

Calibration results

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Normalized Residuals

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Reprojection error (cam0): mean 0.195095905088, median 0.171188514253, std: 0.126319218655

Reprojection error (cam1): mean 0.191353689879, median 0.164793294471, std: 0.128154376221

Gyroscope error (imu0): mean 0.298475573755, median 0.25752434336, std: 0.190418579805

Accelerometer error (imu0): mean 3.27654851415, median 2.24617745278, std: 3.40574922066

Residuals

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Reprojection error (cam0) [px]: mean 0.195095905088, median 0.171188514253, std: 0.126319218655

Reprojection error (cam1) [px]: mean 0.191353689879, median 0.164793294471, std: 0.128154376221

Gyroscope error (imu0) [rad/s]: mean 0.0461786375659, median 0.0398428694409, std: 0.029460603666

Accelerometer error (imu0) [m/s<sup>2</sup>]: mean 0.0857241779101, median 0.0587666304184, std: 0.0891044499

Transformation (cam0):

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T\_ci: (imu0 to cam0):

```
[-0.99986902  0.00862628  0.01369395  0.01815562]
[-0.00853044 -0.99993882  0.00704142  0.01514613]
[ 0.01375385  0.00692369  0.99988144 -0.01037469]
[ 0.          0.          0.          1.          ]]
```

T\_ic: (cam0 to imu0):

```
[-0.99986902 -0.00853044  0.01375385  0.01842514]
[ 0.00862628 -0.99993882  0.00692369  0.01506042]
[ 0.01369395  0.00704142  0.99988144  0.01001819]
[ 0.          0.          0.          1.          ]]
```

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

0.000303251156037

Transformation (cam1):

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T\_ci: (imu0 to cam1):

```
[ 0.      0.      0.      1.      ]]
```

T\_ic: (cam1 to imu0):

```
[-0.999941 -0.00849813  0.00676546 -0.04574088]
[ 0.00852953 -0.99995293  0.00462505  0.01552501]
[ 0.00672584  0.00468248  0.99996642  0.01072085]
[ 0.      0.      0.      1.      ]]
```

timeshift cam1 to imu0: [s] (t\_imu = t\_cam + shift)

```
0.000298754789143
```

Baselines:

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Baseline (cam0 to cam1):

```
[ 0.99997572  0.00004829 -0.00696895 -0.06417092]
[-0.00006473  0.99999722 -0.00235832 -0.00008401]
[ 0.00696882  0.00235871  0.99997294 -0.00027067]
[ 0.      0.      0.      1.      ]]
```

baseline norm: 0.0641715462513 [m]

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

```
[ 0.12388871 -9.78747249 -0.59871263]
```

Calibration configuration

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cam0

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Camera model: omni

Focal length: [556.298481510608, 554.5690511397764]

Principal point: [420.49786515023254, 411.95039073349835]

Omni xi: 0.943542174399

Distortion model: radtan

Distortion coefficients: [-0.2572700733153039, -0.03633589137983016, 0.0010301519370796758, -0.0000400000000001]

Type: apriltgrid

Size: 0.088 [m]  
Spacing 0.0264 [m]

cam1

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Camera model: omni  
Focal length: [554.1322084444726, 552.3681452208727]  
Principal point: [432.06392559389275, 407.3437421932299]  
Omni xi: 0.936645158563  
Distortion model: radtan  
Distortion coefficients: [-0.25840846666370487, -0.032037705367465426, 0.0013450591638324183, -0.0013450591638324183]  
Type: aprilgrid  
Tags:  
Rows: 6  
Cols: 6  
Size: 0.088 [m]  
Spacing 0.0264 [m]

IMU configuration

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IMU0:

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Model: calibrated

Update rate: 200.0

Accelerometer:

    Noise density: 0.00185

    Noise density (discrete): 0.0261629509039

    Random walk: 2.548e-05

Gyroscope:

    Noise density: 0.01094

    Noise density (discrete): 0.154714963724

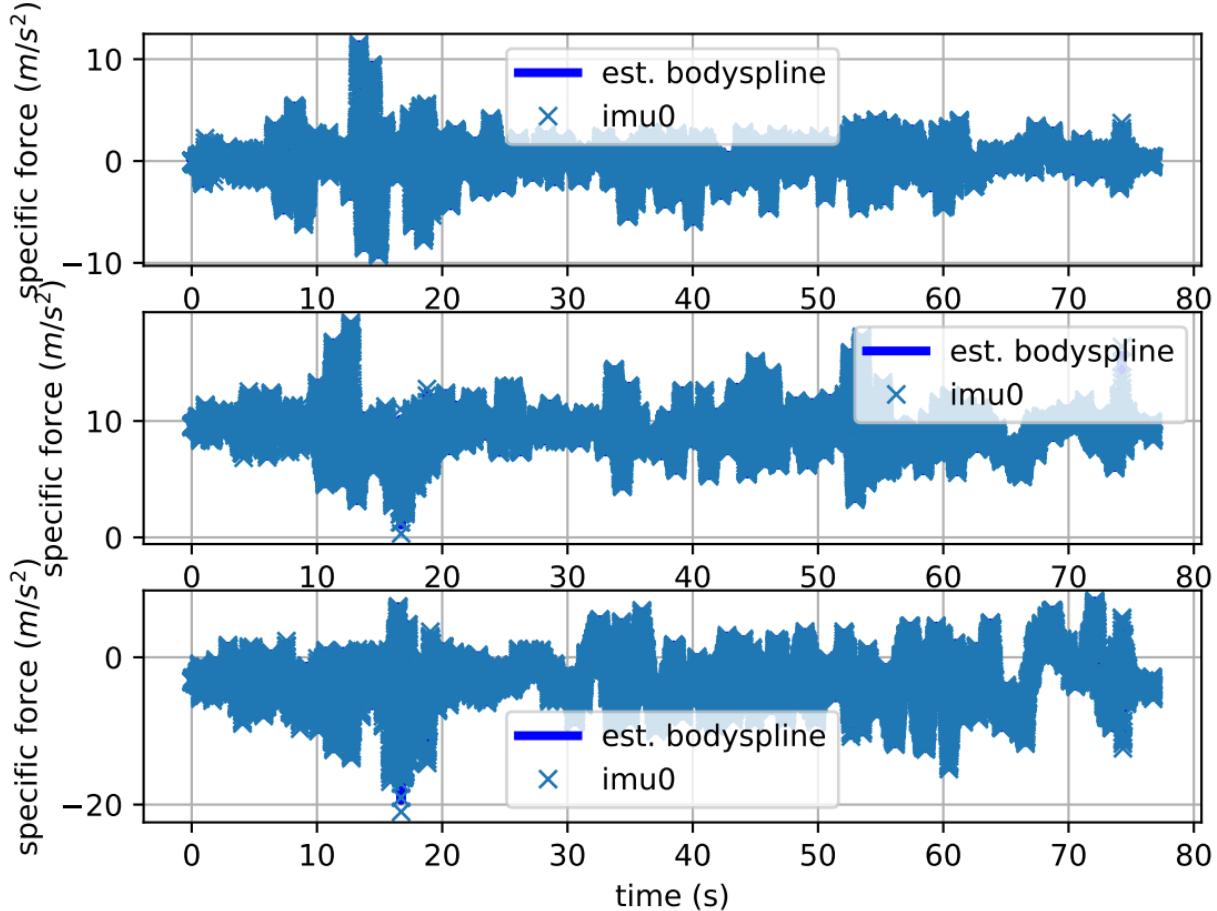
