

## Calibration results

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### Normalized Residuals

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Reprojection error (cam0): mean 0.11002008886168332, median 0.09492566038613186, std: 0.07565384579239917  
Reprojection error (cam1): mean 0.11057867599371686, median 0.0948825246135488, std: 0.07564423851989925  
Gyroscope error (imu0): mean 0.1306707587924305, median 0.11313083829923565, std: 0.08637805492944277  
Accelerometer error (imu0): mean 0.15752378191453814, median 0.13816225180914463, std: 0.10374494262789322

### Residuals

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Reprojection error (cam0) [px]: mean 0.11002008886168332, median 0.09492566038613186, std: 0.07565384579239917  
Reprojection error (cam1) [px]: mean 0.11057867599371686, median 0.0948825246135488, std: 0.07564423851989925  
Gyroscope error (imu0) [rad/s]: mean 0.0028290675510437755, median 0.002449322148371026, std: 0.001870115047784656  
Accelerometer error (imu0) [m/s<sup>2</sup>]: mean 0.04586471868080775, median 0.0402274039799987, std: 0.030206439626788293

### Transformation (cam0):

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T\_ci: (imu0 to cam0):

```
[[-0.01155887 -0.9999145  0.00611473  0.03110952]
 [-0.06645319 -0.00686978 -0.99776589  0.05296884]
 [ 0.99772259  0.01112671 -0.06652692 -0.11707943]
 [ 0.          0.          1.          ]]
```

T\_ic: (cam0 to imu0):

```
[[-0.01155887 -0.06645319  0.99772259  0.11997315]
 [-0.9999145 -0.00686978  0.01112671  0.03277345]
 [ 0.00611473 -0.99776589 -0.06652692  0.04487134]
 [ 0.          0.          1.          ]]
```

timeshift cam0 to imu0: [s] (t\_imu = t\_cam + shift)  
-0.00231305547747402

### Transformation (cam1):

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T\_ci: (imu0 to cam1):  
[[ 0.01363583 -0.99988989 0.00585456 -0.01833475]  
[-0.06711659 -0.00675716 -0.99772226 0.05291726]  
[ 0.99765196 0.01321184 -0.06720134 -0.11645752]  
[ 0. 0. 0. 1. ]]

T\_ic: (cam1 to imu0):  
[[ 0.01363583 -0.06711659 0.99765196 0.11998571]  
[-0.99988989 -0.00675716 0.01321184 -0.01643655]  
[ 0.00585456 -0.99772226 -0.06720134 0.04507797]  
[ 0. 0. 0. 1. ]]

timeshift cam1 to imu0: [s] (t\_imu = t\_cam + shift)  
-0.002299837425766094

Baselines:

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Baseline (cam0 to cam1):  
[[ 0.99999781 0.0001214 0.00208981 -0.04920596]  
[-0.00012001 0.99999977 -0.00066353 -0.00012551]  
[-0.00208989 0.00066328 0.9999976 0.00065151]  
[ 0. 0. 0. 1. ]]  
baseline norm: 0.049210432850790006 [m]

Gravity vector in target coords: [m/s^2]  
[-0.00924943 -0.07839287 -9.8062323 ]

Calibration configuration

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cam0

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Camera model: pinhole  
Focal length: [385.1048541260792, 386.1493637186055]  
Principal point: [316.0189526750673, 233.82710209510972]  
Distortion model: radtan  
Distortion coefficients: [0.010121763654427225, -0.01020820853597662, 0.000569816494845386,  
-0.0027521929862397566]  
Type: aprilgrid  
Tags:  
Rows: 5  
Cols: 5  
Size: 0.03 [m]  
Spacing 0.006 [m]

cam1

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Camera model: pinhole  
Focal length: [385.70371566200026, 386.77204606802354]  
Principal point: [315.60963351967337, 235.3014977391023]  
Distortion model: radtan  
Distortion coefficients: [0.006544181850115668, -0.005394164356124324, 0.0006663626241476452,  
-0.003198489086604299]  
Type: aprilgrid  
Tags:  
Rows: 5  
Cols: 5  
Size: 0.03 [m]  
Spacing 0.006 [m]

IMU configuration

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IMU0:

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Model: calibrated  
Update rate: 200.0

Accelerometer:

Noise density: 0.02058816338856536

Noise density (discrete): 0.2911605988846235

Random walk: 0.0007836847078940729

Gyroscope:

Noise density: 0.0015309108696273642

Noise density (discrete): 0.021650349146114075

Random walk: 2.0703289176602875e-05

T\_ib (imu0 to imu0)

[[1. 0. 0. 0.]

