

## Calibration results

---

### Normalized Residuals

---

Reprojection error (cam0): mean 0.489191446083, median 0.430240210629, std: 0.307137281348

Reprojection error (cam1): mean 0.588306083474, median 0.526549267497, std: 0.347433173697

Gyroscope error (imu0): mean 0.374474809686, median 0.337960975369, std: 0.194315813555

Accelerometer error (imu0): mean 0.130118620448, median 0.112899669889, std: 0.092223425015

### Residuals

---

Reprojection error (cam0) [px]: mean 0.489191446083, median 0.430240210629, std: 0.307137281348

Reprojection error (cam1) [px]: mean 0.588306083474, median 0.526549267497, std: 0.347433173697

Gyroscope error (imu0) [rad/s]: mean 0.0160570991995, median 0.0144914230989, std: 0.008332064570

Accelerometer error (imu0) [m/s<sup>2</sup>]: mean 0.0650566500339, median 0.0564475267847, std: 0.0461098270

### Transformation (cam0):

---

T\_ci: (imu0 to cam0):

```
[[-0.00815187 0.99966053 -0.02474616 0.02200964]
 [ 0.99994041 -0.00796945 0.00746115 -0.00185234]
 [ 0.0072614 -0.02480551 -0.99966592 -0.02307056]
 [ 0.          0.          0.          1.        ]]
```

T\_ic: (cam0 to imu0):

```
[[-0.00815187 0.99994041 0.0072614 0.00184034]
 [ 0.99966053 -0.00796945 -0.02480551 -0.02258921]
 [-0.02474616 0.00746115 -0.99966592 -0.02250438]
 [ 0.          0.          0.          1.        ]]
```

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

0.00463637286291

### Transformation (cam1):

---

T\_ci: (imu0 to cam1):

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

T\_ic: (cam1 to imu0):

```
[[ 0.00853398  0.99986026  0.01437475  0.00303737]
 [ 0.9997126 -0.0082089 -0.02252396  0.09750063]
 [-0.02240281  0.01456284 -0.99964296 -0.02311995]
 [ 0.      0.      0.      1.      ]]
```

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

```
0.00426963662875
```

Baselines:

```
=====
```

Baseline (cam0 to cam1):

```
[[ 0.99999718  0.00039916 -0.00234109 -0.12007933]
 [-0.00041576  0.99997475 -0.00709396 -0.00020209]
 [ 0.0023382  0.00709492  0.9999721  0.00207234]
 [ 0.      0.      0.      1.      ]]
```

```
baseline norm: 0.120097379352 [m]
```

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

```
[ 0.08006638 -9.80619915 -0.02169278]
```

Calibration configuration

```
=====
```

cam0

```
====
```

Camera model: pinhole

Focal length: [526.8317903597064, 529.3031843485312]

Principal point: [638.3784593472517, 362.9824564554476]

Distortion model: radtan

Distortion coefficients: [-0.06149950304026363, 0.01482239483103718, -4.2262668598600376e-05, -0.00

Type: aprilgrid

Tags:

Spacing 0.00624 [m]

cam1

-----  
Camera model: pinhole

Focal length: [524.9031086062662, 529.9497896073701]

Principal point: [656.2080381510465, 343.62999148021566]

Distortion model: radtan

Distortion coefficients: [-0.038530979257722586, -0.0011187957905845088, 0.00016590790457398838, -]

Type: aprilgrid

Tags:

Rows: 6

Cols: 6

Size: 0.0208 [m]

Spacing 0.00624 [m]

IMU configuration

=====

IMU0:

-----  
Model: calibrated

Update rate: 400.0

Accelerometer:

    Noise density: 0.0249989777828

    Noise density (discrete): 0.499979555655

    Random walk: 0.000383377122126

Gyroscope:

    Noise density: 0.00214394917684

    Noise density (discrete): 0.0428789835368

    Random walk: 1.71694027056e-05

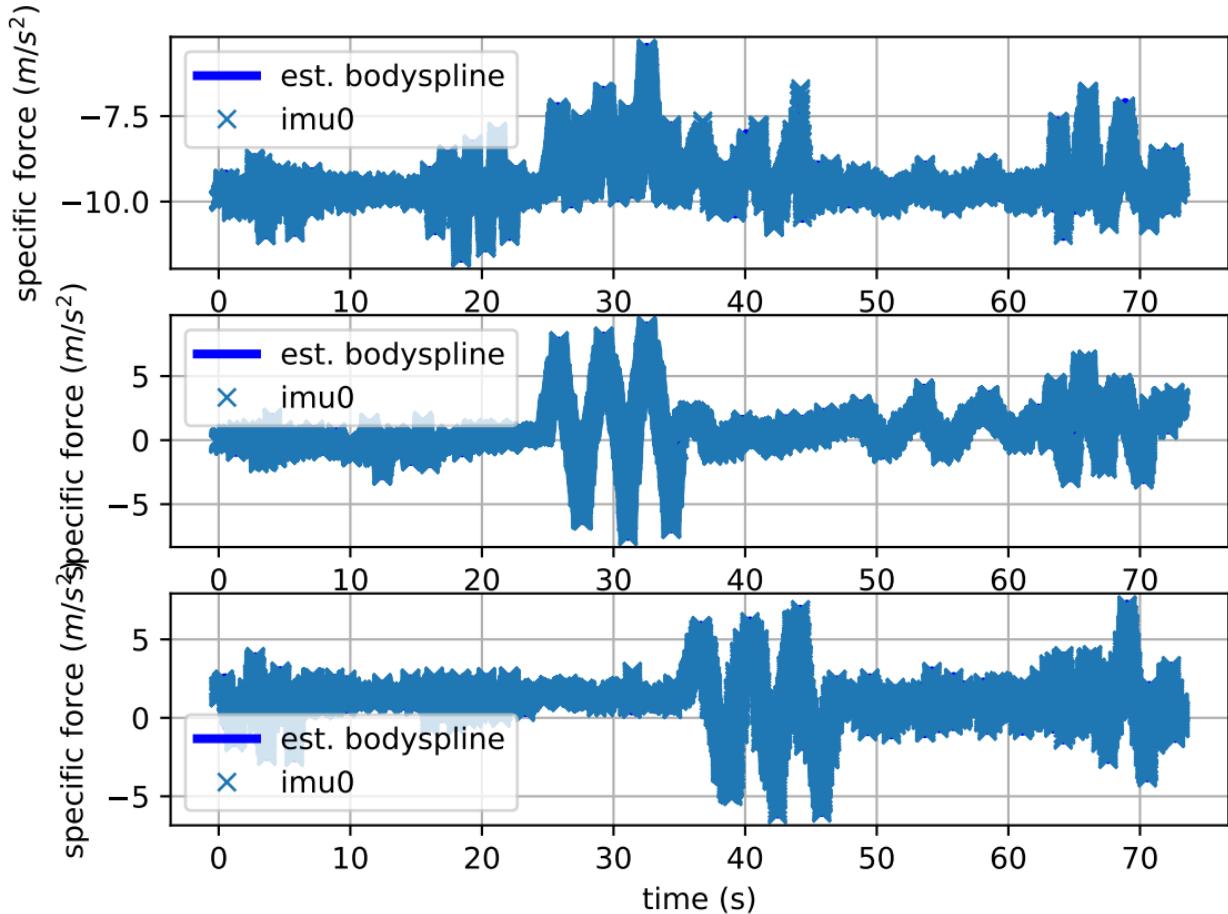
T\_i\_b

[[ 1. 0. 0. 0.]