    Random walk: 0.0005897

T i b

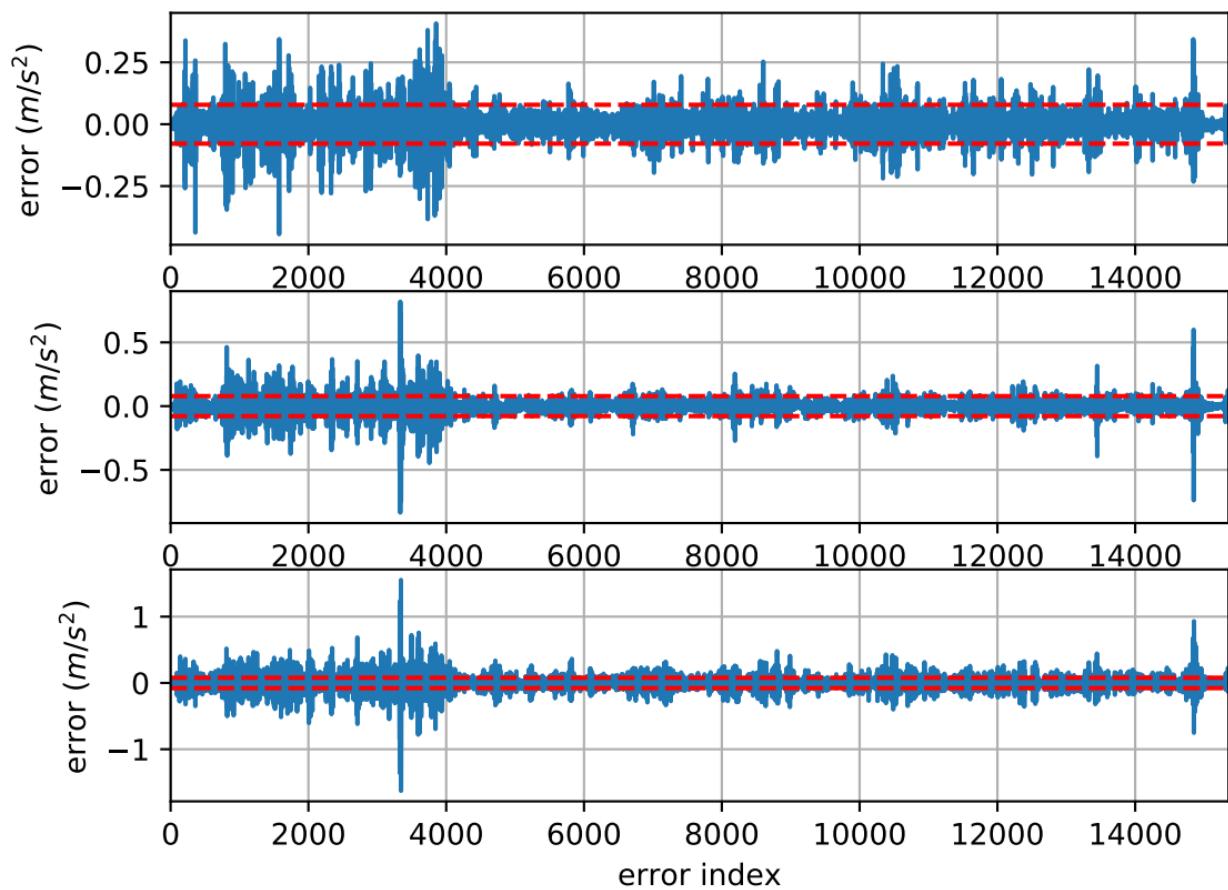
[ 0. 0. 0. 1.]

time offset with respect to IMU0: 0.0 [s]