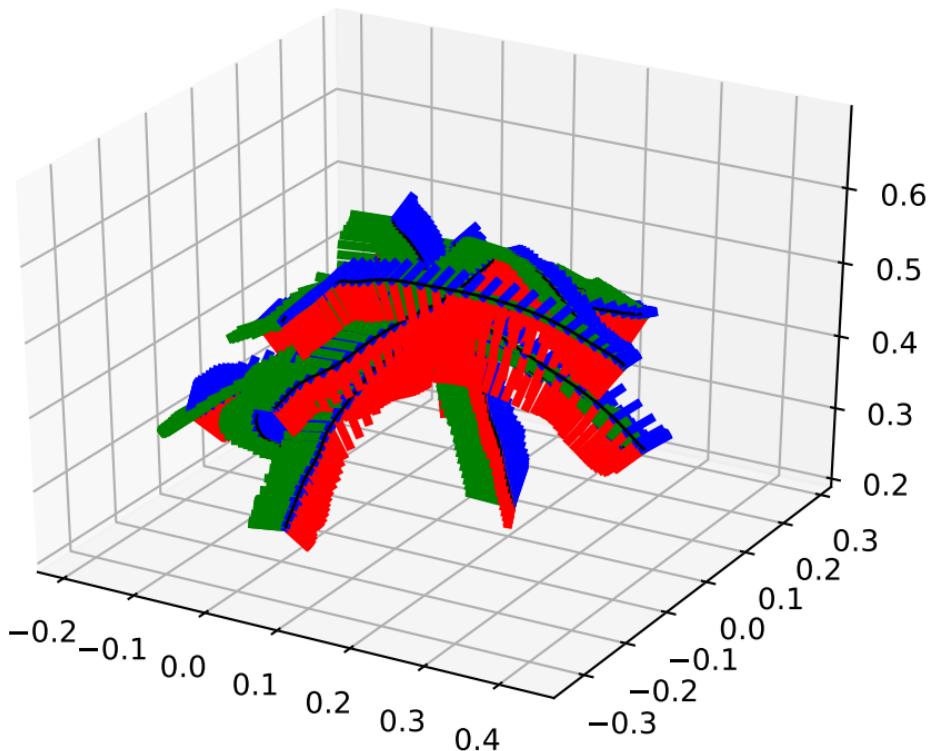
[0. 1. 0. 0.]

[0. 0. 1. 0.]

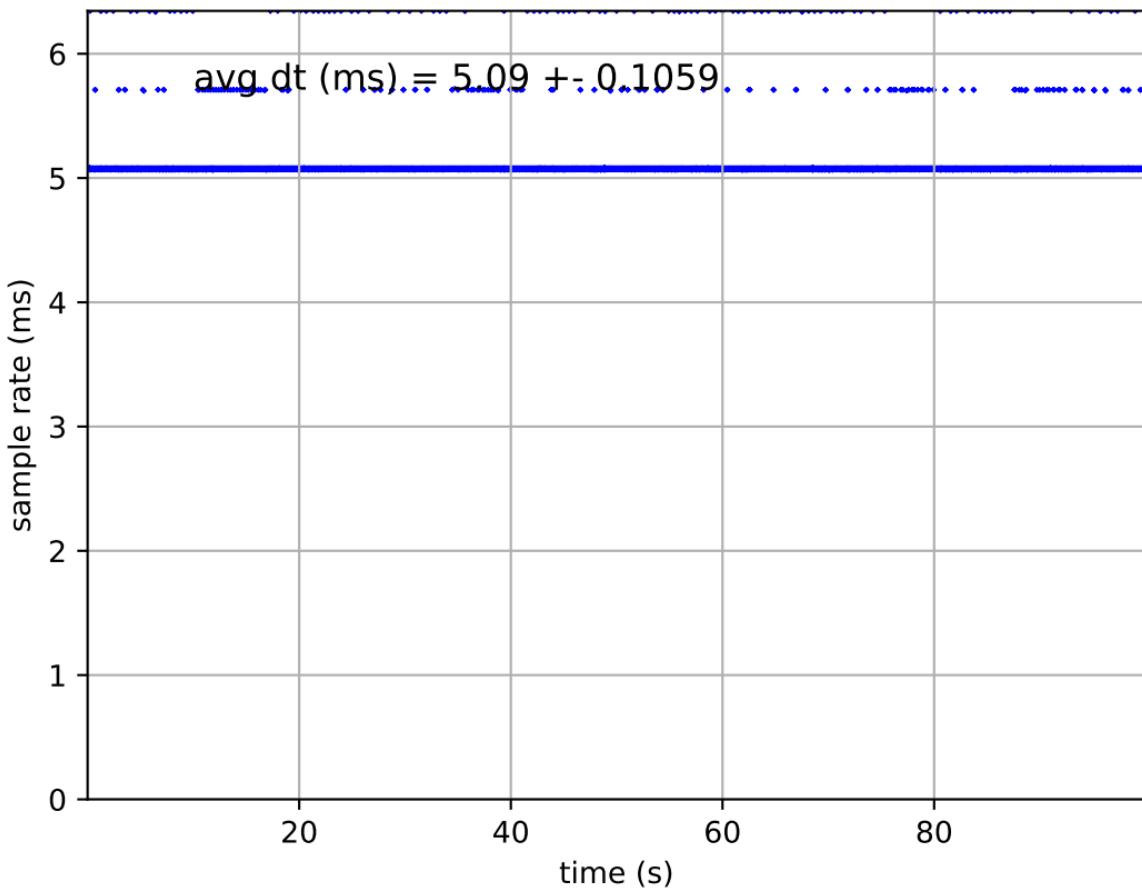
[0. 0. 0. 1.]]