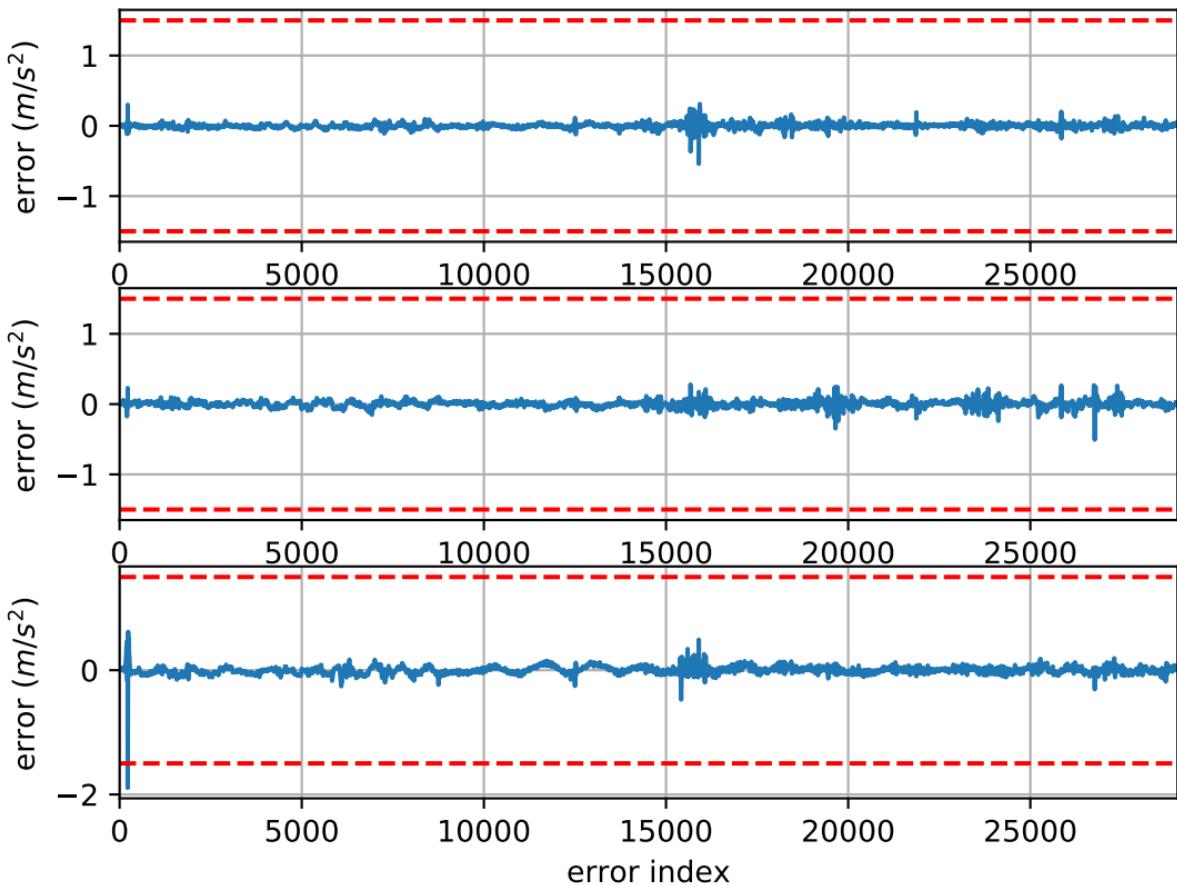
[ 0. 1. 0. 0.]



