

## Calibration results

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### Normalized Residuals

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Reprojection error (cam0): mean 0.119563937376, median 0.113875420337, std: 0.0605389023366

Reprojection error (cam1): mean 0.122401741415, median 0.116753533068, std: 0.0621851862802

Gyroscope error (imu0): mean 0.0609405772583, median 0.0540659891547, std: 0.0375885994135

Accelerometer error (imu0): mean 0.0546803015123, median 0.0503343863479, std: 0.0284225993892

### Residuals

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Reprojection error (cam0) [px]: mean 0.119563937376, median 0.113875420337, std: 0.0605389023366

Reprojection error (cam1) [px]: mean 0.122401741415, median 0.116753533068, std: 0.0621851862802

Gyroscope error (imu0) [rad/s]: mean 0.0100336546275, median 0.00890177754591, std: 0.0061888324892

Accelerometer error (imu0) [m/s<sup>2</sup>]: mean 0.0962276289906, median 0.0885795893767, std: 0.0500187320355

### Transformation (cam0):

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T\_ci: (imu0 to cam0):

```
[[-0.99976387  0.01527332 -0.01545717  0.04881406]
 [-0.01531563  0.99987927 -0.0026226   0.00415934]
 [ 0.01541525  0.00285872  0.99987709  0.00420889]
 [ 0.          0.          1.          ]]]
```

T\_ic: (cam0 to imu0):

```
[[-0.99976387 -0.01531563  0.01541525 -0.04880371]
 [ 0.01527332  0.99987927  0.00285872 -0.00491642]
 [-0.01545717 -0.0026226   0.99987709 -0.00344293]
 [ 0.          0.          1.          ]]]
```

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

-0.00170400617103

### Transformation (cam1):

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T\_ci: (imu0 to cam1):  
[[ 0.99996528 -0.00814324 -0.0017689 -0.03181115]  
[ 0.00813025 0.9999408 -0.00723206 0.00510661]  
[ 0.00182769 0.00721743 0.99997228 0.00435671]  
[ 0. 0. 0. 1. ]]

T\_ic: (cam1 to imu0):  
[[ 0.99996528 0.00813025 0.00182769 0.03176056]  
[-0.00814324 0.9999408 0.00721743 -0.0053968 ]  
[-0.0017689 -0.00723206 0.99997228 -0.00437592]  
[ 0. 0. 0. 1. ]]

timeshift cam1 to imu0: [s] (t\_imu = t\_cam + shift)  
-0.00168406261095

Baselines:

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Baseline (cam0 to cam1):  
[[ 0.99963213 -0.02345272 0.01362275 -0.08056704]  
[ 0.02351254 0.99971452 -0.0042473 -0.0001814 ]  
[-0.01351925 0.00456604 0.99989819 0.00078919]  
[ 0. 0. 0. 1. ]]  
baseline norm: 0.0805711054688 [m]

Gravity vector in target coords: [m/s^2]  
[-9.8061446 -0.0062409 0.08894949]

Calibration configuration

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cam0

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Camera model: pinhole  
Focal length: [267.2251450547752, 267.64848708718597]  
Principal point: [314.5333611534087, 198.7995284662385]  
Distortion model: fov  
Distortion coefficients: [0.925142297424674]  
Type: aprilgrid  
Tags:  
Rows: 6  
Cols: 6  
Size: 0.0312 [m]  
Spacing 0.00959999976 [m]

cam1

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Camera model: pinhole  
Focal length: [266.9850888521345, 267.6408382890132]  
Principal point: [314.0552026308079, 198.0890132556777]  
Distortion model: fov  
Distortion coefficients: [0.9233685962930176]  
Type: aprilgrid  
Tags:  
Rows: 6  
Cols: 6  
Size: 0.0312 [m]  
Spacing 0.00959999976 [m]

IMU configuration

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IMU0:

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Model: calibrated  
Update rate: 1000.0

Accelerometer:

Noise density: 0.055650476137

Noise density (discrete): 1.75982257466

Random walk: 0.000935944634767

Gyroscope:

Noise density: 0.00520658046016

Noise density (discrete): 0.16464653075

Random walk: 9.79101890858e-05

$T_{ib}$  (imu0 to imu0)

[ [ 1. 0. 0. 0.]

