

## Calibration results

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### Normalized Residuals

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Reprojection error (cam0): mean 0.2143480845365937, median 0.1838182717661068, std: 0.1384012471  
Reprojection error (cam1): mean 0.22704760264176946, median 0.1979967640505448, std: 0.14160062  
Gyroscope error (imu0): mean 0.7432750165125861, median 0.5815817866884672, std: 0.6024615316  
Accelerometer error (imu0): mean 0.2295723799744764, median 0.1964228404819075, std: 0.1611048000

### Residuals

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Reprojection error (cam0) [px]: mean 0.2143480845365937, median 0.1838182717661068, std: 0.1384012471  
Reprojection error (cam1) [px]: mean 0.22704760264176946, median 0.1979967640505448, std: 0.14160062  
Gyroscope error (imu0) [rad/s]: mean 0.012137681019650529, median 0.009497230576622667, std: 0.00  
Accelerometer error (imu0) [m/s<sup>2</sup>]: mean 0.04169241035478469, median 0.03567215563707874, std: 0.0

### Transformation (cam0):

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T\_ci: (imu0 to cam0):

```
[[-0.02740196 -0.99846049  0.04822642 -0.00063958]
 [-0.01098613 -0.04854242 -0.9987607  0.00305909]
 [ 0.99956412  0.02683818 -0.01229937  0.00527301]
 [ 0.          0.          0.          1.        ]]
```

T\_ic: (cam0 to imu0):

```
[[-0.02740196 -0.01098613  0.99956412 -0.00521958]
 [-0.99846049 -0.04854242  0.02683818 -0.00063162]
 [ 0.04822642 -0.9987607 -0.01229937  0.00315099]
 [ 0.          0.          0.          1.        ]]
```

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

0.012704462259815051

### Transformation (cam1):

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T\_ci: (imu0 to cam1):

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

T\_ic: (cam1 to imu0):

```
[[ 0.03009065 -0.0200835  0.99934539 -0.00740037]
[-0.9989408 -0.03542438  0.02936655 -0.11776057]
[ 0.03481141 -0.99917054 -0.02112817  0.00704157]
[ 0.      0.      0.      1.      ]]
```

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

```
0.012729608889888186
```

Baselines:

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Baseline (cam0 to cam1):

```
[[ 0.99990629  0.01339216  0.00283962 -0.11707471]
[-0.01336689  0.99987249 -0.00873629 -0.00030567]
[-0.00295625  0.00869752  0.99995781  0.00570124]
[ 0.      0.      0.      1.      ]]
```

baseline norm: 0.11721384064605536 [m]

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

```
[ 0.34223833 -9.79972032 -0.12952812]
```

Calibration configuration

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cam0

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Camera model: pinhole

Focal length: [463.03633149689495, 463.7420991615777]

Principal point: [550.7246303872446, 551.6771731850886]

Distortion model: equidistant

Distortion coefficients: [-0.0005816842417577593, 0.08625550893556834, -0.14254444744803196, 0.083

Type: aprilgrid

Tags:

Spacing 0.024 [m]

cam1

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Camera model: pinhole

Focal length: [465.4009751413733, 465.89405732904993]

Principal point: [542.2507732527565, 556.9887235669287]

Distortion model: equidistant

Distortion coefficients: [0.02904639015524337, -0.05691934881864534, 0.10247894127389645, -0.07023

Type: aprilgrid

Tags:

Rows: 6

Cols: 6

Size: 0.08 [m]

Spacing 0.024 [m]

IMU configuration

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IMU0:

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Model: calibrated

Update rate: 100.0

Accelerometer:

    Noise density: 0.0181609

    Noise density (discrete): 0.181609

    Random walk: 0.0002204

Gyroscope:

    Noise density: 0.001633

    Noise density (discrete): 0.01632999999999997

    Random walk: 1.75e-05

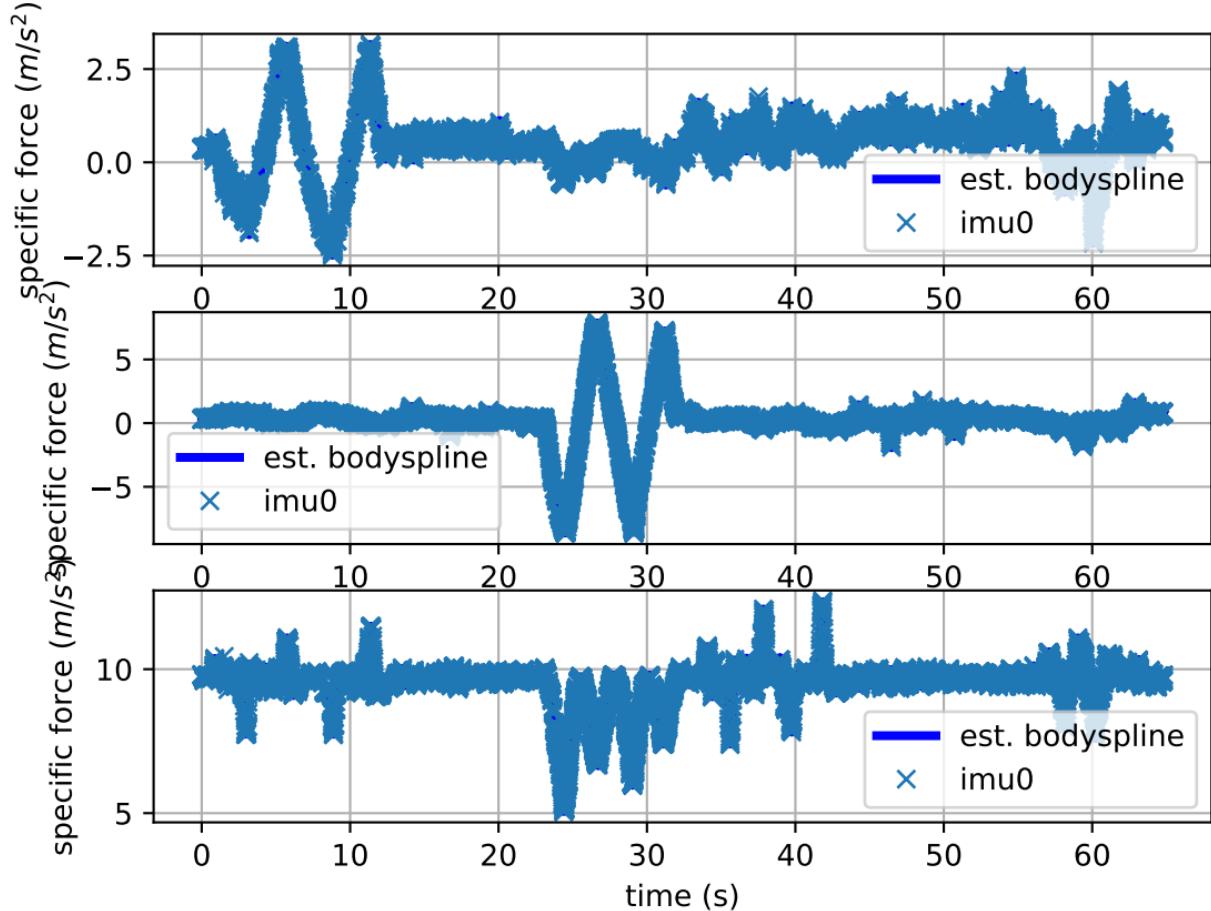
T\_i\_b

[[1. 0. 0. 0.]