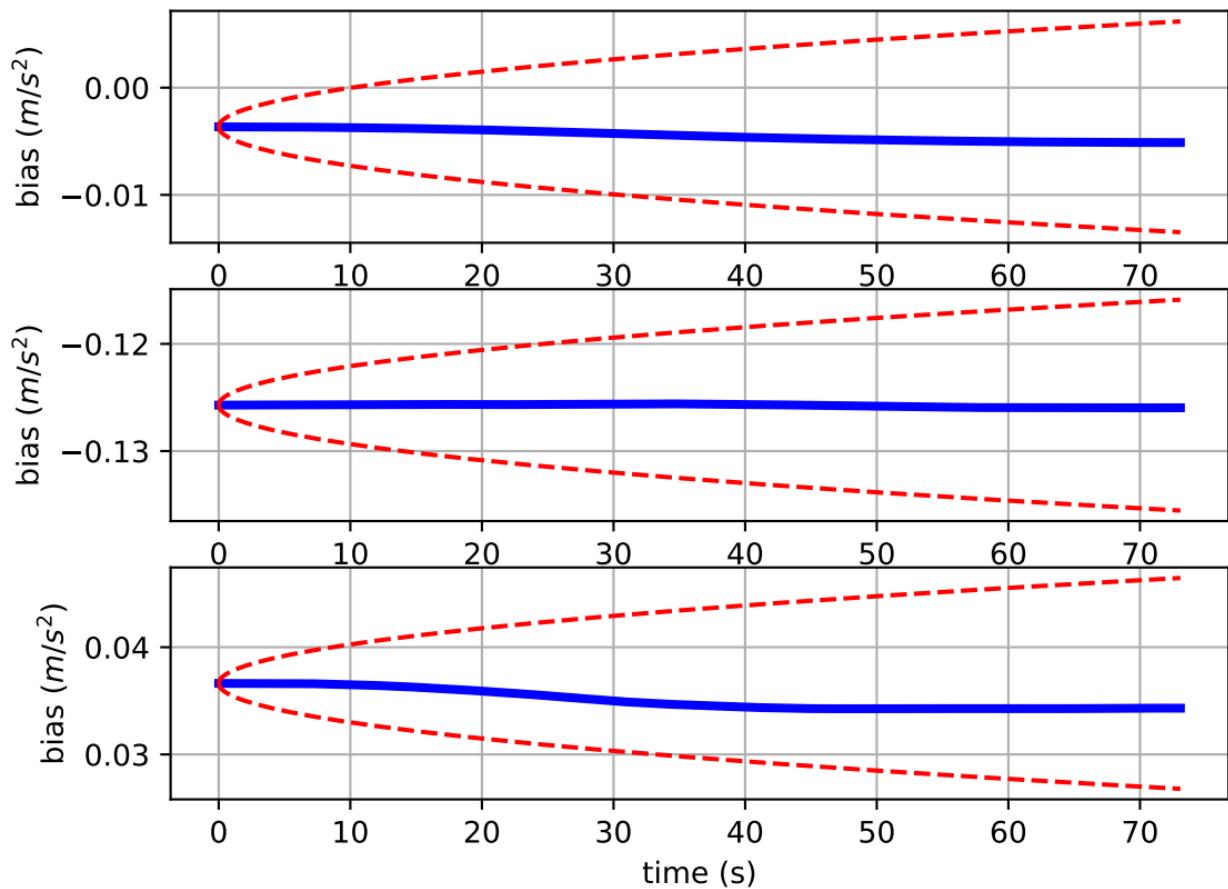
# Comparison of predicted and measured specific force (imu0 frame)