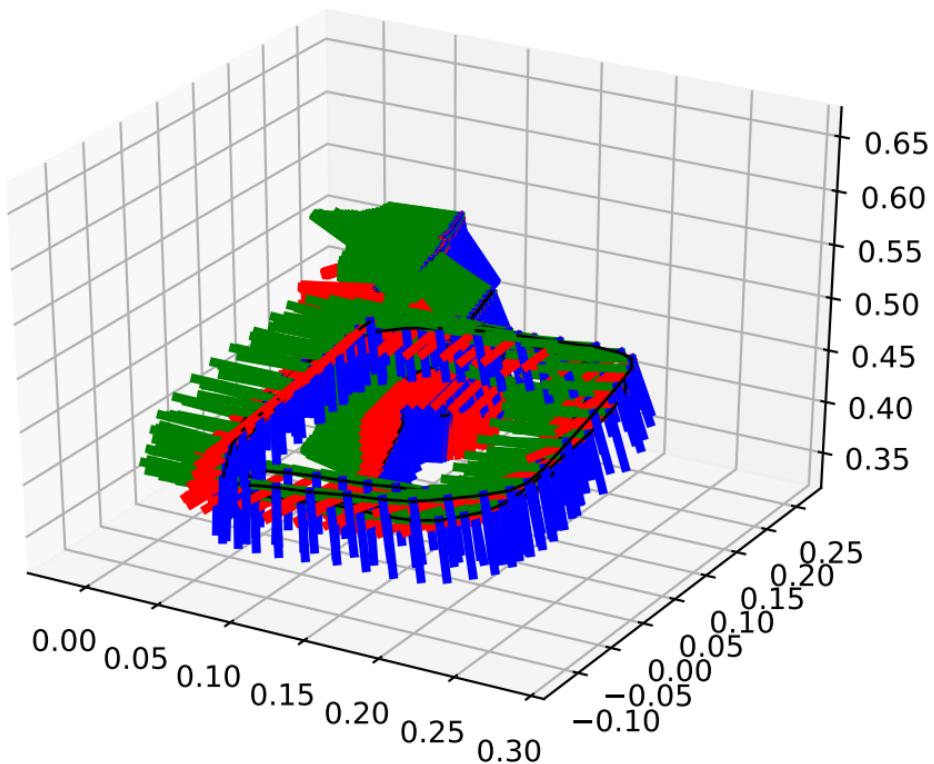
  [ 0. 1. 0. 0.]

  [ 0. 0. 1. 0.]

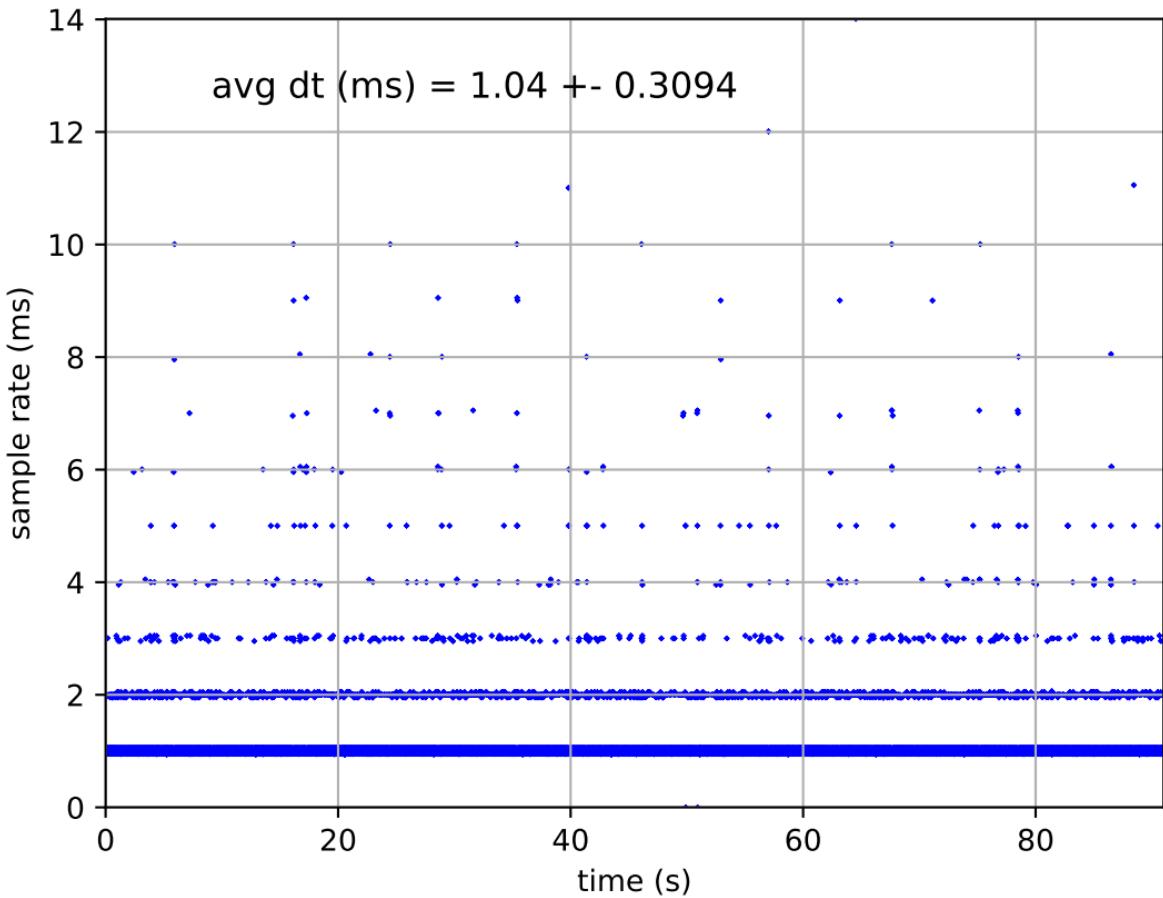
  [ 0. 0. 0. 1.]]

