

## Calibration results

---

### Normalized Residuals

---

Reprojection error (cam0): mean 0.09419959113734602, median 0.08834248348542144, std: 0.04972129  
Reprojection error (cam1): mean 0.09917919613749884, median 0.09423297101812196, std: 0.05020323  
Gyroscope error (imu0): mean 0.018867968332392182, median 0.016739499197281557, std: 0.010912  
Accelerometer error (imu0): mean 0.07319857885442732, median 0.06019691557796636, std: 0.0652028

### Residuals

---

Reprojection error (cam0) [px]: mean 0.09419959113734602, median 0.08834248348542144, std: 0.04972129  
Reprojection error (cam1) [px]: mean 0.09917919613749884, median 0.09423297101812196, std: 0.05020323  
Gyroscope error (imu0) [rad/s]: mean 0.007169827966309029, median 0.006361009694966993, std: 0.00  
Accelerometer error (imu0) [m/s<sup>2</sup>]: mean 0.02781545996468238, median 0.022874827919627215, std: 0.0

### Transformation (cam0):

---

T\_ci: (imu0 to cam0):

```
[[ 0.00670802  0.99992642 -0.01010727 -0.04586423]
 [ 0.00242564  0.0100912   0.99994614  0.01263181]
 [ 0.99997456 -0.00673218 -0.00235777 -0.05098783]
 [ 0.          0.          0.          1.        ]]
```

T\_ic: (cam0 to imu0):

```
[[ 0.00670802  0.00242564  0.99997456  0.05126355]
 [ 0.99992642  0.0100912   -0.00673218  0.04539012]
 [-0.01010727  0.99994614  -0.00235777 -0.01321491]
 [ 0.          0.          0.          1.        ]]
```

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

0.0019071204237431304

### Transformation (cam1):

---

T\_ci: (imu0 to cam1):

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

T\_ic: (cam1 to imu0):

```
[[ 0.00165561  0.00093501  0.99999819  0.05039202]
 [ 0.99998406  0.00539569 -0.00166063 -0.06278317]
 [-0.00539723  0.99998501 -0.00092606 -0.01314327]
 [ 0.      0.      0.      1.      ]]
```

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

```
0.001901867458041627
```

Baselines:

-----

Baseline (cam0 to cam1):

```
[[ 0.99997614  0.00469811 -0.00506377  0.10817339]
 [-0.00470555  0.99998786 -0.00145908  0.00051284]
 [ 0.00505686  0.00148287  0.99998611  0.00069196]
 [ 0.      0.      0.      1.      ]]
```

baseline norm: 0.10817682355861229 [m]

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

```
[-0.01463974 -9.80653393  0.01004427]
```

Calibration configuration

=====

cam0

----

Camera model: pinhole

Focal length: [351.31400364193297, 351.4911744656785]

Principal point: [367.8522793375995, 253.8402144980996]

Distortion model: equidistant

Distortion coefficients: [-0.03696737352869157, -0.008917880497032812, 0.008912969593422046, -0.003

Type: aprilgrid

Tags:

Spacing 0.0375 [m]

cam1

-----  
Camera model: pinhole

Focal length: [352.6489794433894, 352.8586498571586]

Principal point: [347.8170010310082, 270.5806692485468]

Distortion model: equidistant

Distortion coefficients: [-0.039086652082708805, -0.005525347047415151, 0.004398151558986798, -0.00

Type: aprilgrid

Tags:

Rows: 7

Cols: 12

Size: 0.15 [m]

Spacing 0.0375 [m]

IMU configuration

=====

IMU0:

-----  
Model: calibrated

Update rate: 400.0

Accelerometer:

    Noise density: 0.019

    Noise density (discrete): 0.37999999999999995

    Random walk: 0.0043

Gyroscope:

    Noise density: 0.019

    Noise density (discrete): 0.37999999999999995

    Random walk: 0.000266

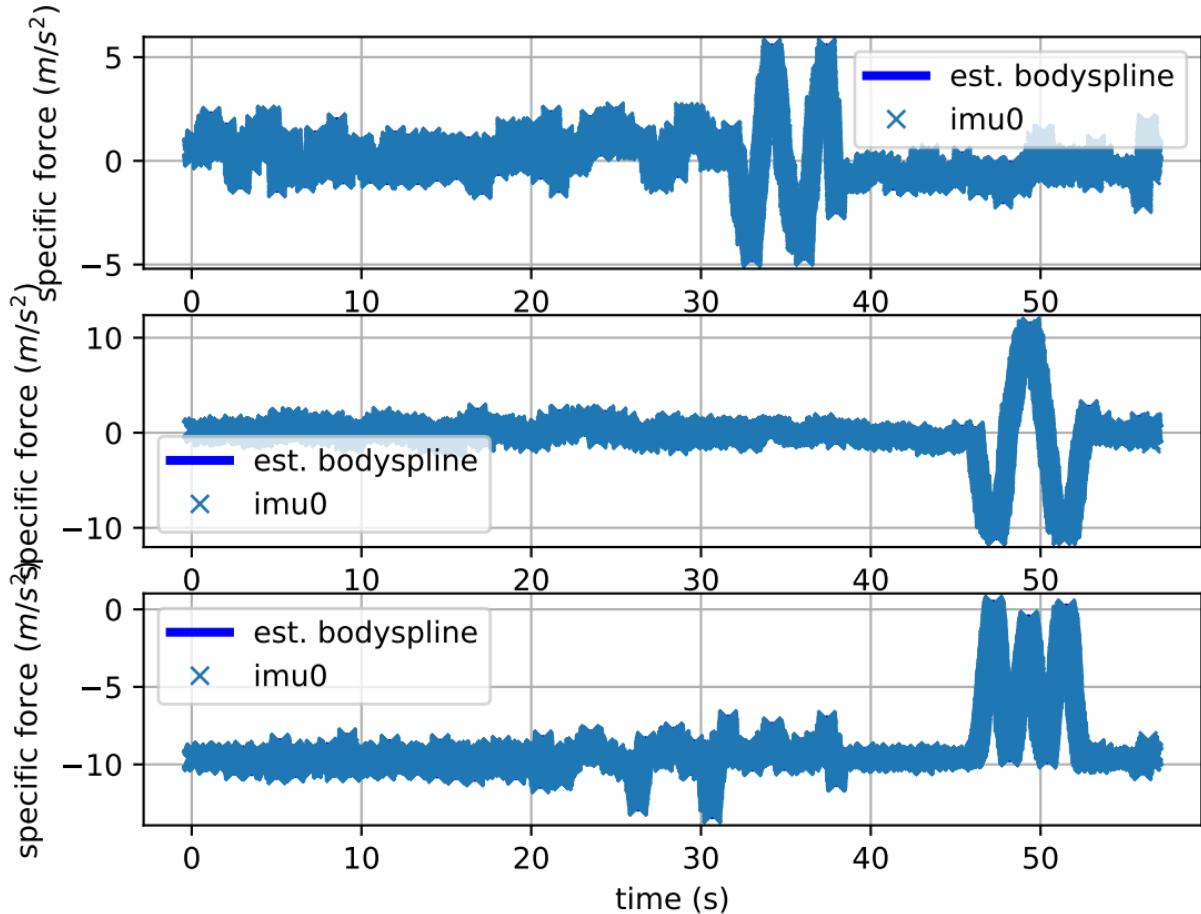
T\_i\_b

[[1. 0. 0. 0.]