time offset with respect to IMU0: 0.0 [s]

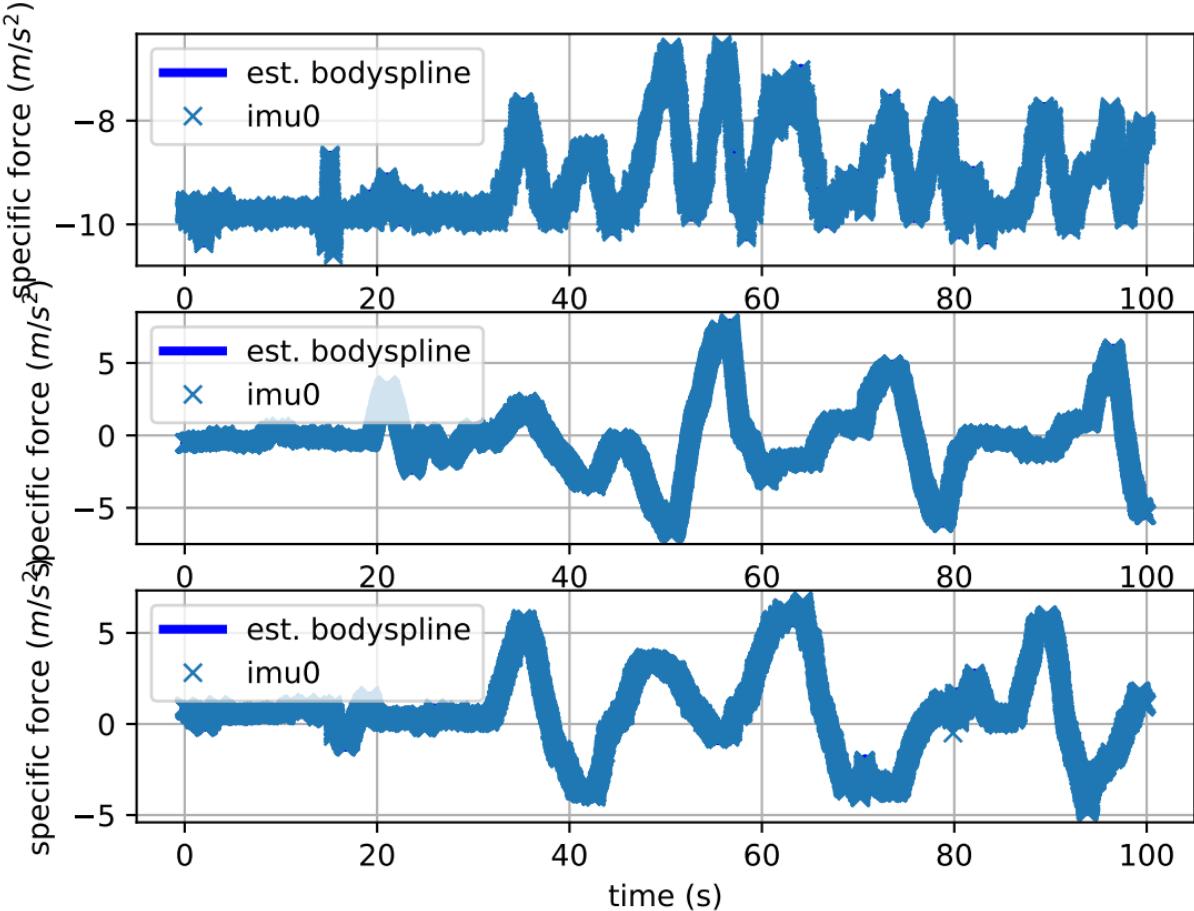
imu0: estimated poses



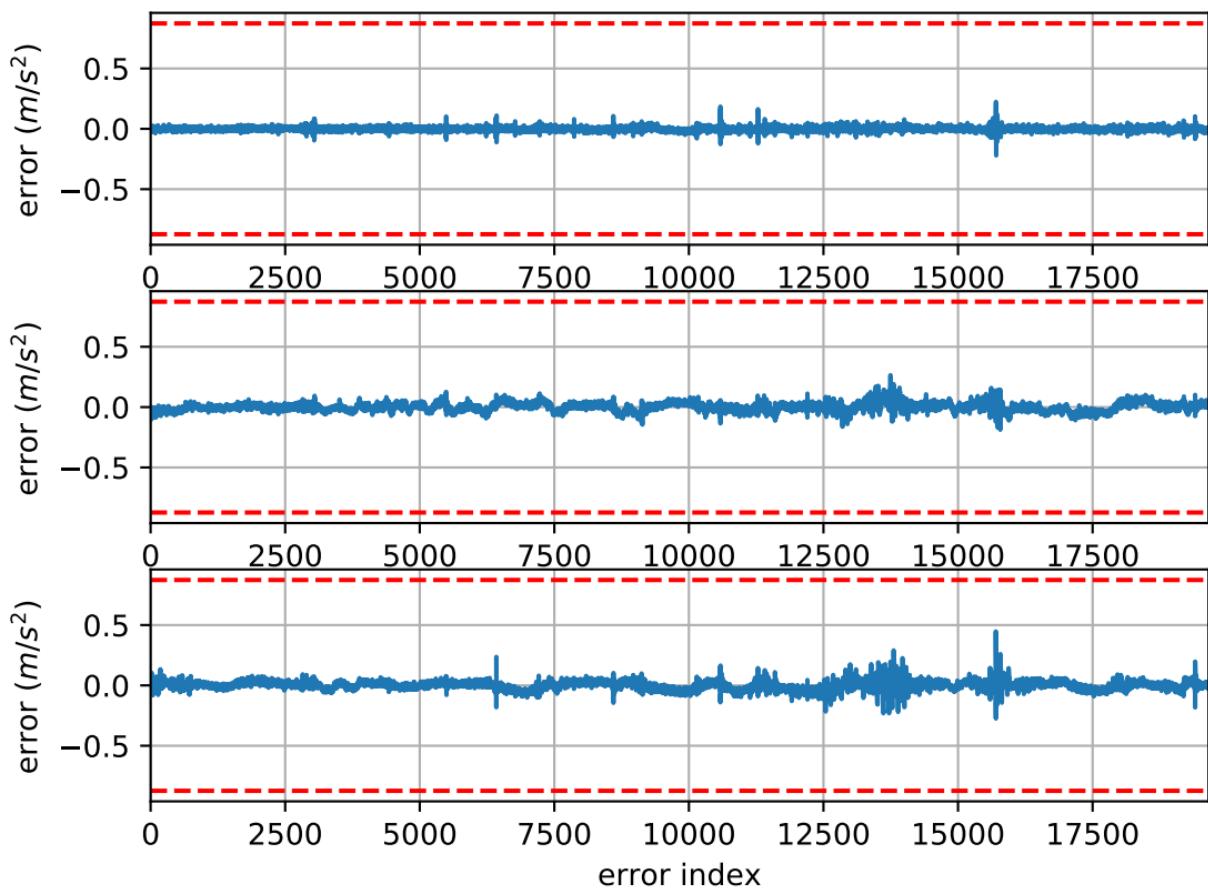
