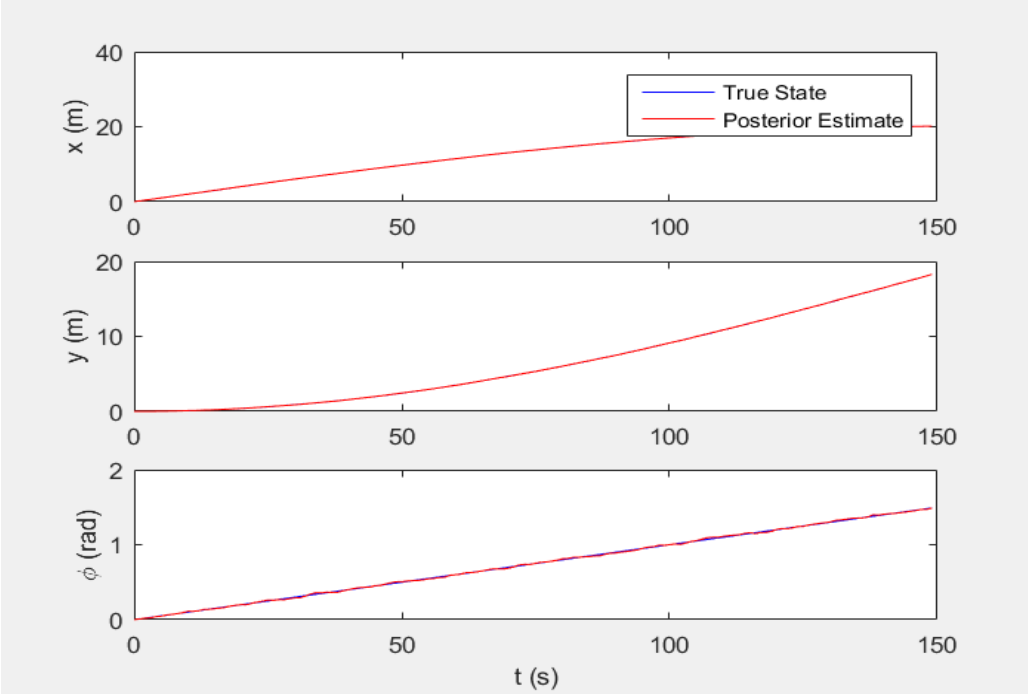
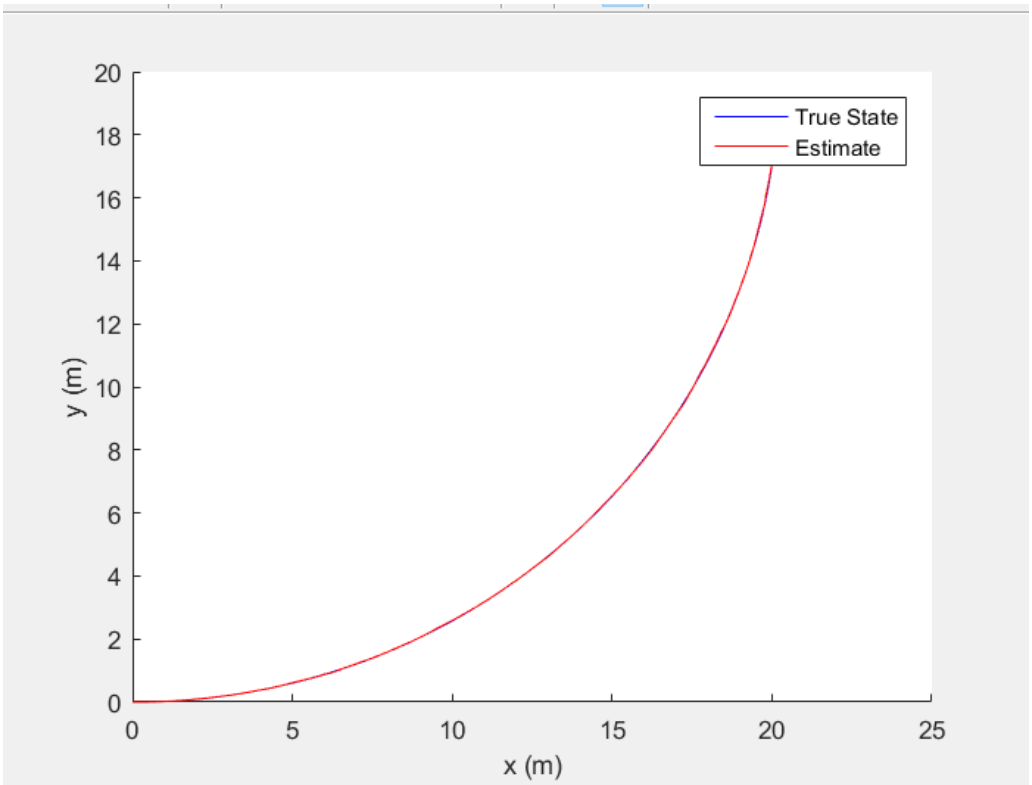