time offset with respect to IMU0: 0.0 [s]

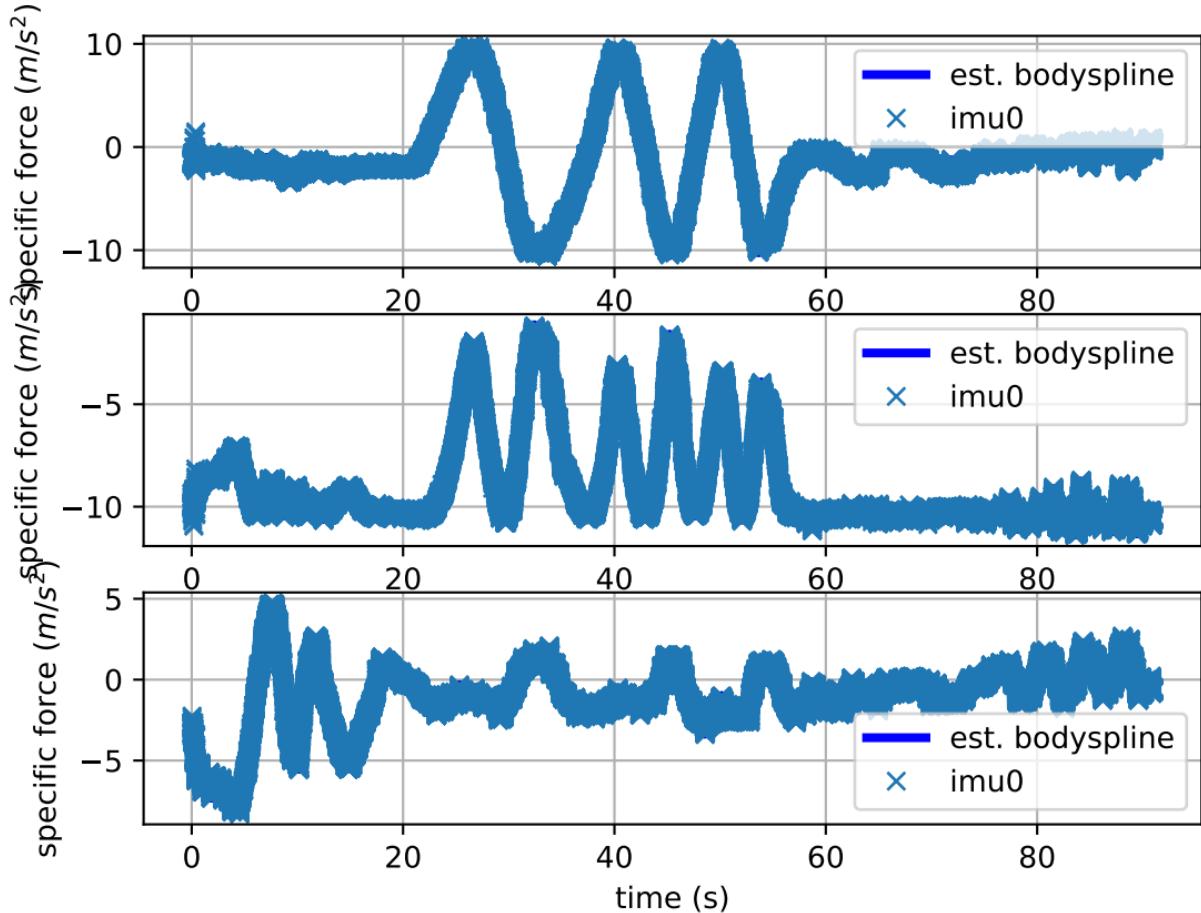
imu0: estimated poses



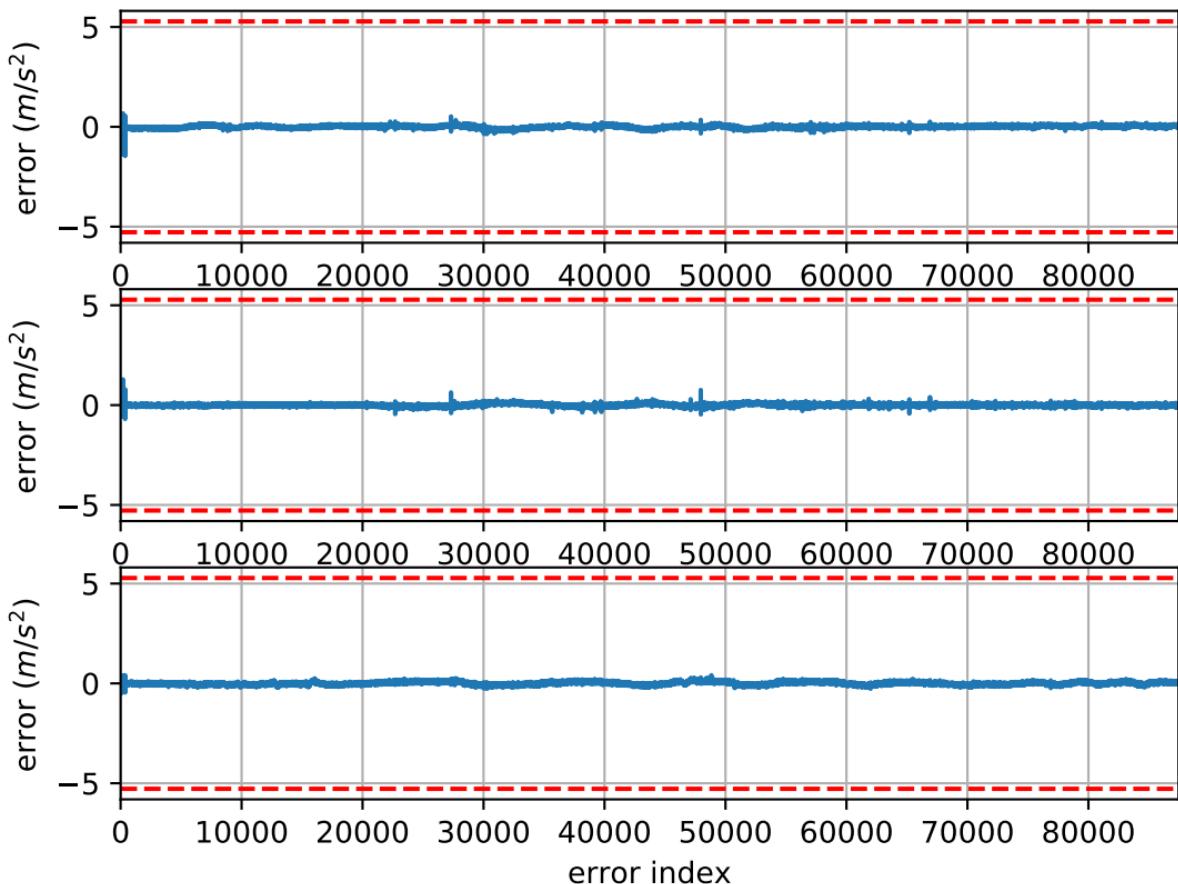