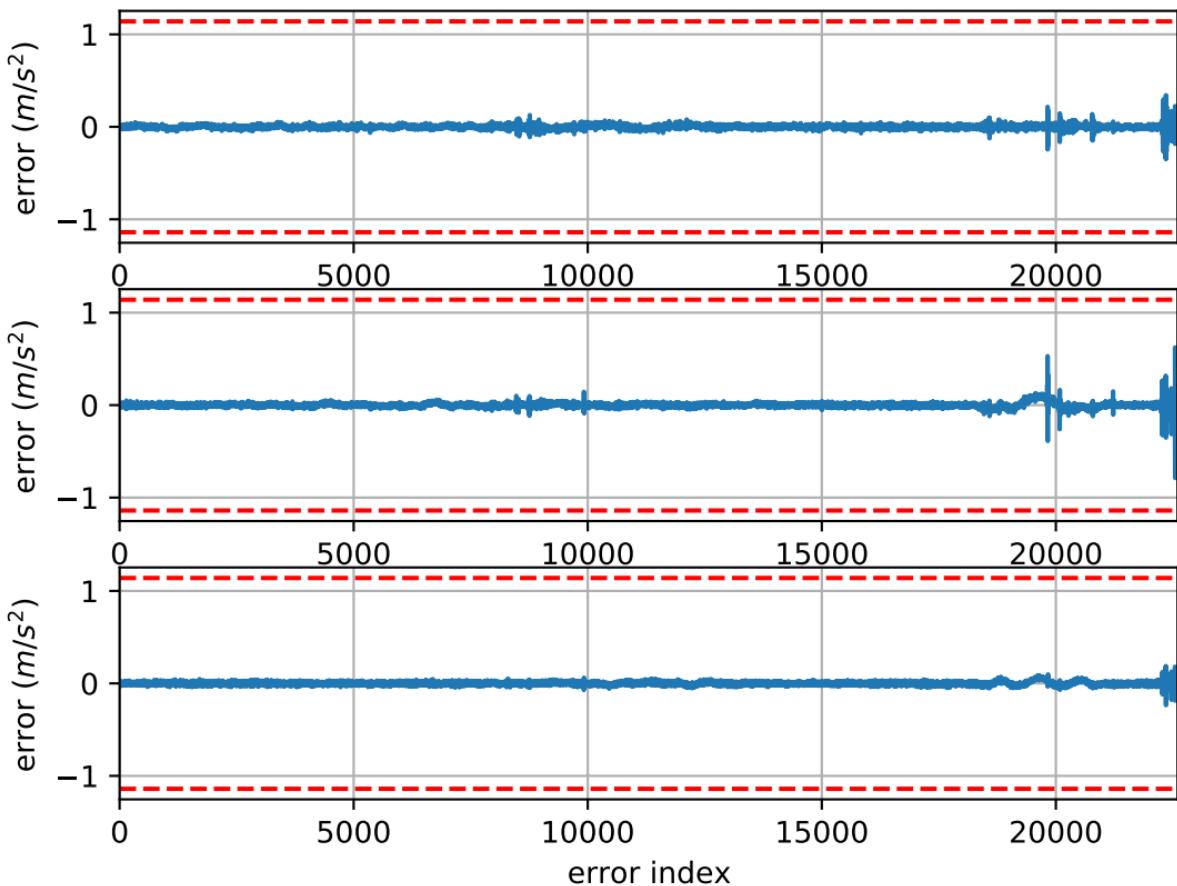
[0. 1. 0. 0.]

[0. 0. 1. 0.]