# imu0: sample inertial rate



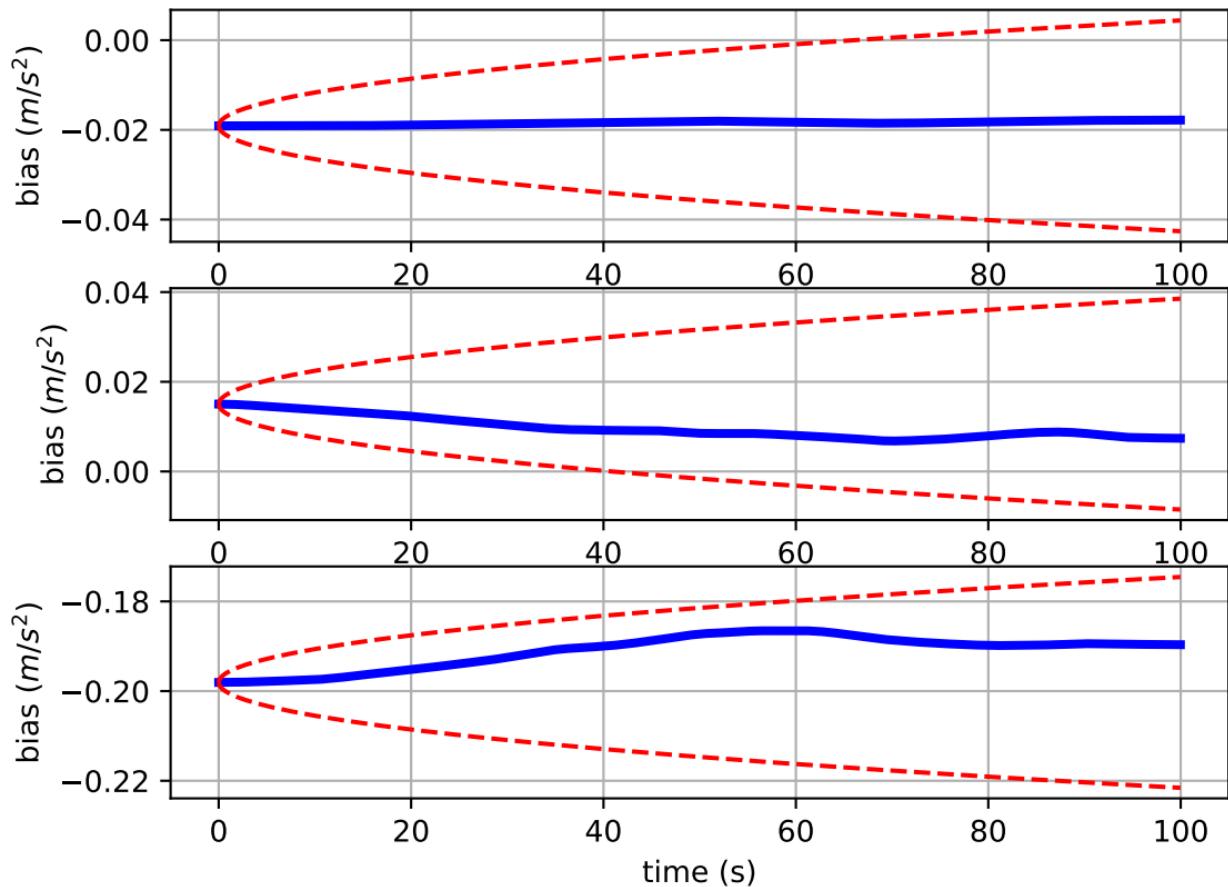
# Comparison of predicted and measured specific force (imu0 frame)



