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

Reprojection error (cam0):   mean 0.668370392429, median 0.481367760623, std: 0.772818103027
Gyroscope error (imu0):   mean 2.51397314825, median 0.682521224549, std: 5.16341099429
Accelerometer error (imu0):   mean 0.915574949444, median 0.202355123844, std: 2.07972150085

Residuals

Reprojection error (cam0) [px]:   mean 0.668370392429, median 0.481367760623, std: 0.772818103027
Gyroscope error (imu0) [rad/s]:   mean 0.0904425969464, median 0.0245543561443, std: 0.185758666417
Accelerometer error (imu0) [m/s^2]: mean 0.372315740232, median 0.0822870894071, std: 0.845712358706

Transformation (cam0):

T_ci: (imu0 to cam0):
[[0.28220108 -0.67072201 -0.68592604 -0.13227272]
 [0.92281473 -0.00566706 0.38520237 0.1366922]
 [-0.26225089 -0.74168717 0.6173529   0.33252639]
 [0.   0.   0.   1.   ]]

T_ic: (cam0 to imu0):
[[0.28220108 0.92281473 -0.26225089 -0.00160873]
 [-0.67072201 -0.00566706 -0.74168717 0.15868698]
 [-0.68592604 0.38520237 0.6173529 -0.34866959]
 [0.   0.   0.   1.   ]]

timeshift cam0 to imu0: [s] (t_imu = t_cam + shift)
-0.53817077147

Gravity vector in target coords: [m/s^2]
[3.65328241 7.85910384 4.58872939]