# imu0: sample inertial rate



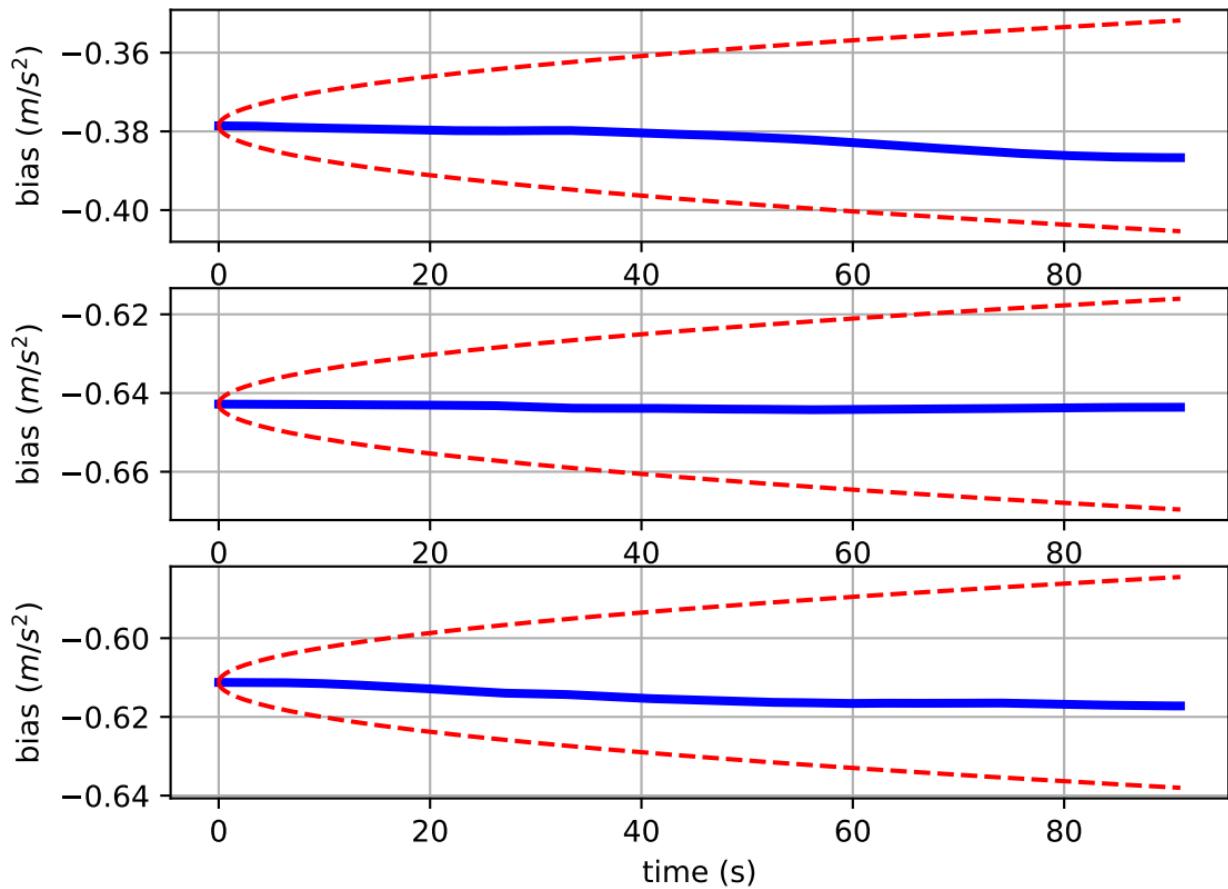
# Comparison of predicted and measured specific force (imu0 frame)