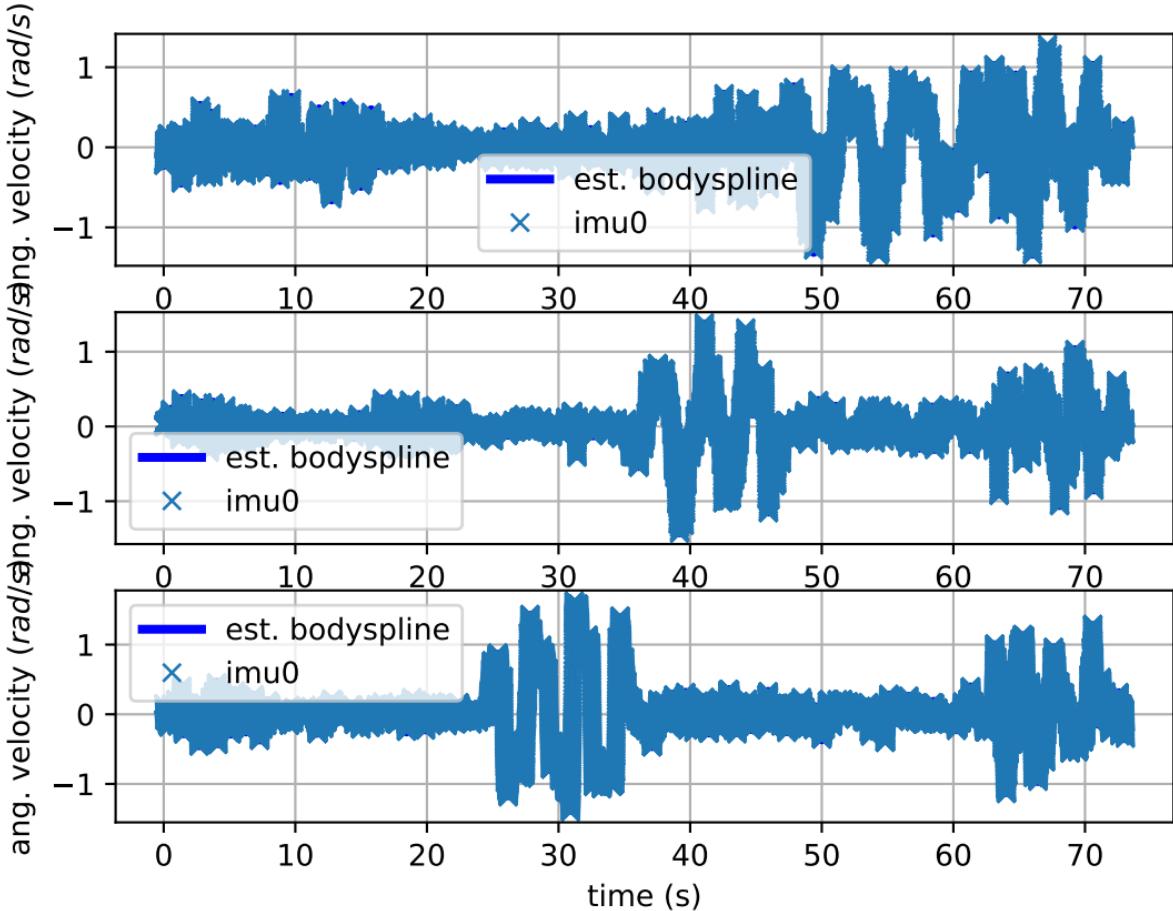
# imu0: acceleration error



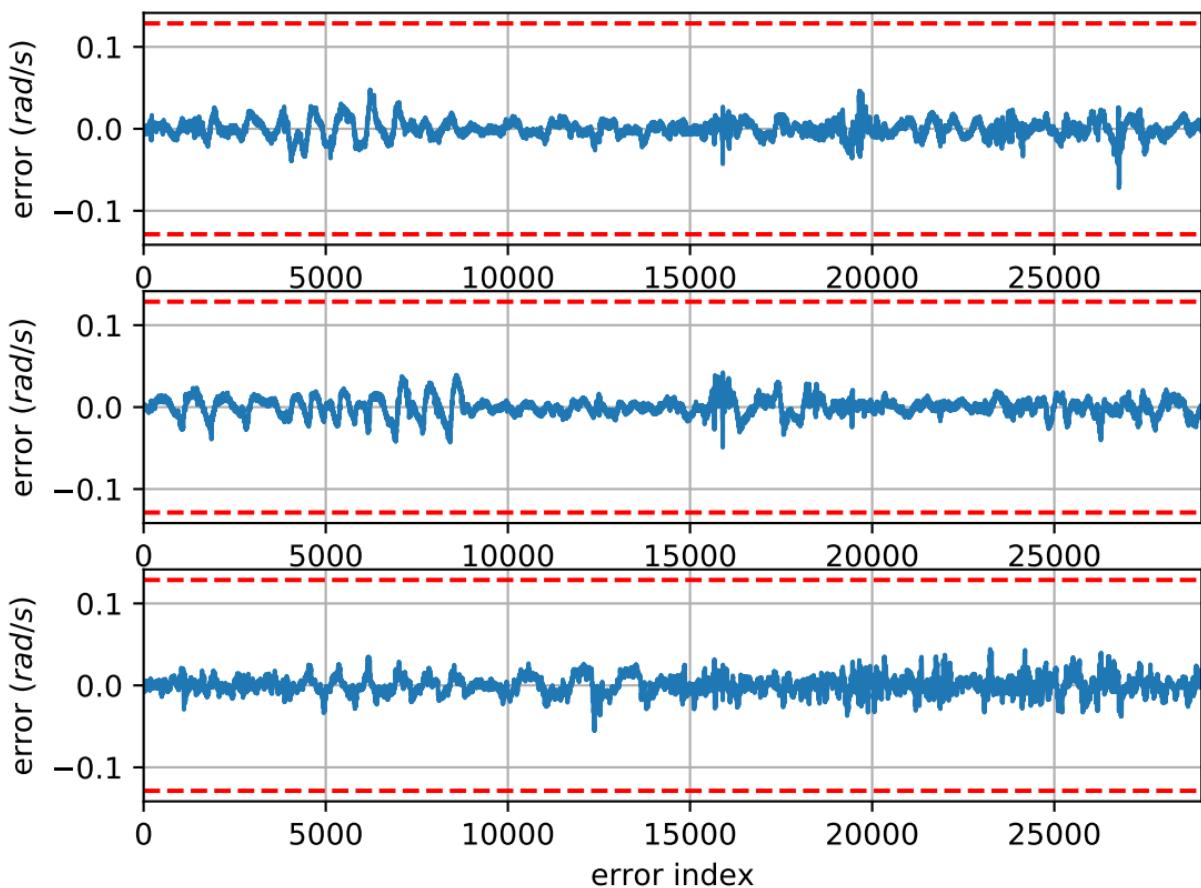
# imu0: estimated accelerometer bias (imu frame)