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

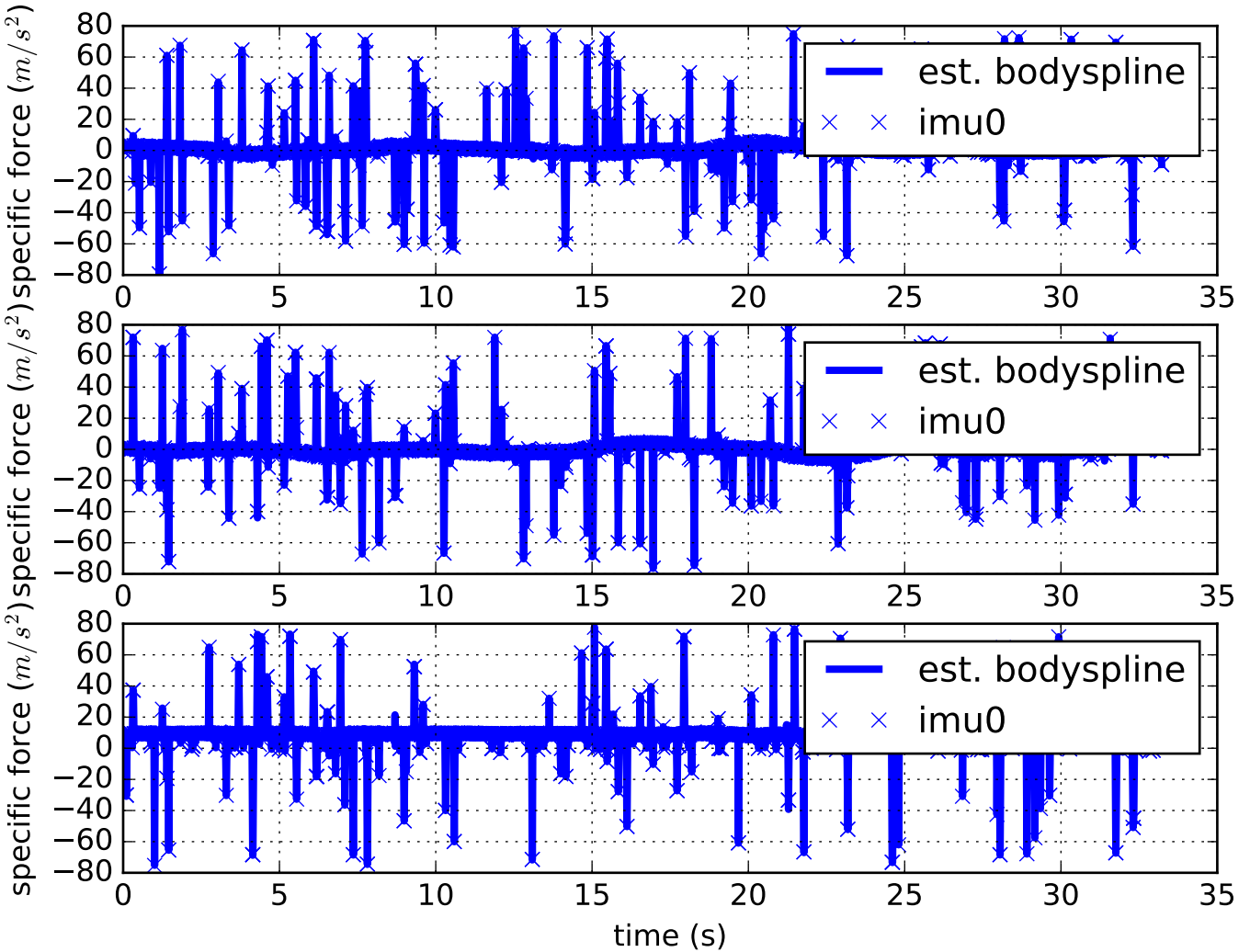
cam0

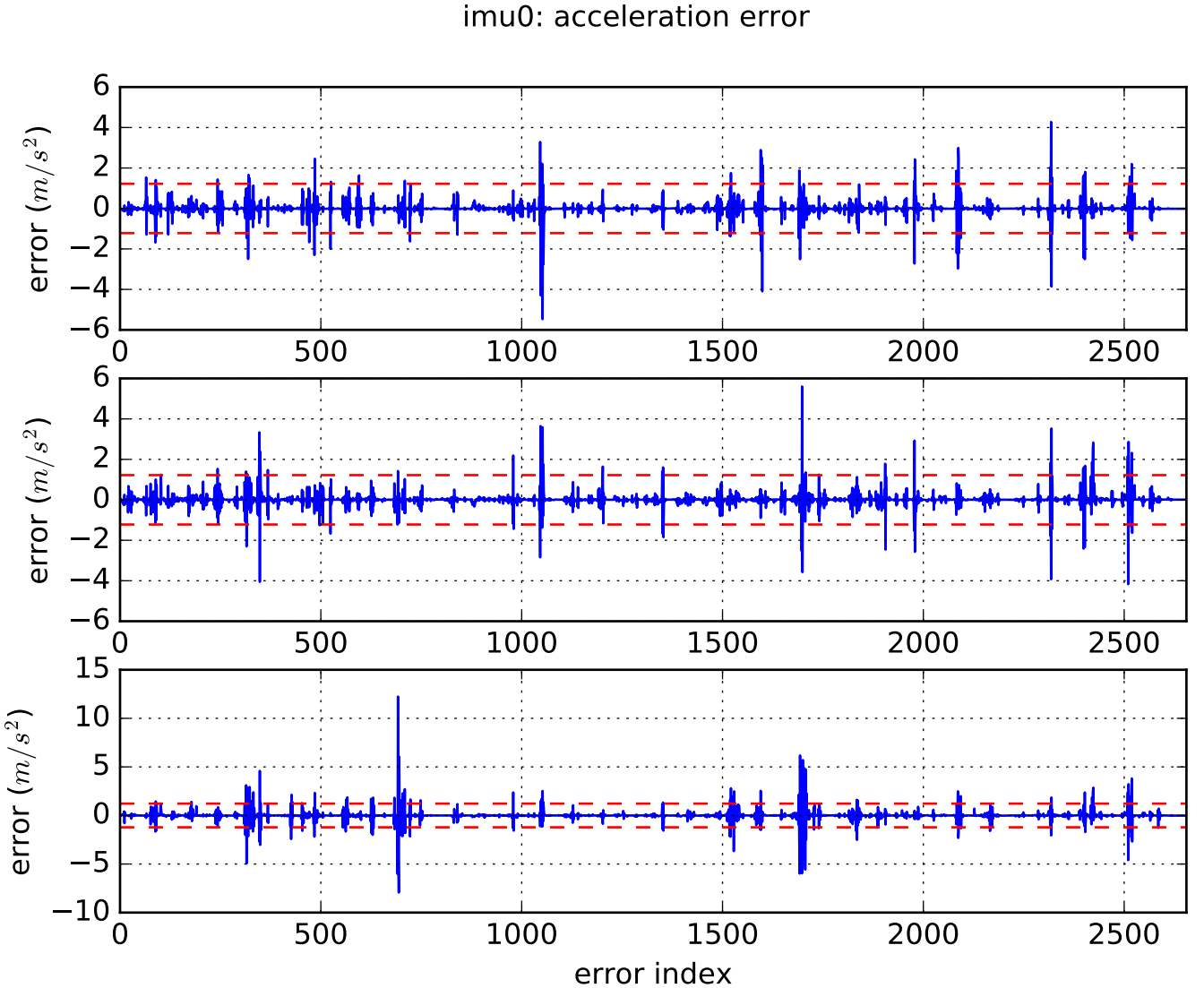
  Camera model: pinhole
  Focal length: [530.00468109, 521.86027041]
  Principal point: [428.96714026, 248.36783979]
  Distortion model: equidistant
  Distortion coefficients: [0.31205856, 0.23307093, -0.13151944, 0.12435412]
  Type: aprilgrid
  Tags:
    Rows: 6
    Cols: 6
    Size: 0.072 [m]
    Spacing 0.0216 [m]