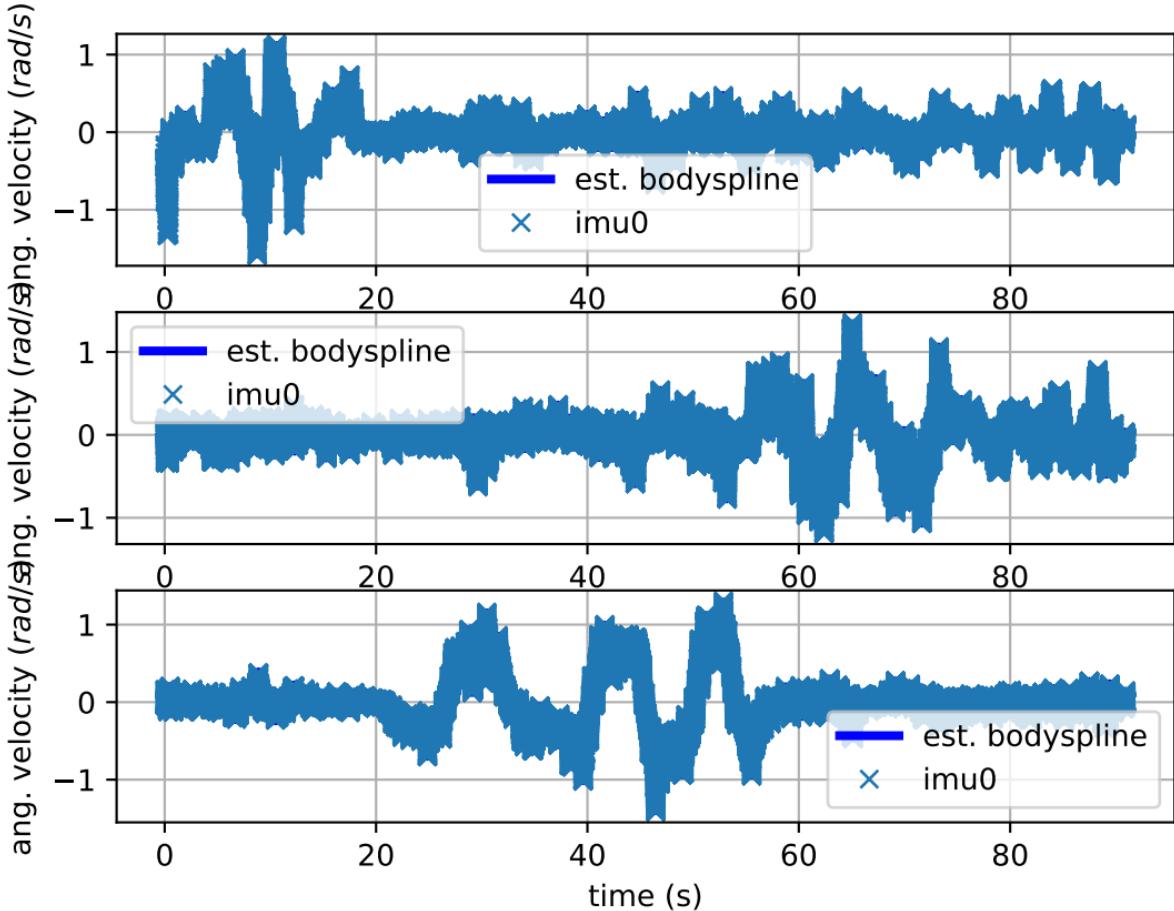
# imu0: acceleration error