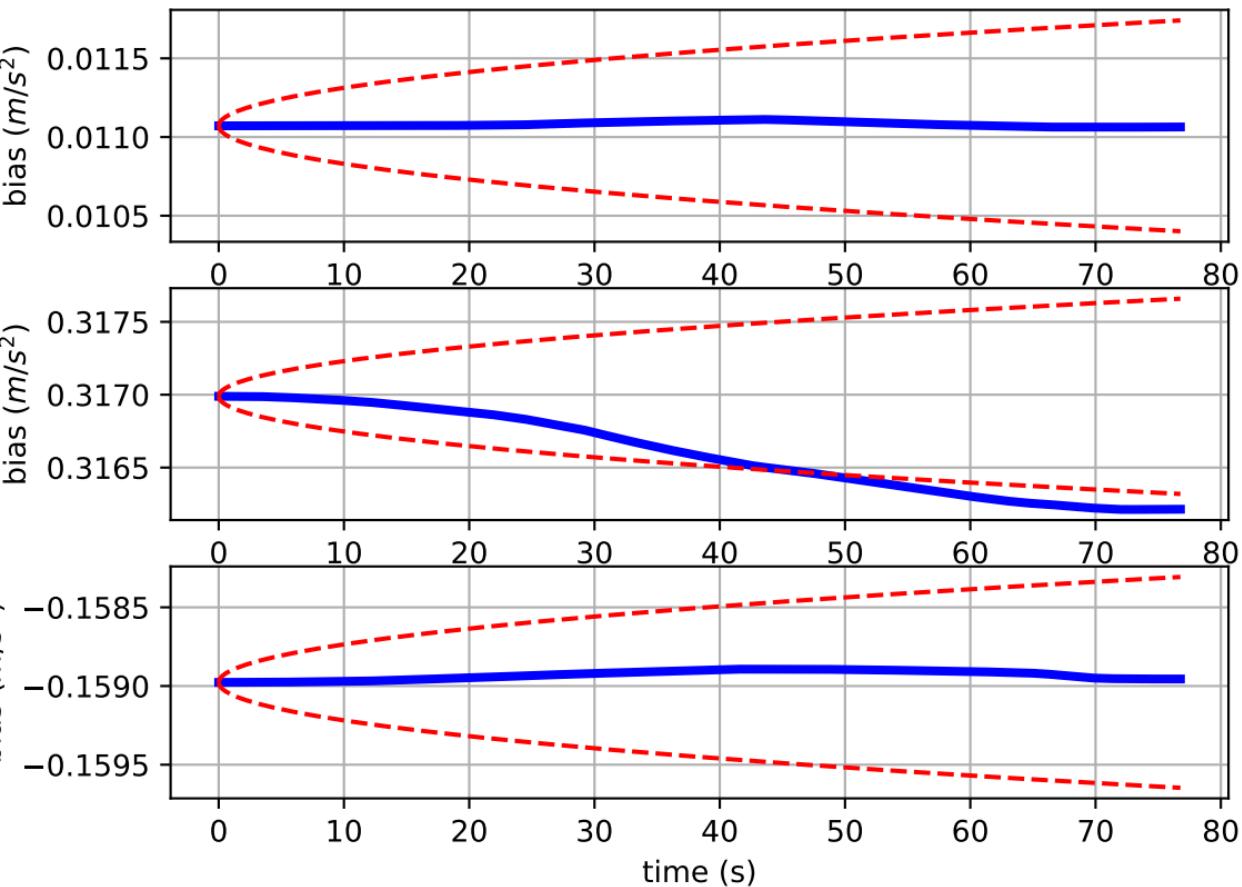
# Comparison of predicted and measured specific force (imu0 frame)