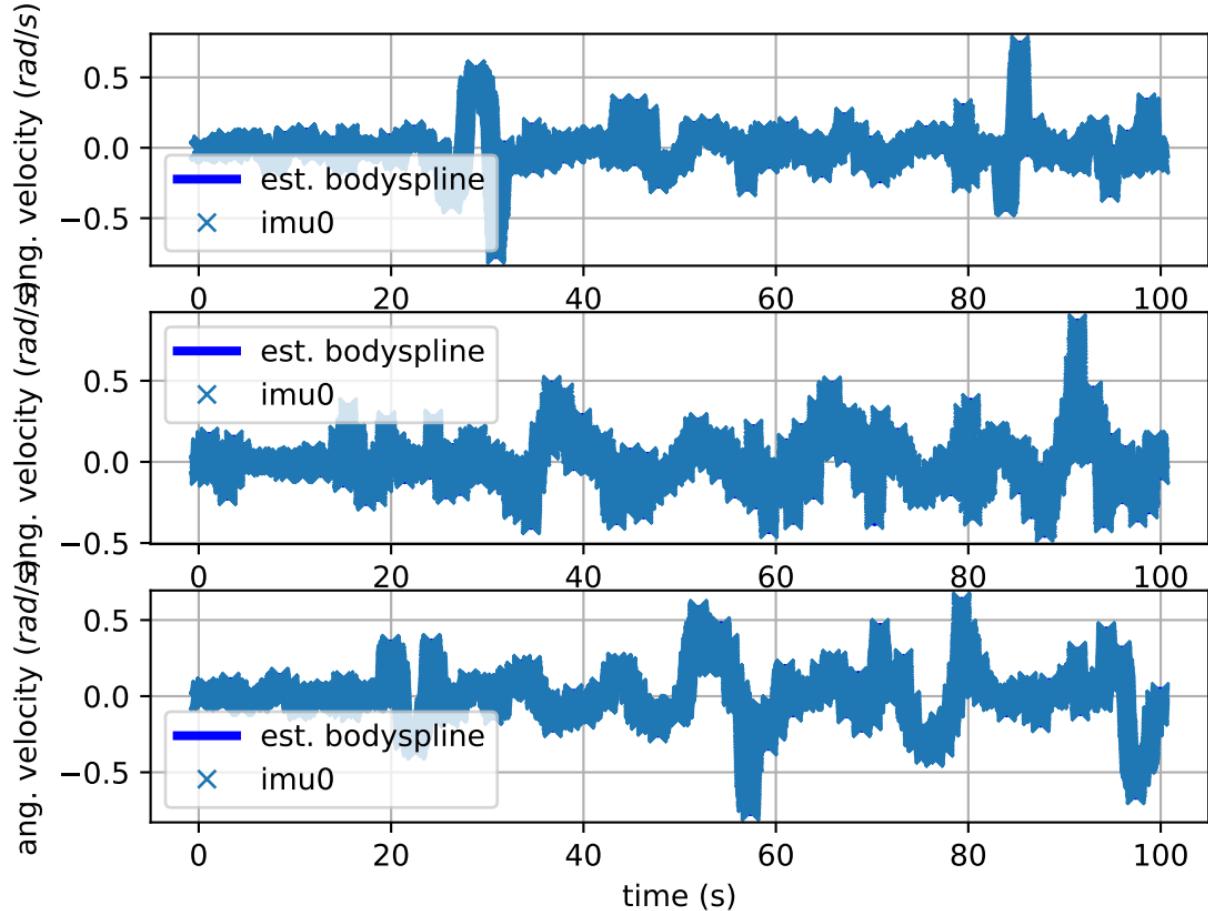
# imu0: acceleration error