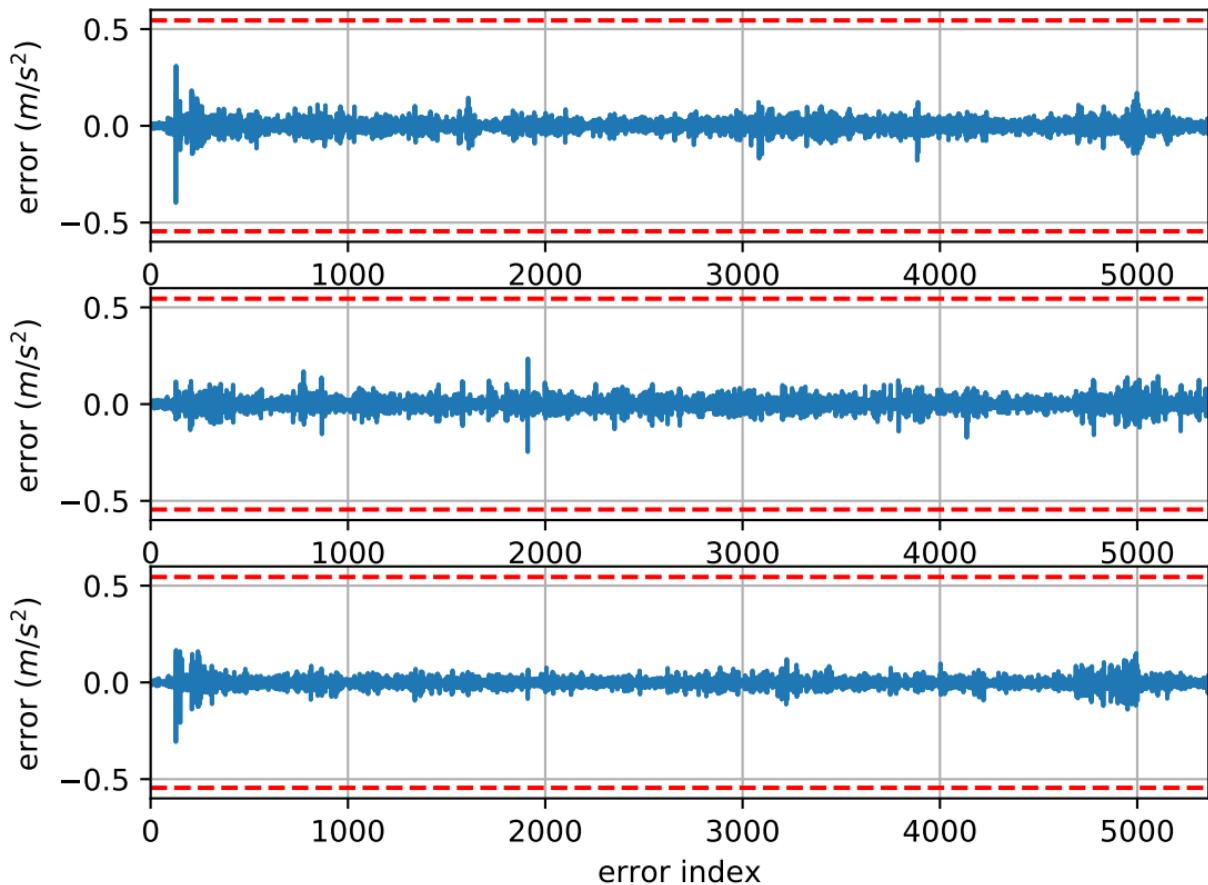
[0. 1. 0. 0.]

[0. 0. 1. 0.]