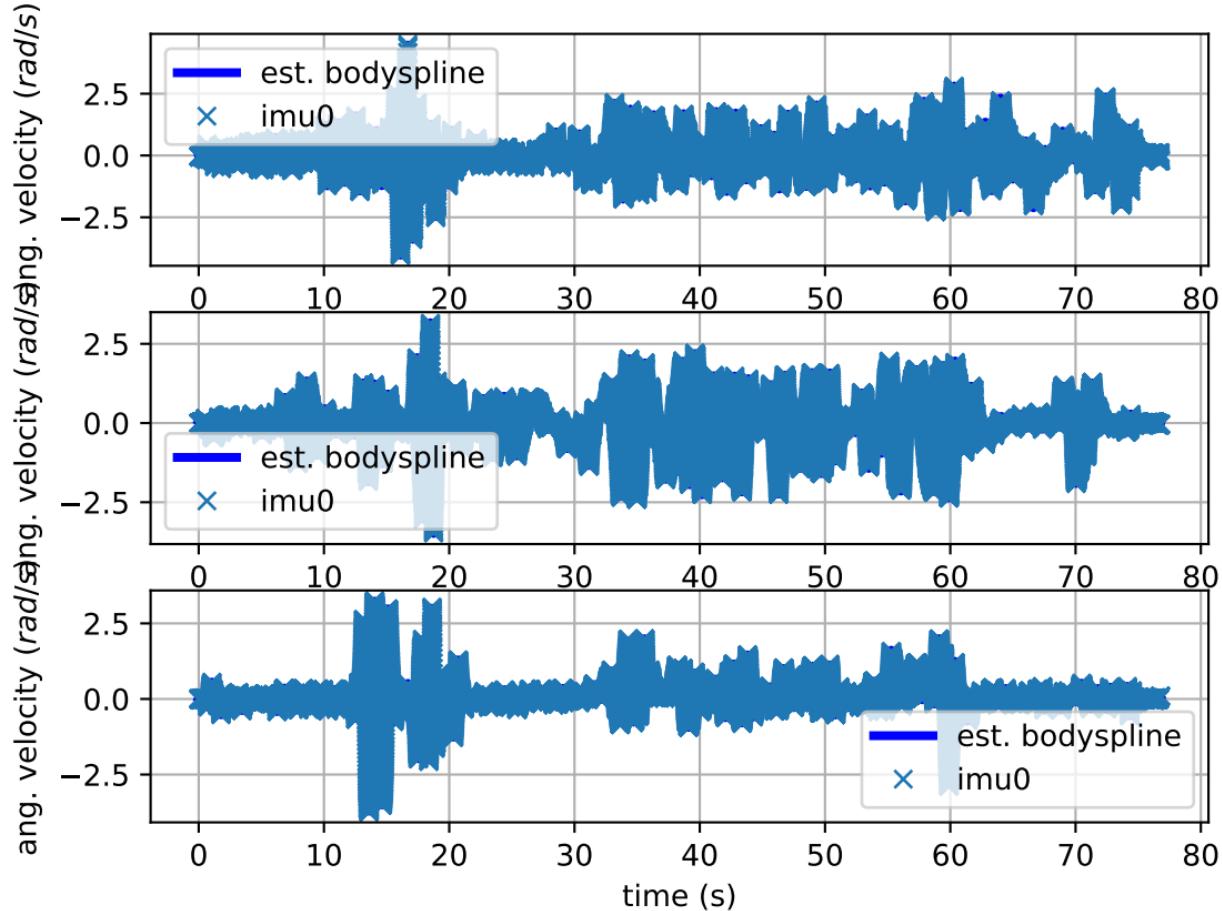
# imu0: acceleration error



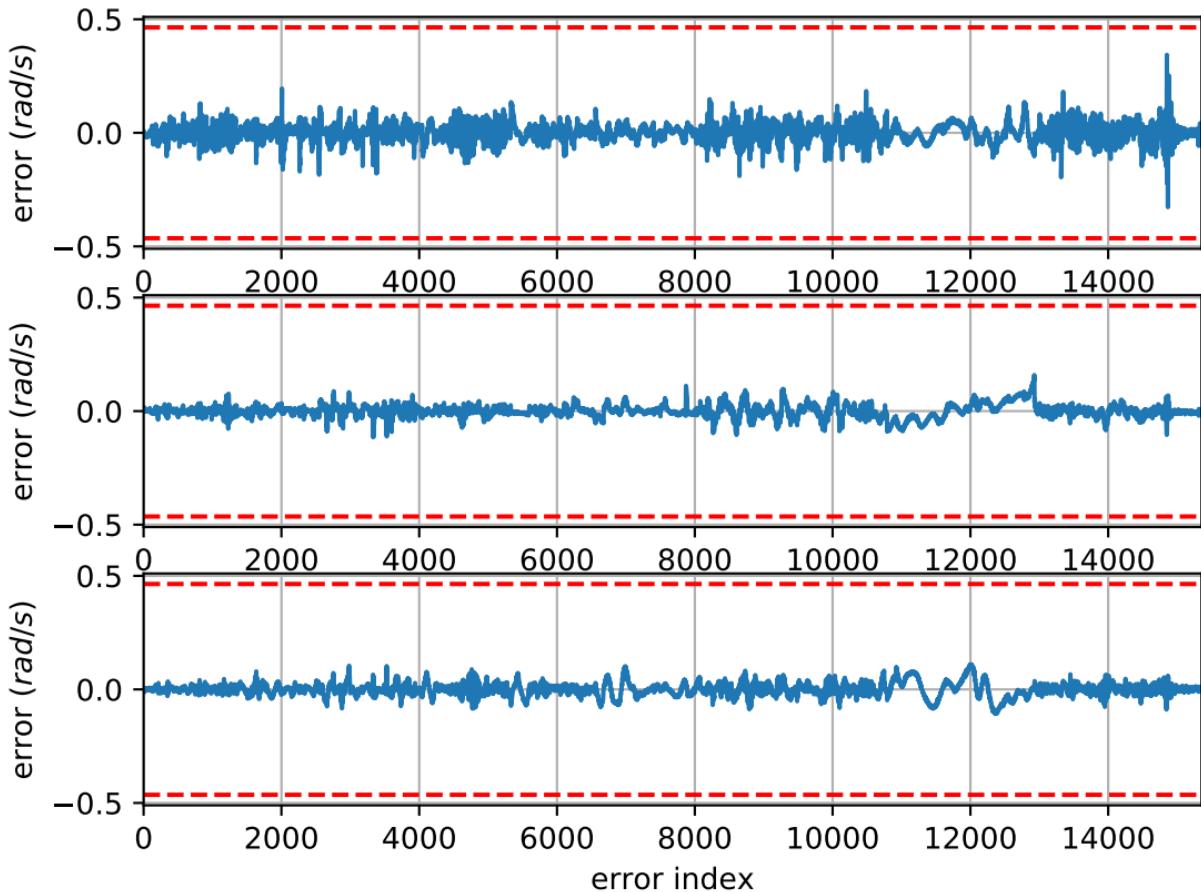
# imu0: estimated accelerometer bias (imu frame)