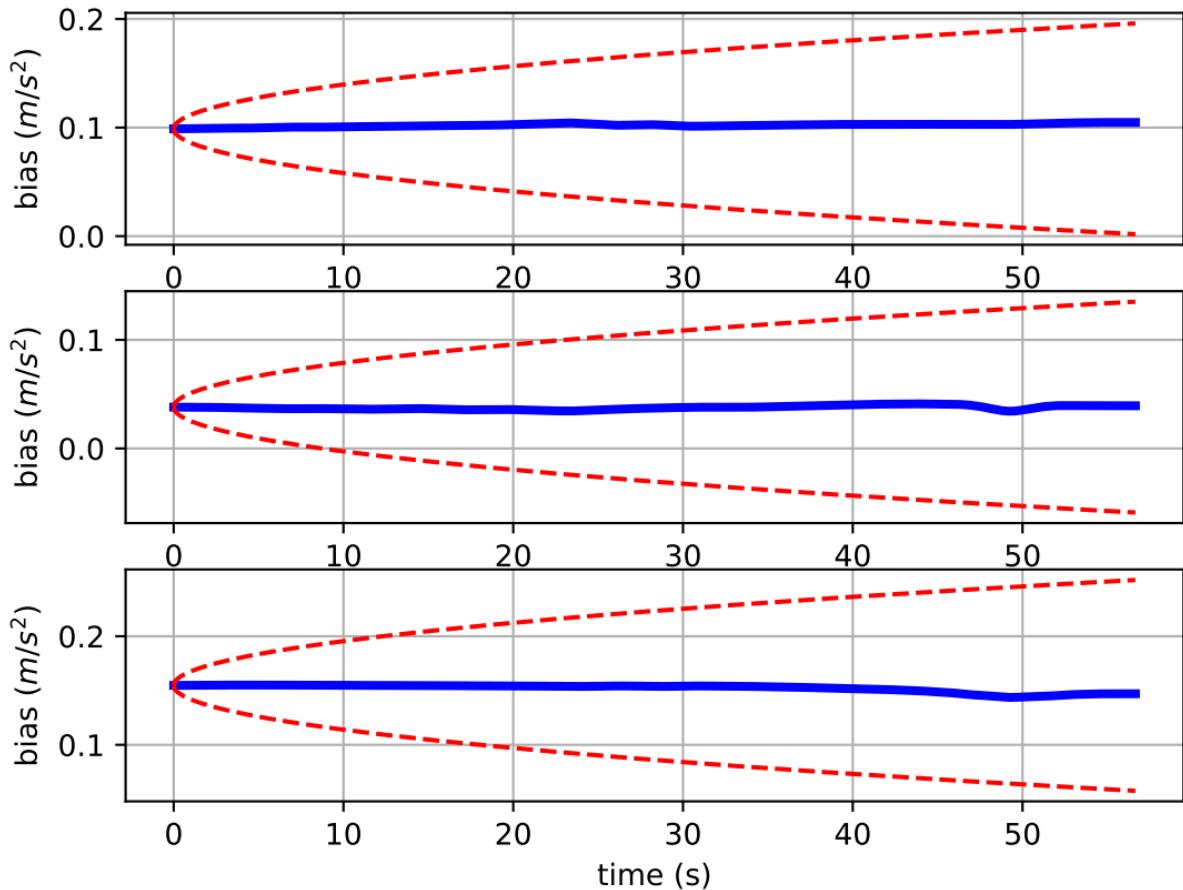
# Comparison of predicted and measured specific force (imu0 frame)