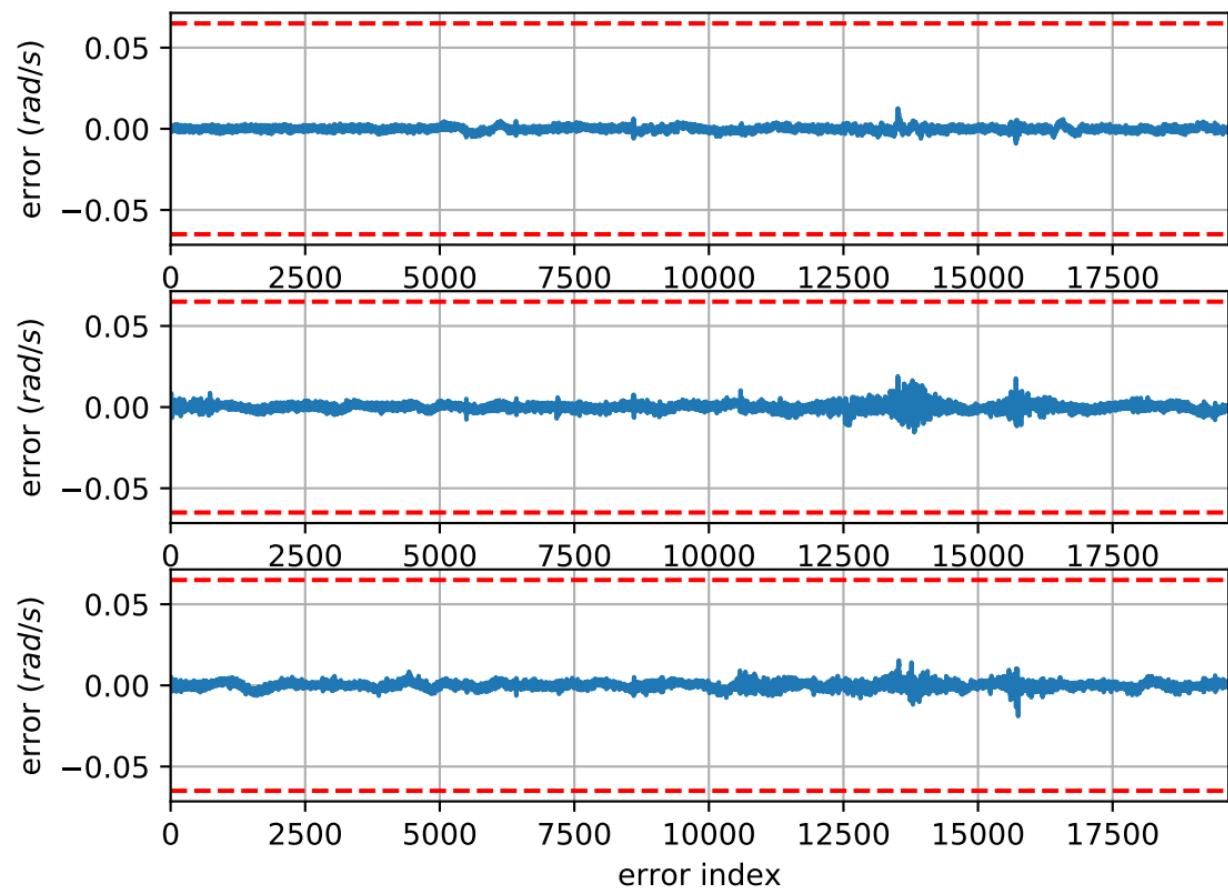
# imu0: estimated accelerometer bias (imu frame)