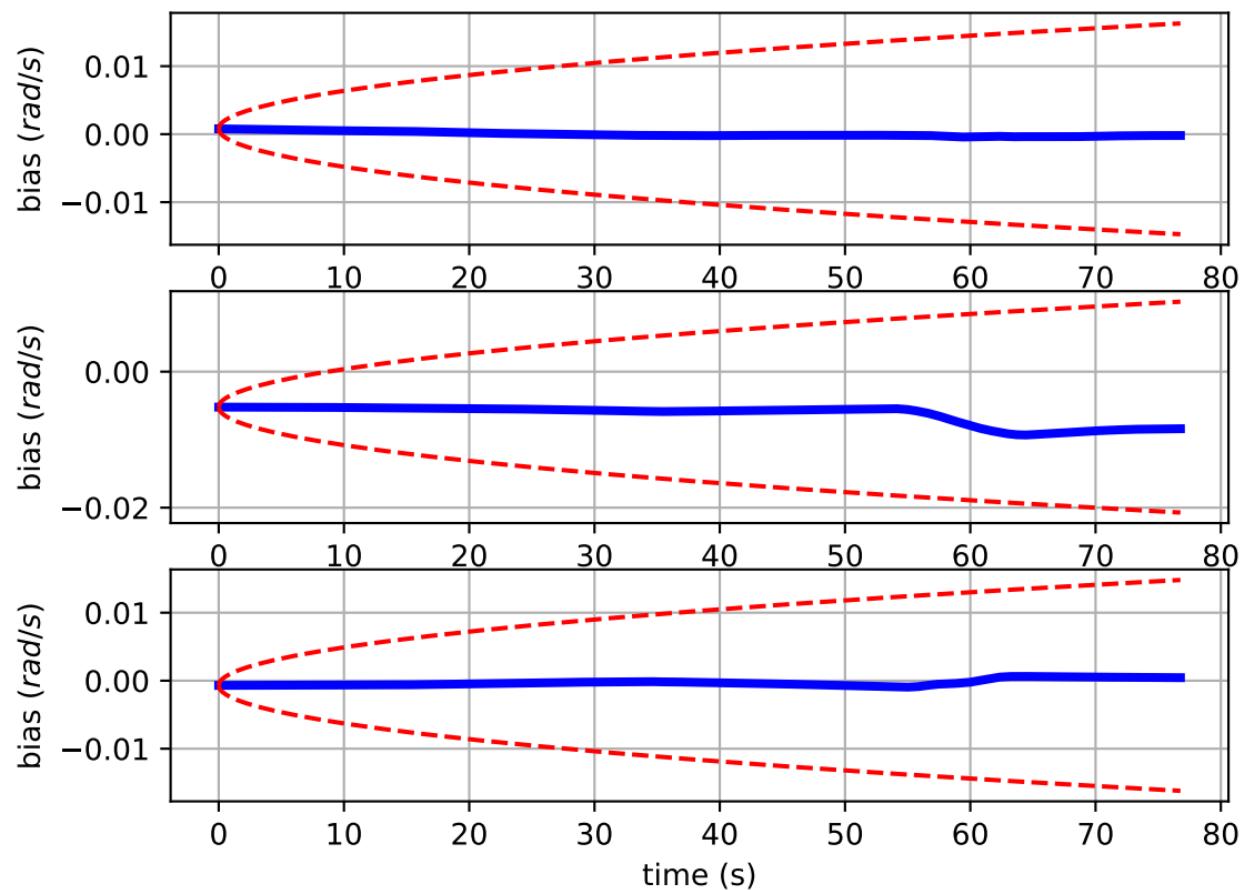
# Comparison of predicted and measured angular velocities (body frame)