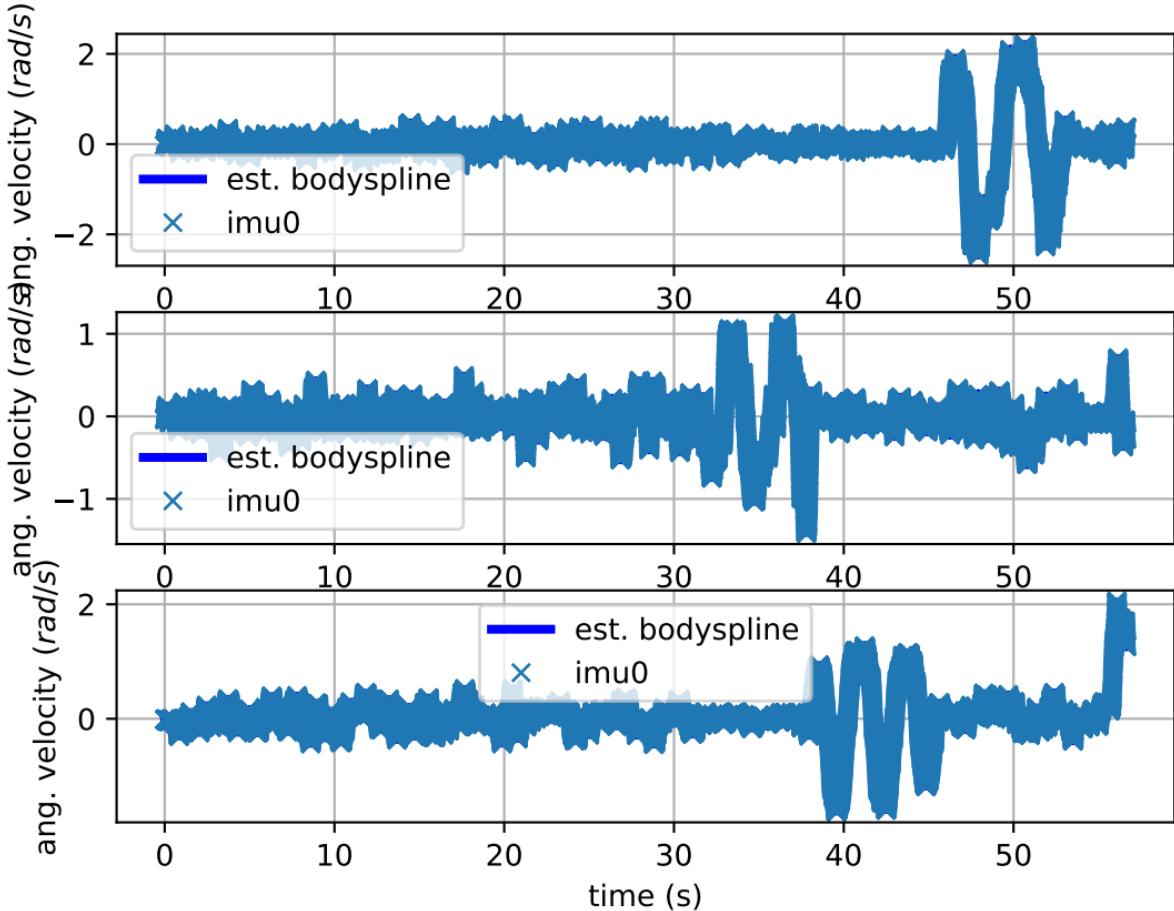
# imu0: acceleration error



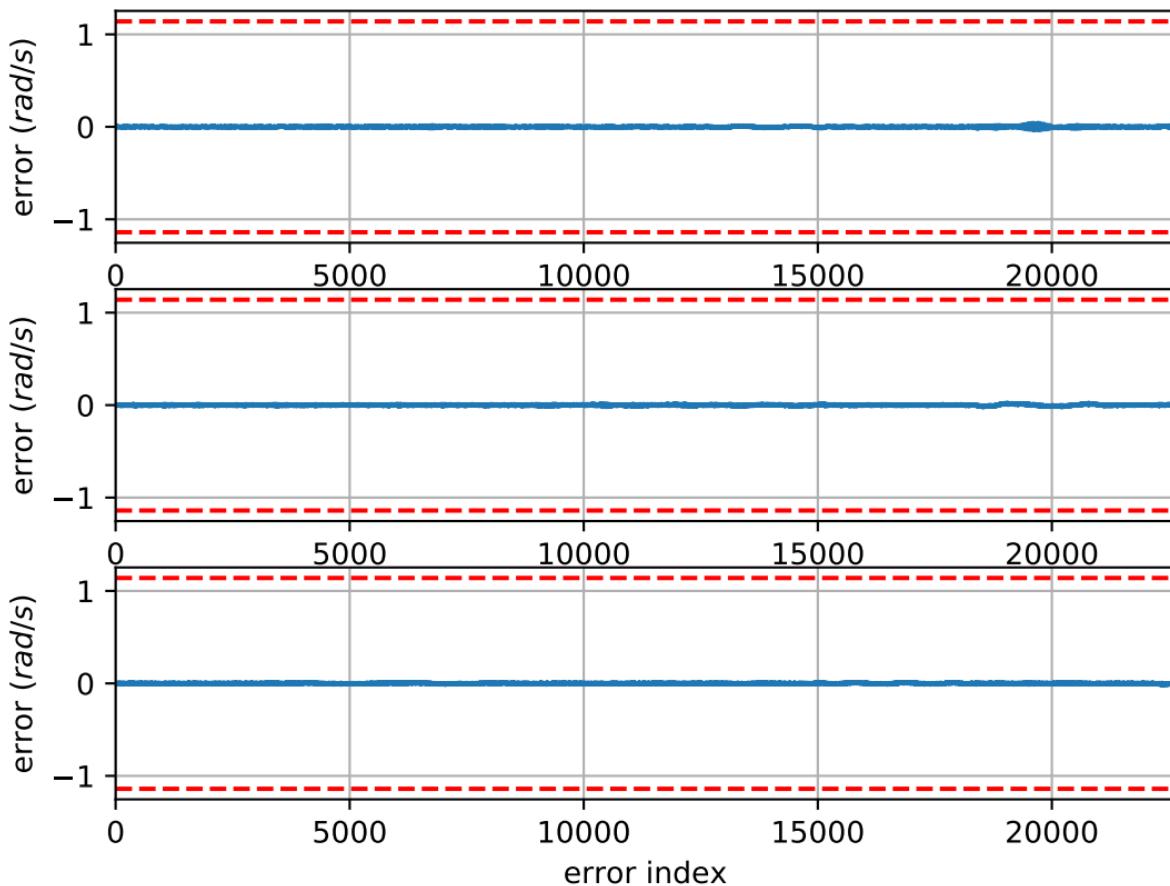
# imu0: estimated accelerometer bias (imu frame)