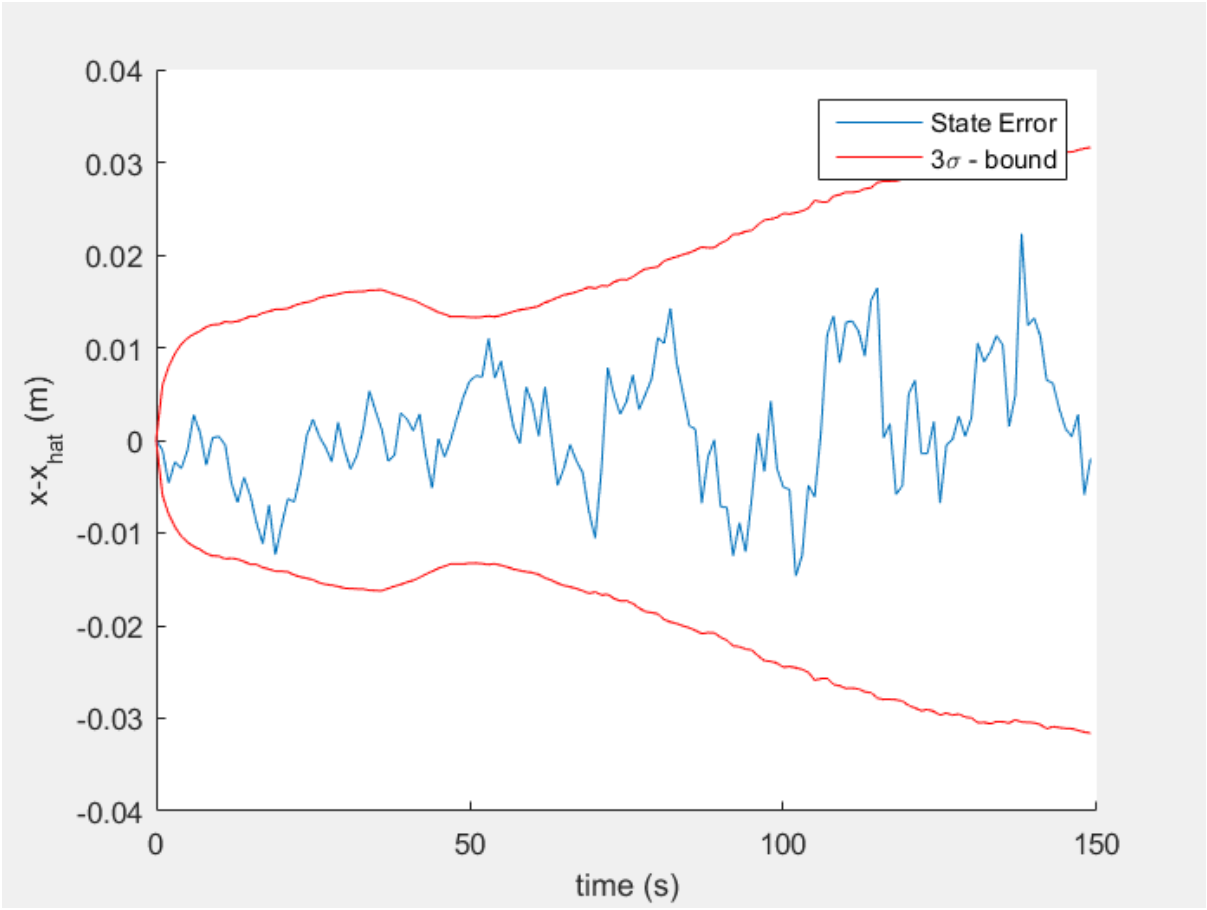
Sensing and Estimation