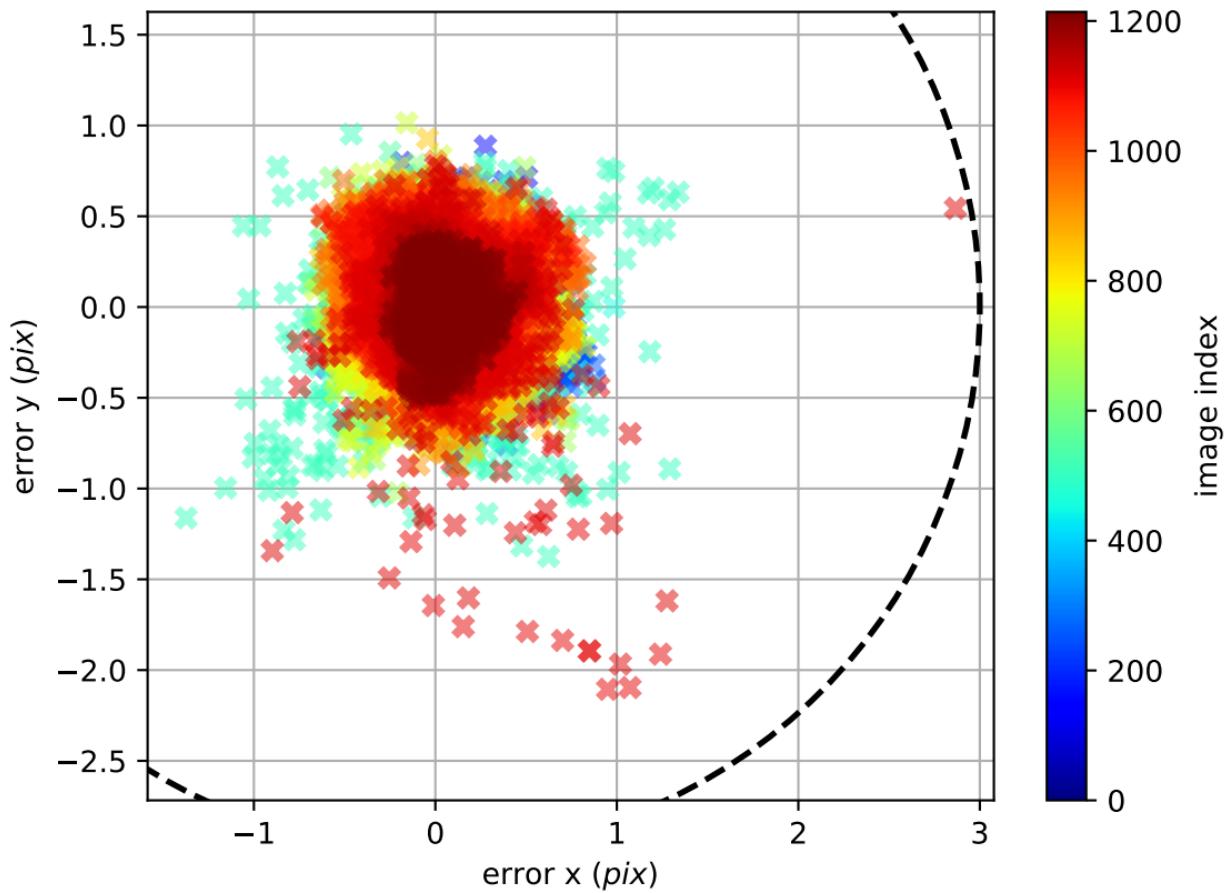
# imu0: angular velocities error



# imu0: estimated gyro bias (imu frame)



cam0: reprojection errors



cam1: reprojection errors