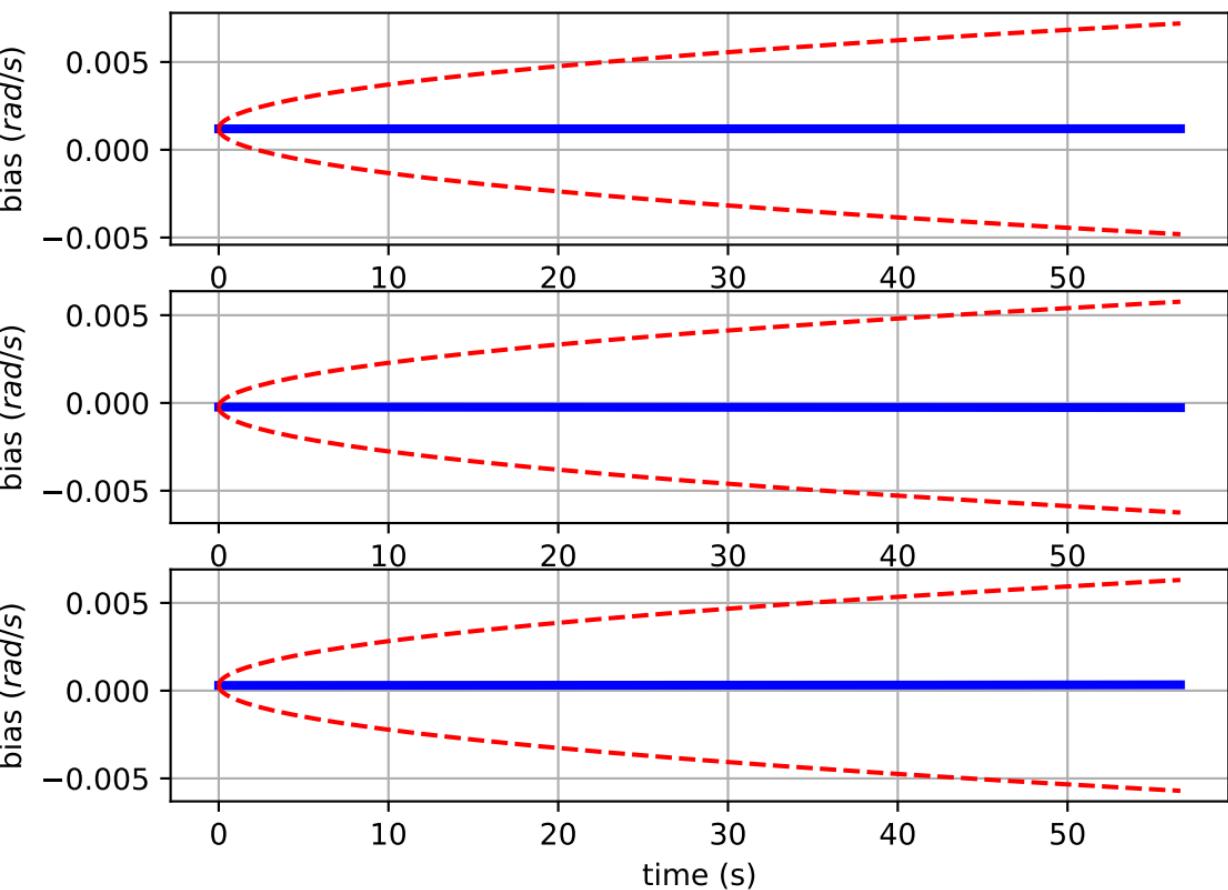
# Comparison of predicted and measured angular velocities (body frame)



