500
600
700
800
error index


imu0: estimated accelerometer bias (imu frame)
0.000015
0.000010
0.000005
0.000000
−0.000005
−0.000010
−0.000015
−0.000020
0
5
10
15
20
25
30
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)
0.08
0.06
0.04
0.02
0.00
−0.02
−0.04
−0.06
−0.08
0
100
200
300
400
500
600
700
800
error index


imu0: estimated gyro bias (imu frame)
−0.008005
−0.008010
−0.008015
−0.008020
−0.008025
−0.008030
0
5
10
15
20
25
30
−1.712e−2
−0.000010
−0.000015
−0.000020
−0.000025
−0.000030
0
5
10
15
20
25
30
+1.855e−2
0.000025
0.000020
0.000015
0.000010
0.000005
0
5
10
15
20
25
30
time (s)


cam0: reprojection errors
error y (pix)
error x (pix)
image index
15
10
5
0
−5
−10
−15
−20
−15
−10
−5
0
5
10
15
20
900
800
700
600
500
400
300
200
100
0