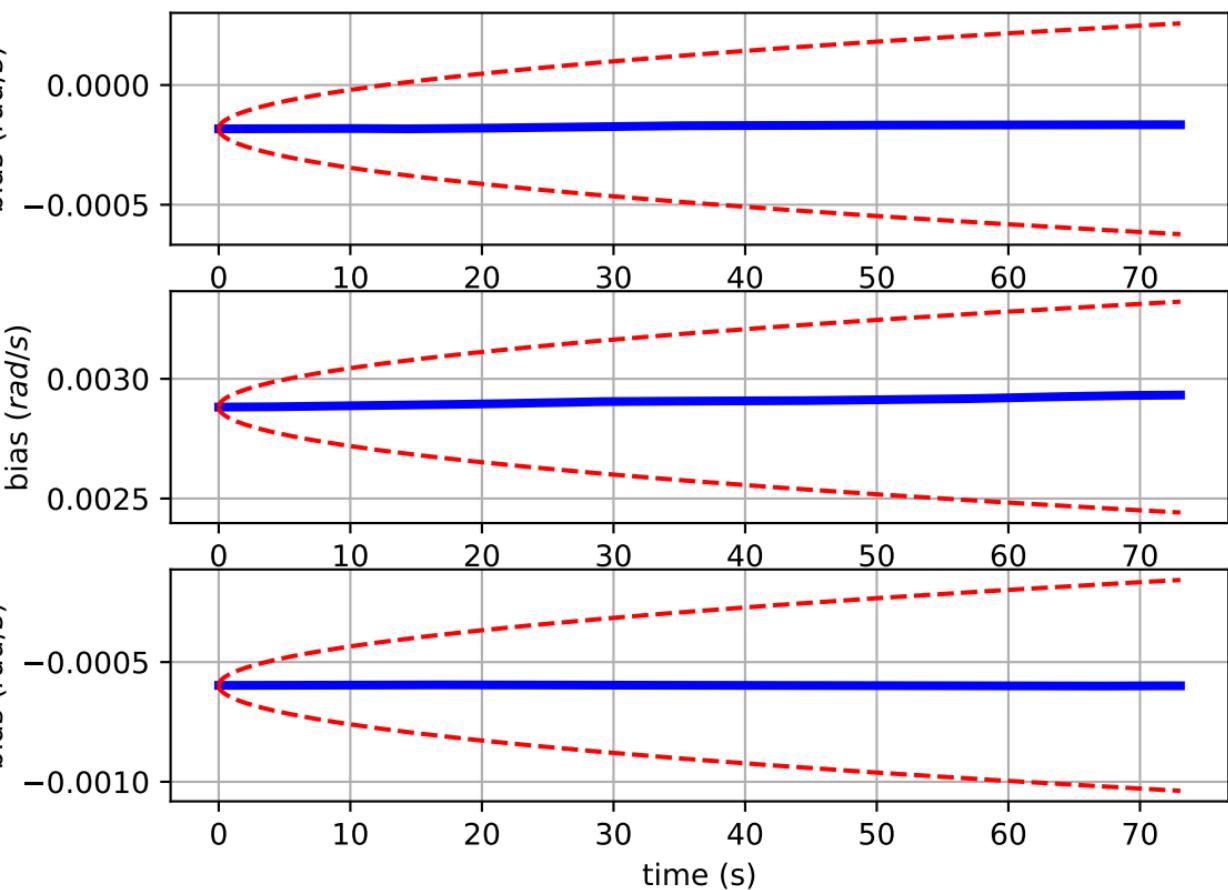
# Comparison of predicted and measured angular velocities (body frame)