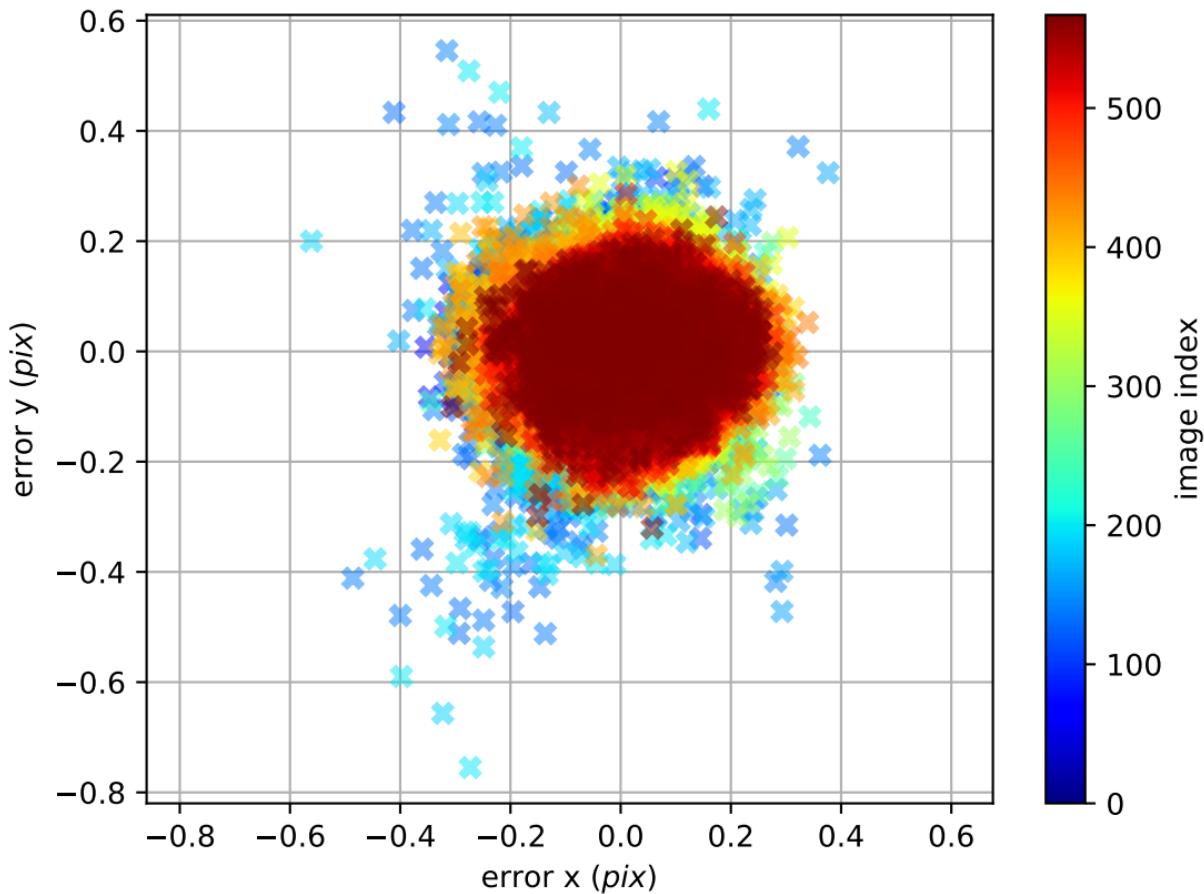
# imu0: angular velocities error



# imu0: estimated gyro bias (imu frame)



cam0: reprojection errors



cam1: reprojection errors