in Robotics

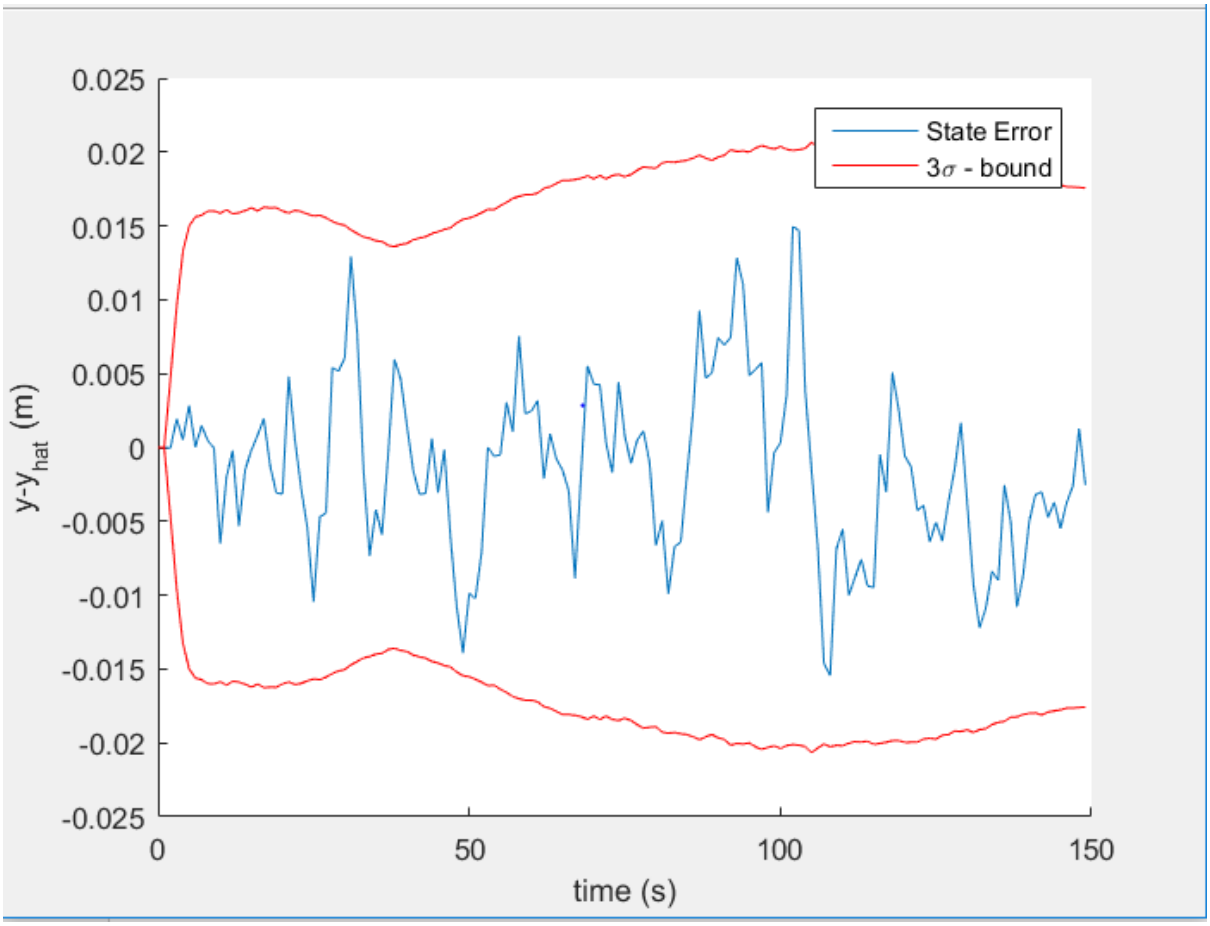
Assignment 3