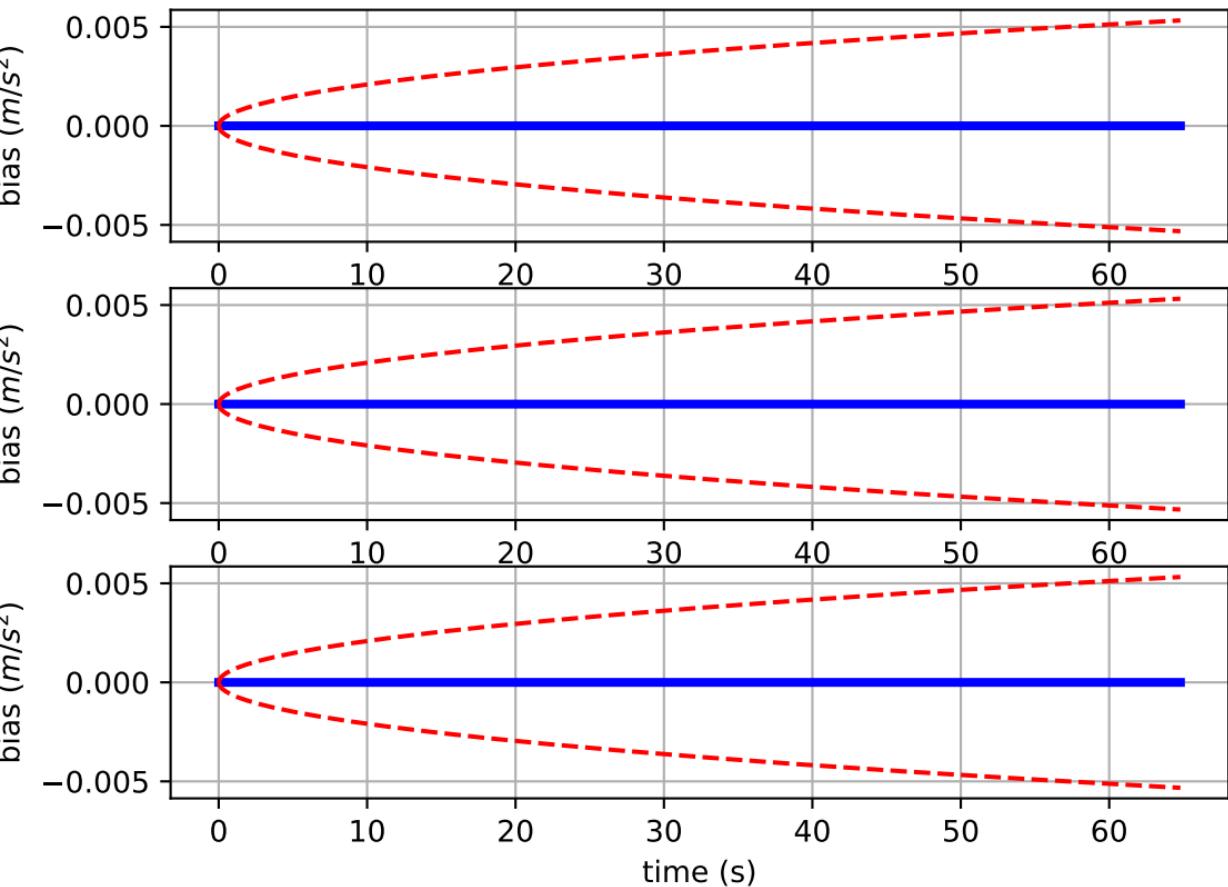
# Comparison of predicted and measured specific force (imu0 frame)