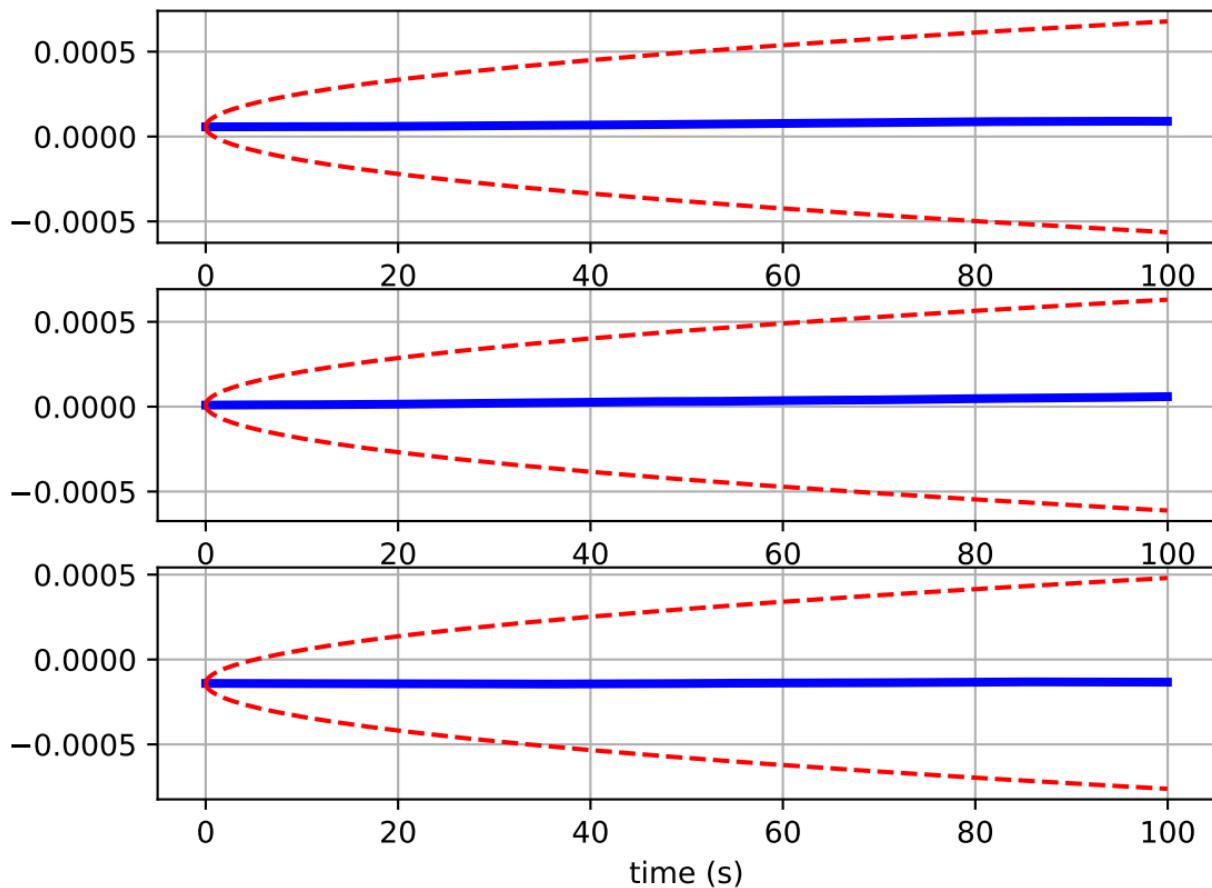
# Comparison of predicted and measured angular velocities (body frame)