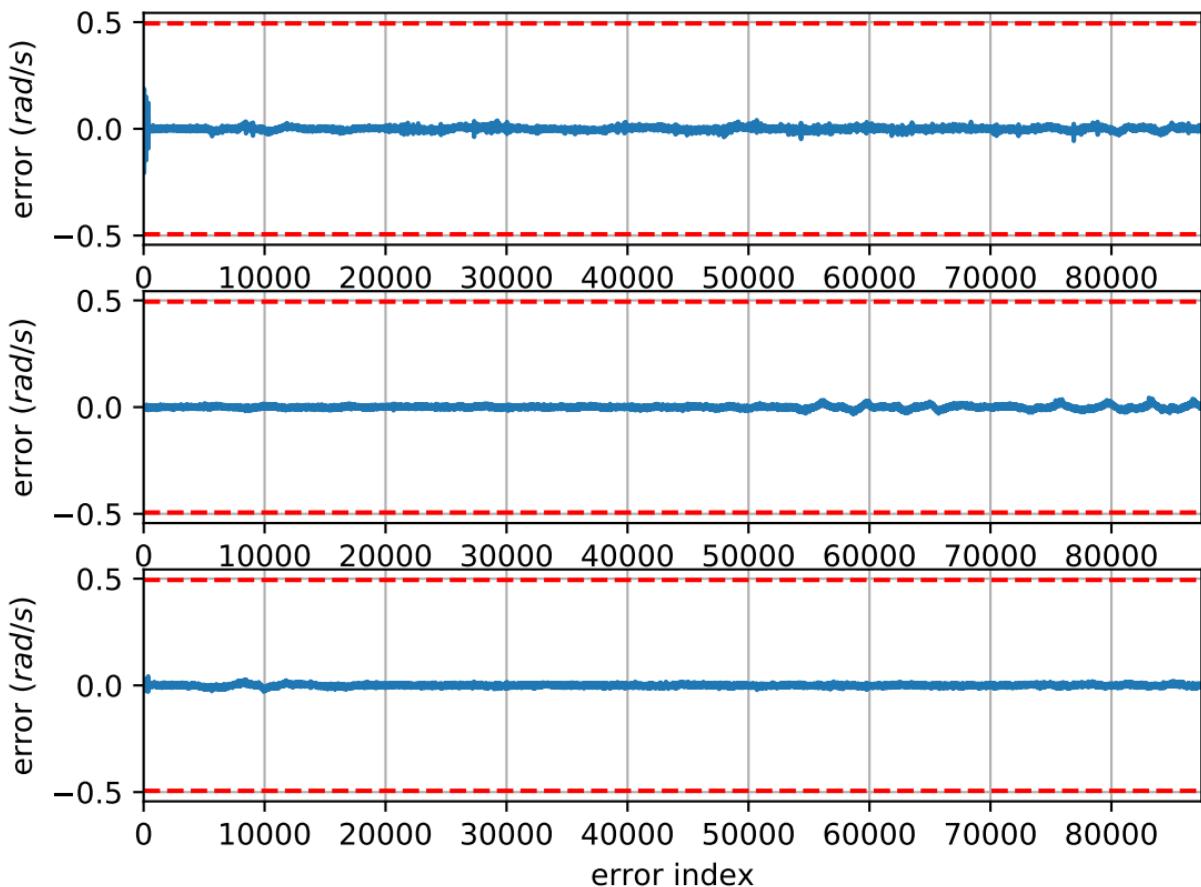
# imu0: estimated accelerometer bias (imu frame)