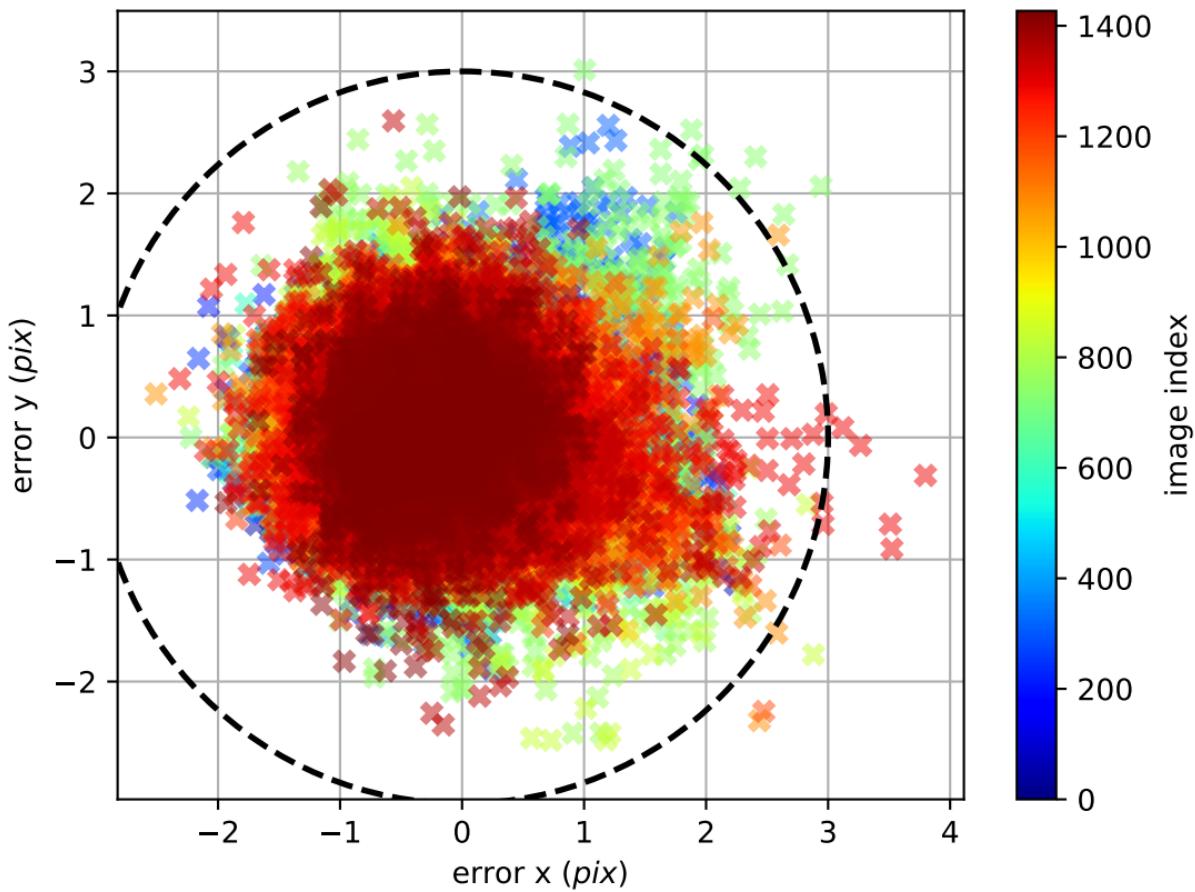
# imu0: angular velocities error



# imu0: estimated gyro bias (imu frame)



cam0: reprojection errors



cam1: reprojection errors