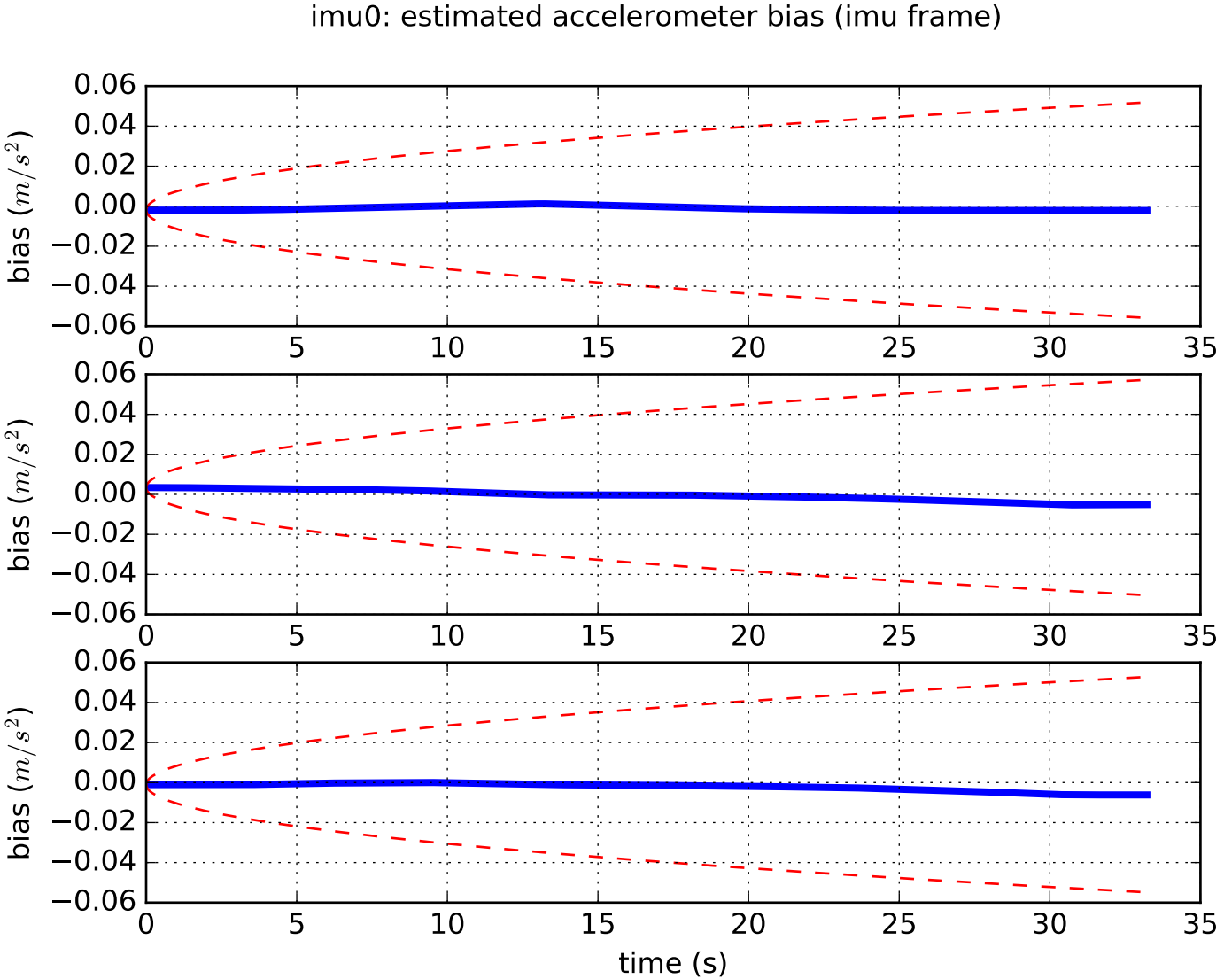
IMU configuration
==========

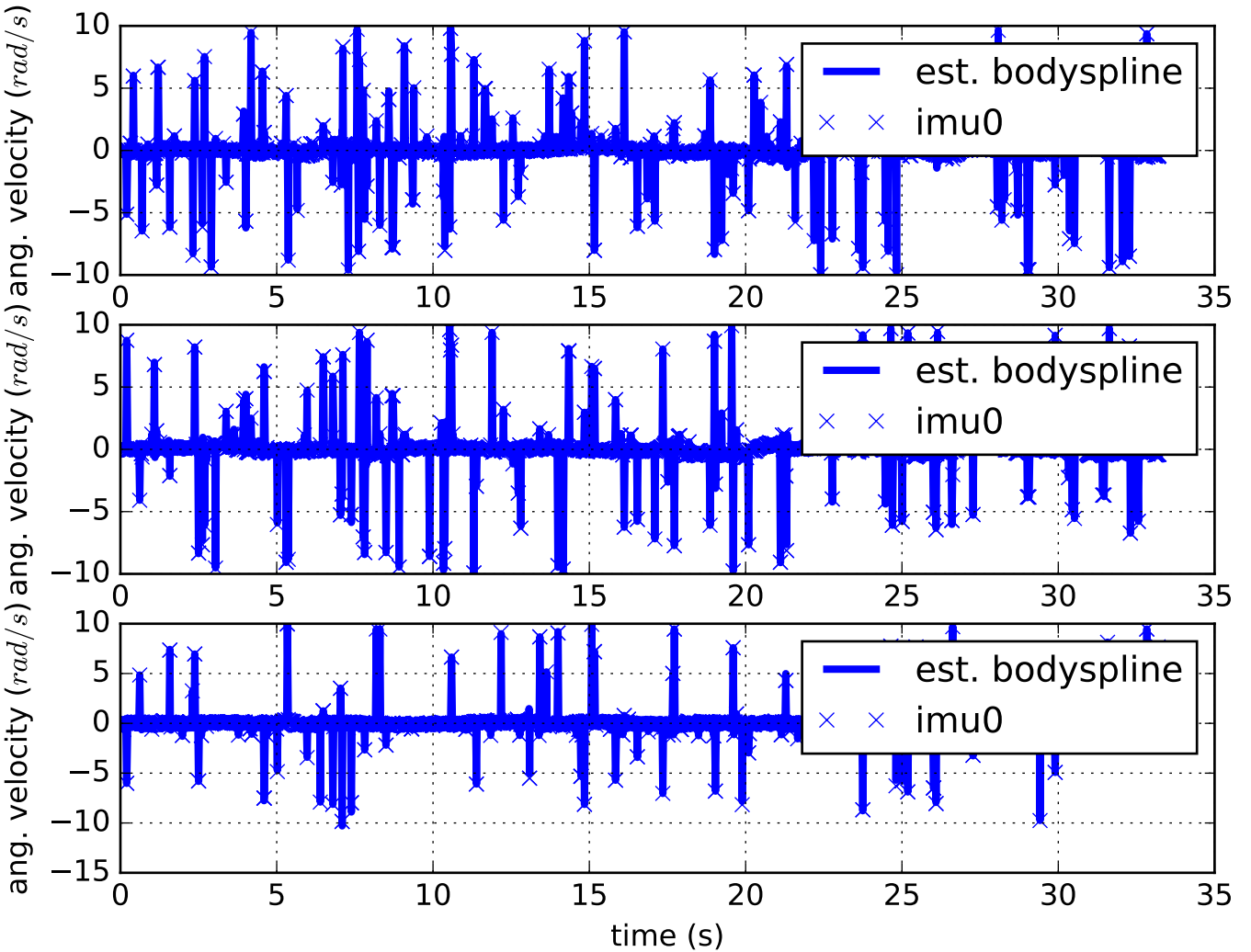
IMU0:

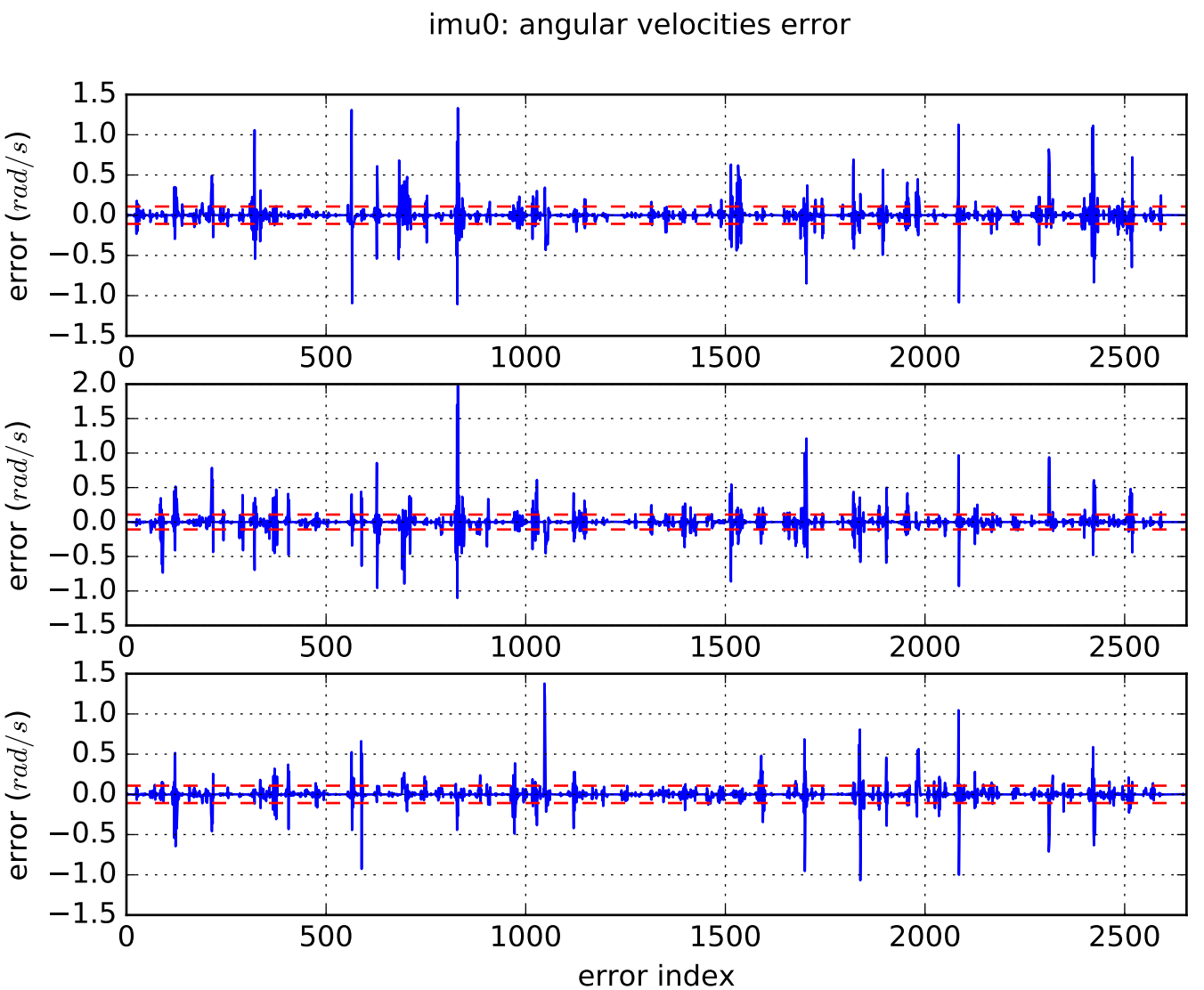
  Model: calibrated
  Update rate: 100.0
  Accelerometer:
    Noise density: 0.0406646927658
    Noise density (discrete): 0.406646927658
    Random walk: 0.00311311645065
  Gyroscope:
    Noise density: 0.00359759598107
    Noise density (discrete): 0.0359759598107
    Random walk: 0.000114424620336
  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]