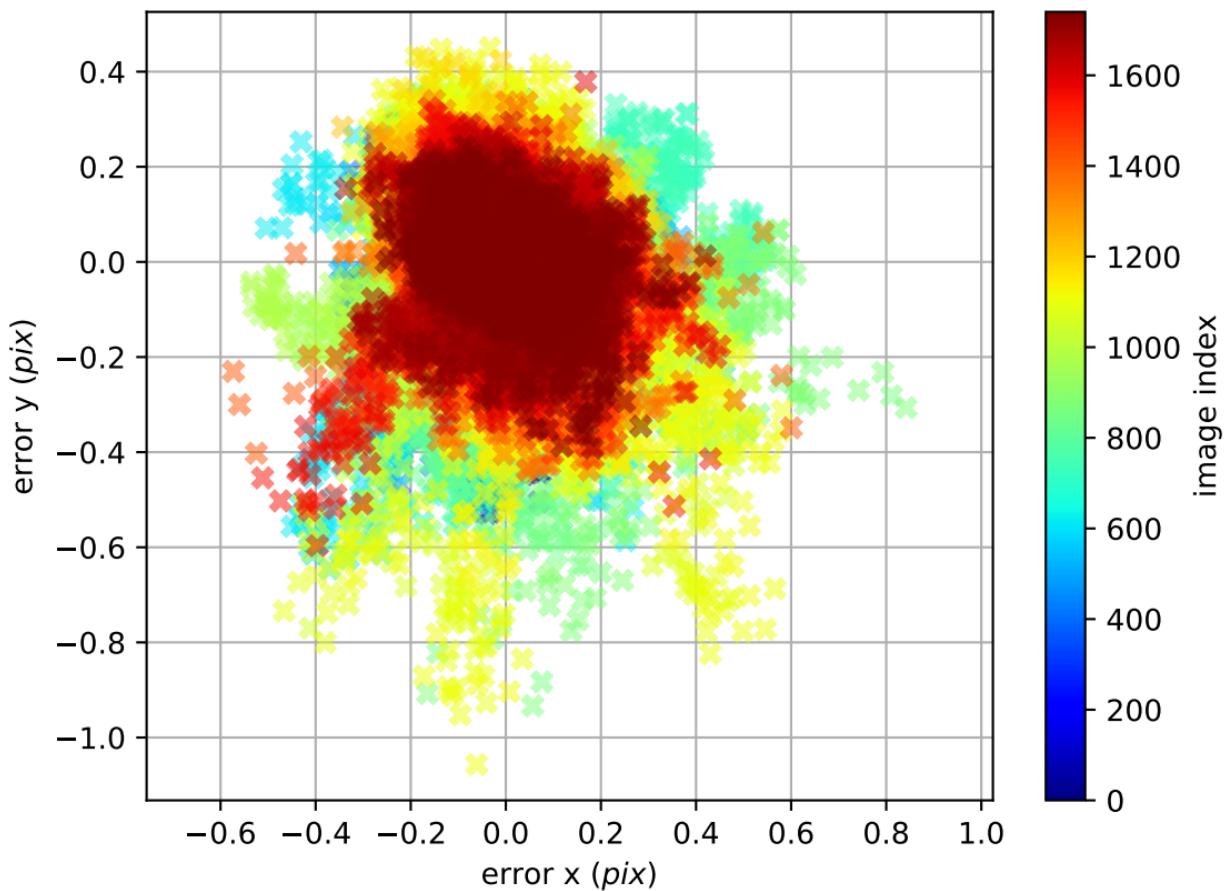
# imu0: angular velocities error



# imu0: estimated gyro bias (imu frame)



cam0: reprojection errors



cam1: reprojection errors