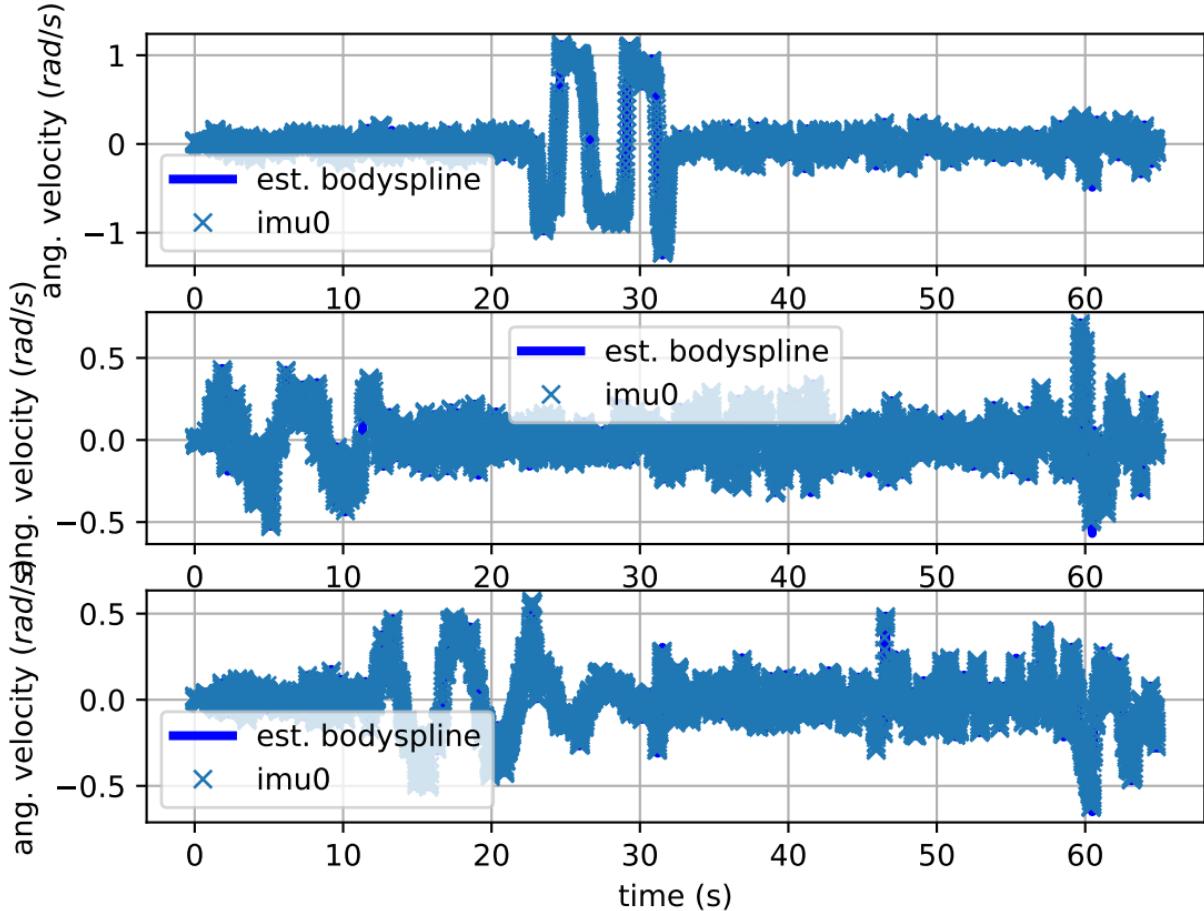
# imu0: acceleration error



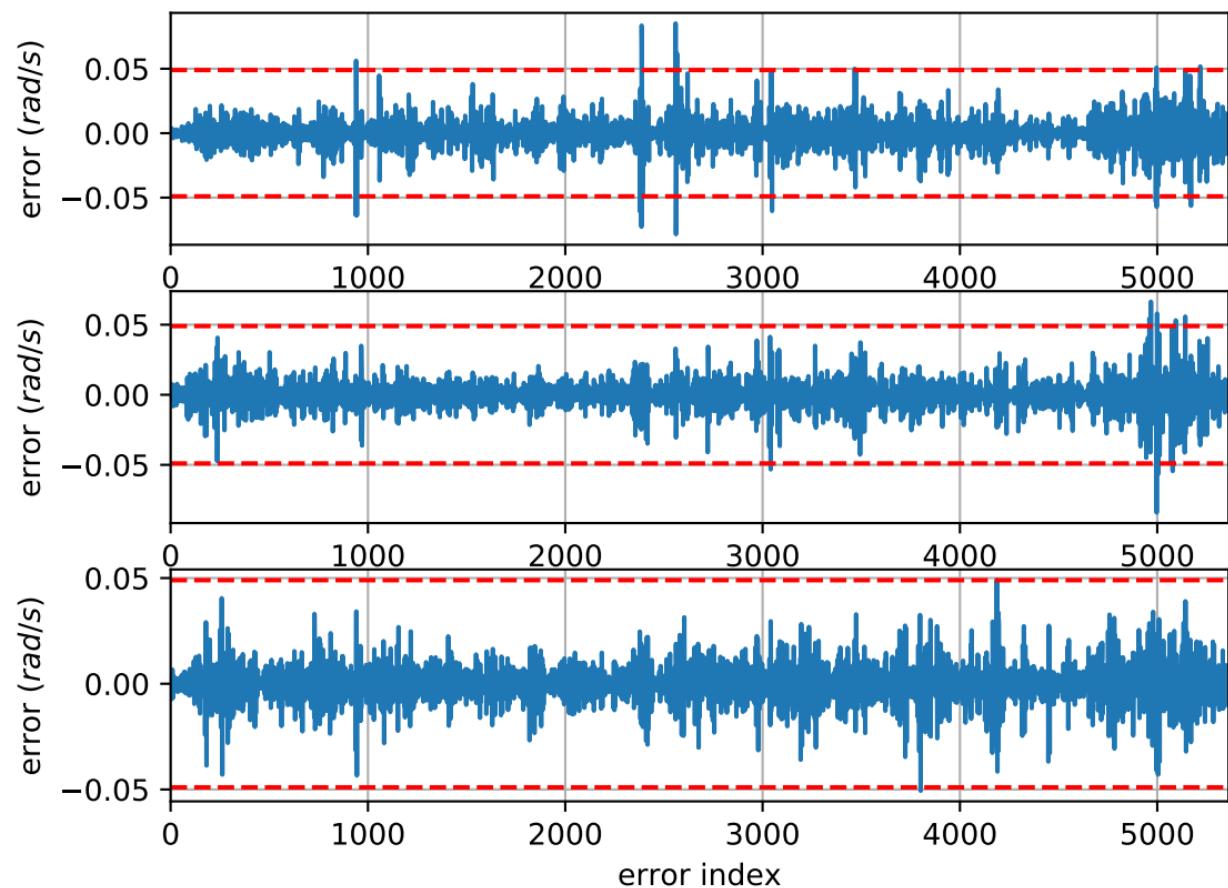
# imu0: estimated accelerometer bias (imu frame)