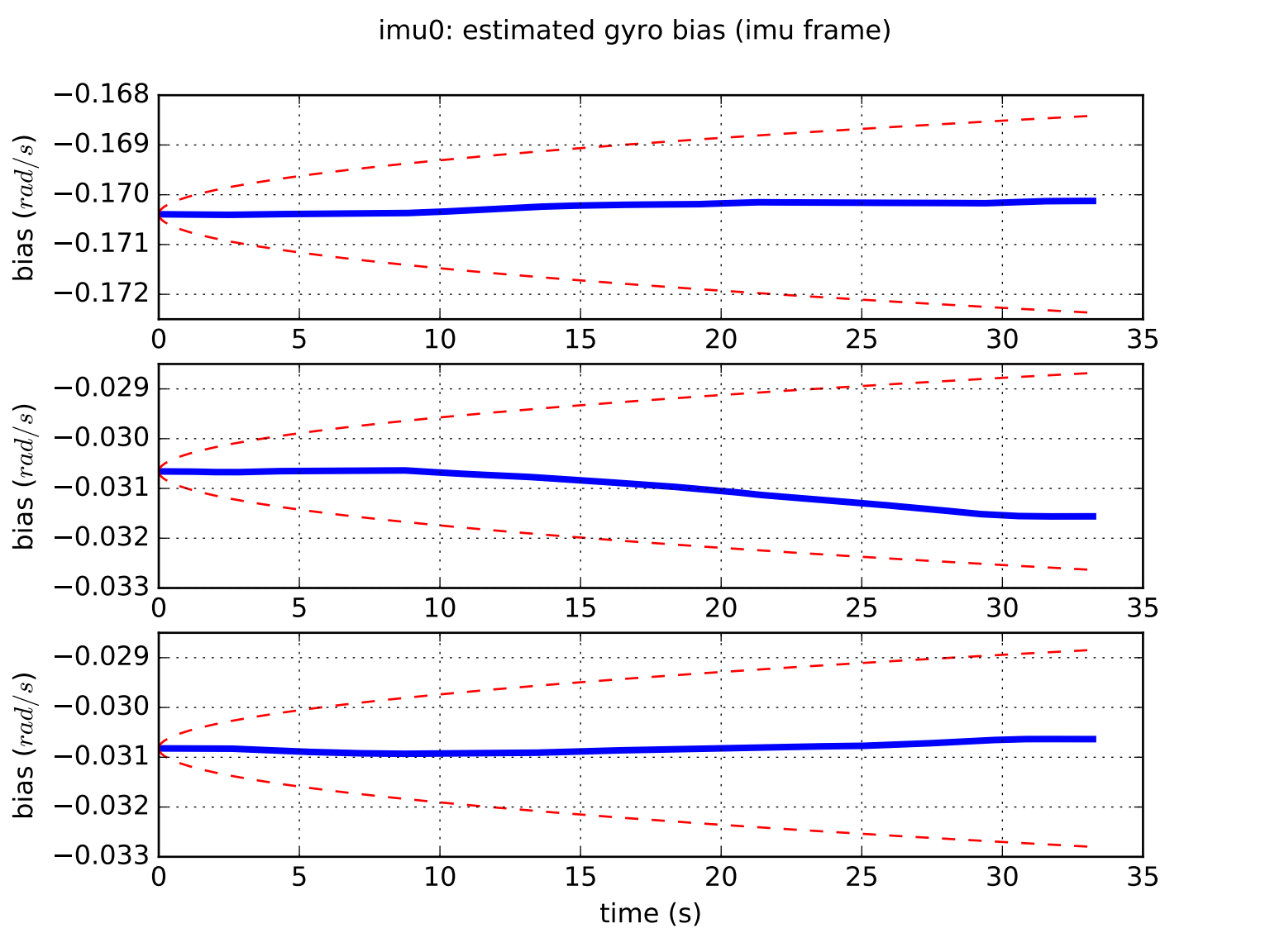

Comparison of predicted and measured specific force (imu0 frame)
specific force (m/s^2)
specific force (m/s^2)
specific force (m/s^2)
time (s)
est. bodyspline
imu0
est. bodyspline
imu0
est. bodyspline
imu0