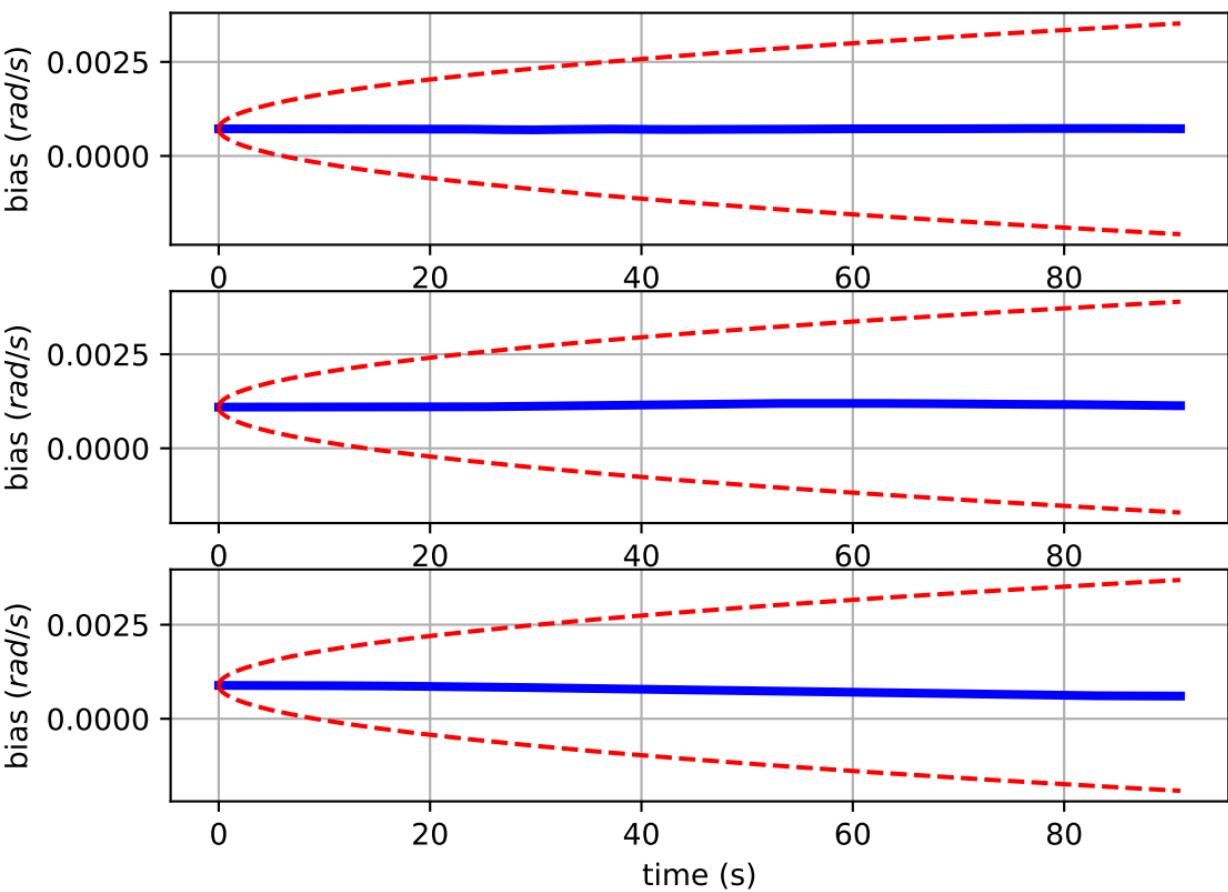
# Comparison of predicted and measured angular velocities (body frame)