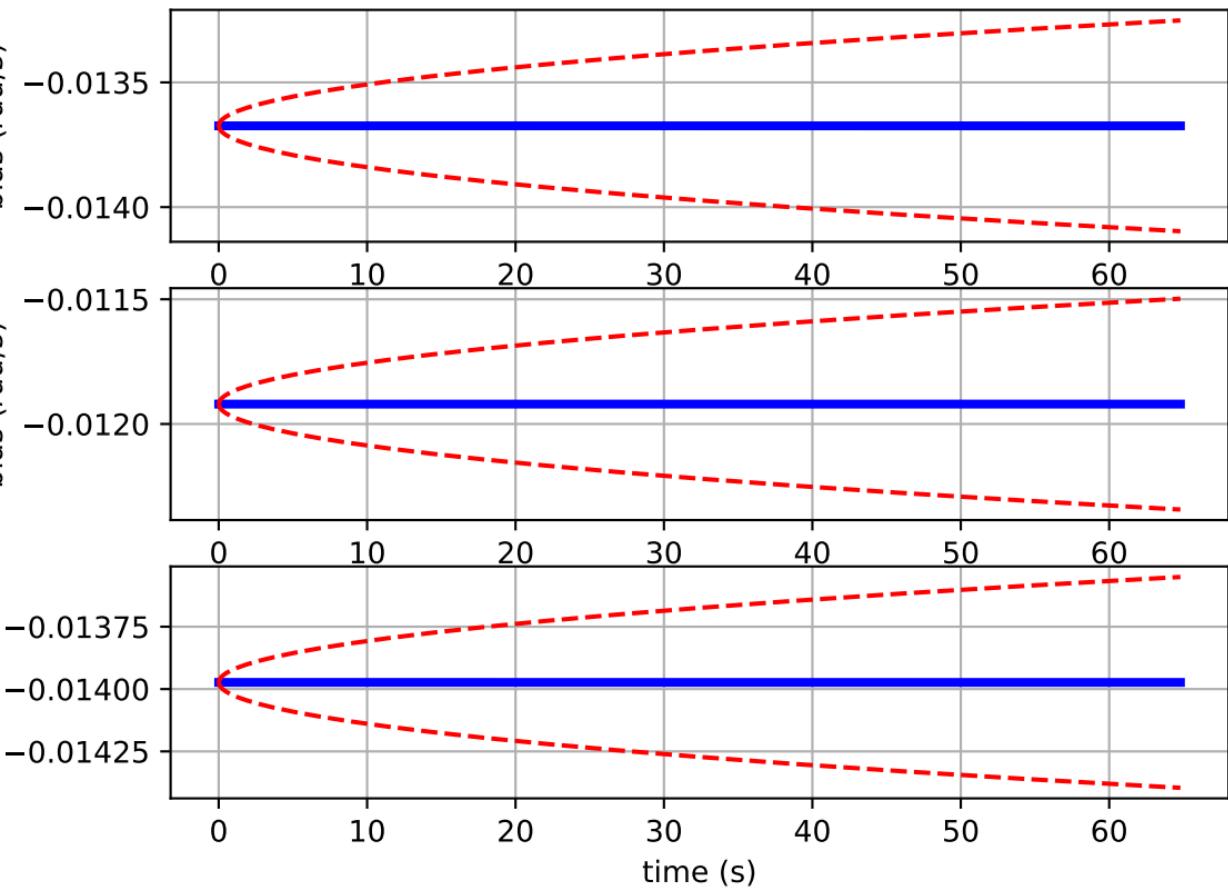
# Comparison of predicted and measured angular velocities (body frame)