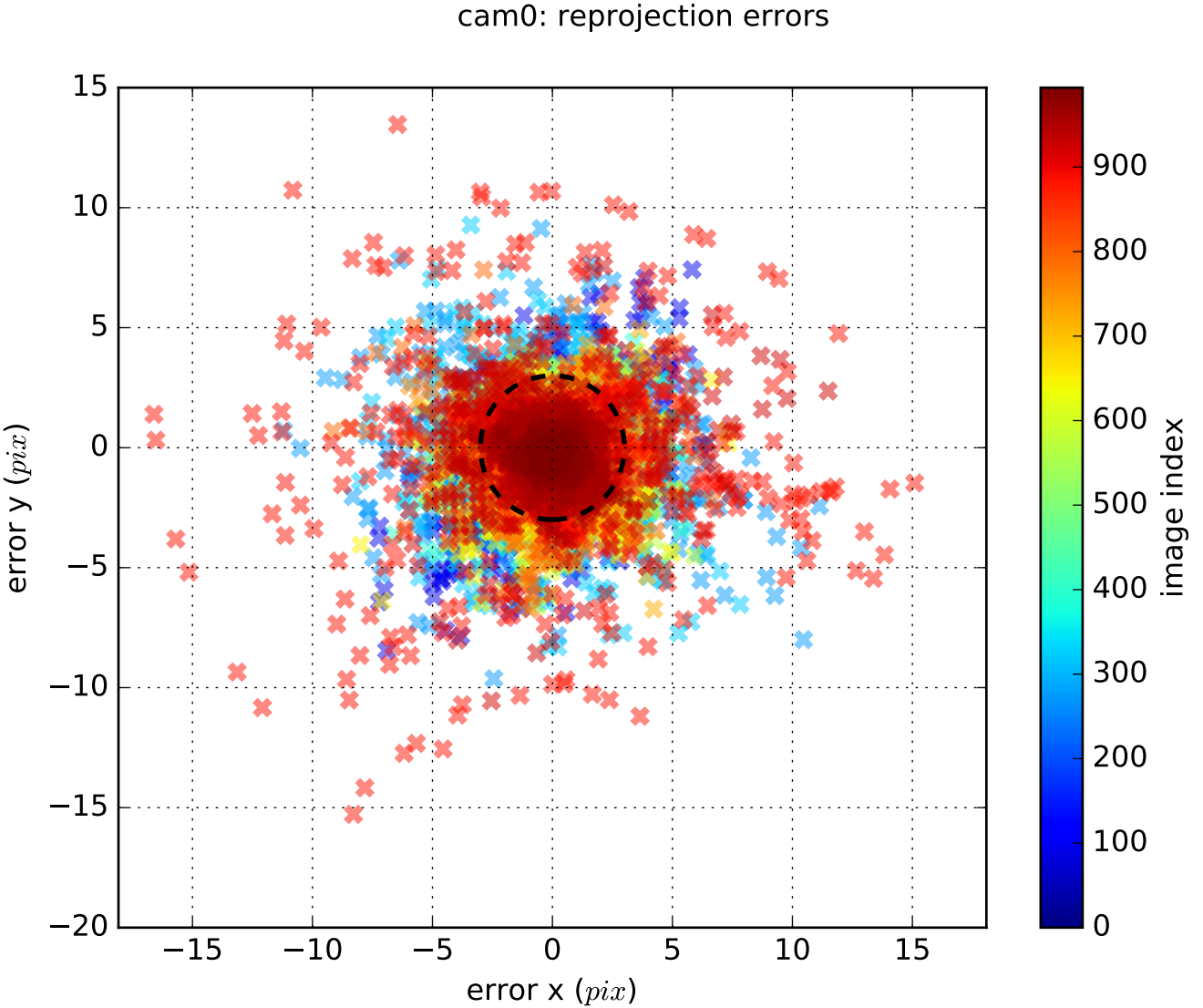

imu0: acceleration error
error (m/s^2)
6
4
2
0
−2
−4
−6
0
500
1000
1500
2000
2500
error (m/s^2)
6
4
2
0
−2
−4
−6
0
500
1000
1500
2000
2500
error (m/s^2)
15
10
5
0
−5
−10
0
500
1000
1500
2000
2500
error index


imu0: estimated accelerometer bias (imu frame)
bias (m/s^2)
bias (m/s^2)
bias (m/s^2)
0.06
0.04
0.02
0.00
−0.02
−0.04
−0.06
0
5
10
15
20
25
30
35
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)
error (rad/s)
error (rad/s)
error index
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
2.0
0
500
1000
1500
2000
2500


imu0: estimated gyro bias (imu frame)
bias (rad/s)
−0.168
−0.169
−0.170
−0.171
−0.172
bias (rad/s)
−0.029
−0.030
−0.031
−0.032
−0.033
bias (rad/s)
−0.029
−0.030
−0.031
−0.032
−0.033
0
5
10
15
20
25
30
35
time (s)


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