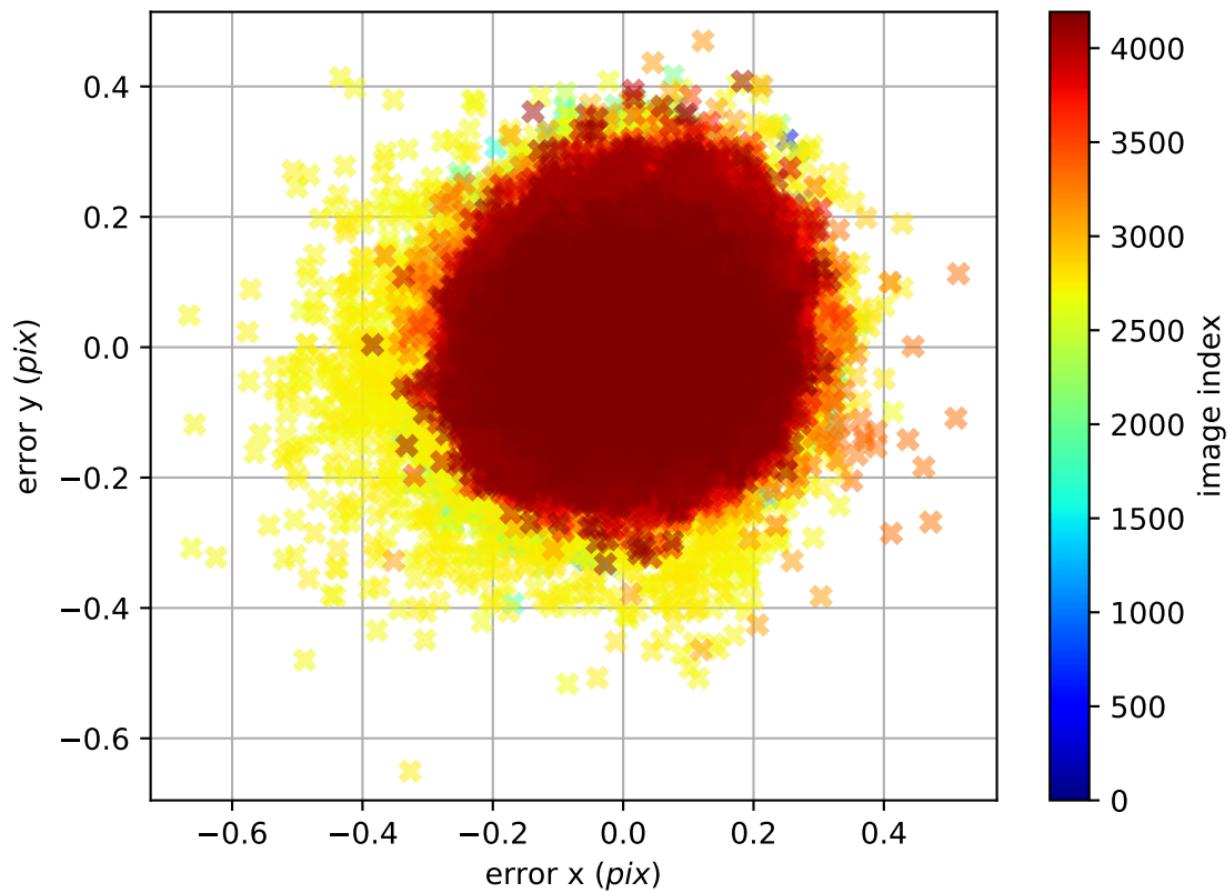
# imu0: angular velocities error



# imu0: estimated gyro bias (imu frame)



cam0: reprojection errors



cam1: reprojection errors