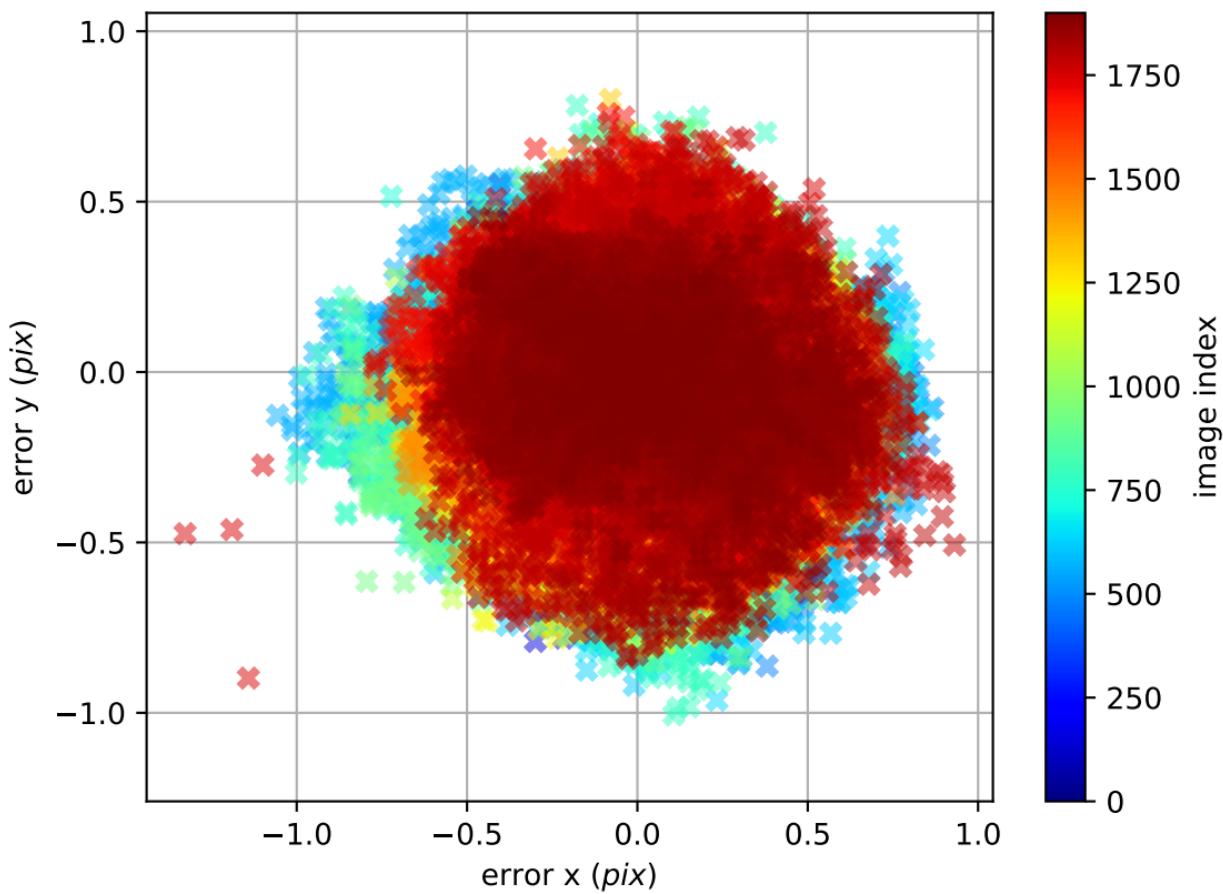
# imu0: angular velocities error



# imu0: estimated gyro bias (imu frame)



cam0: reprojection errors



cam1: reprojection errors