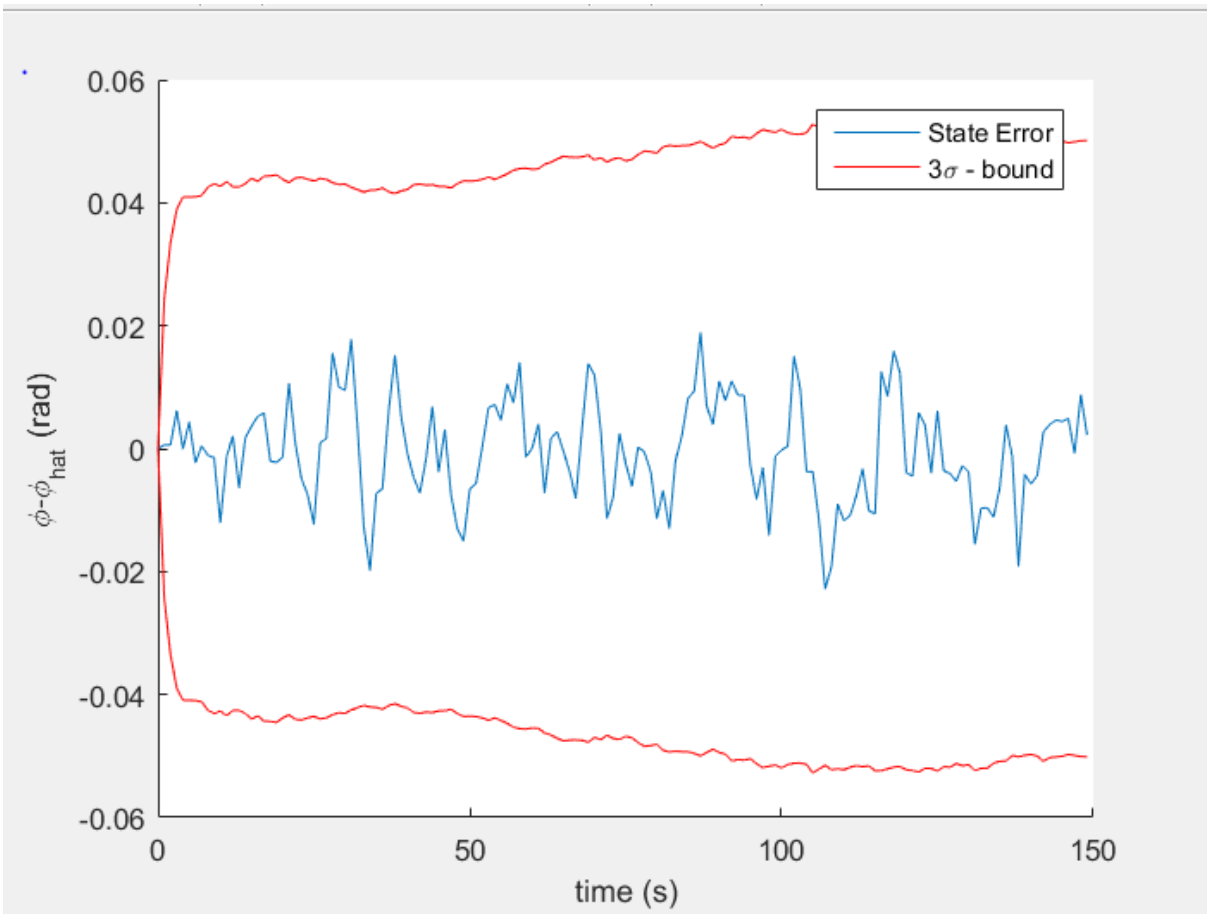
1. Distance only measurements

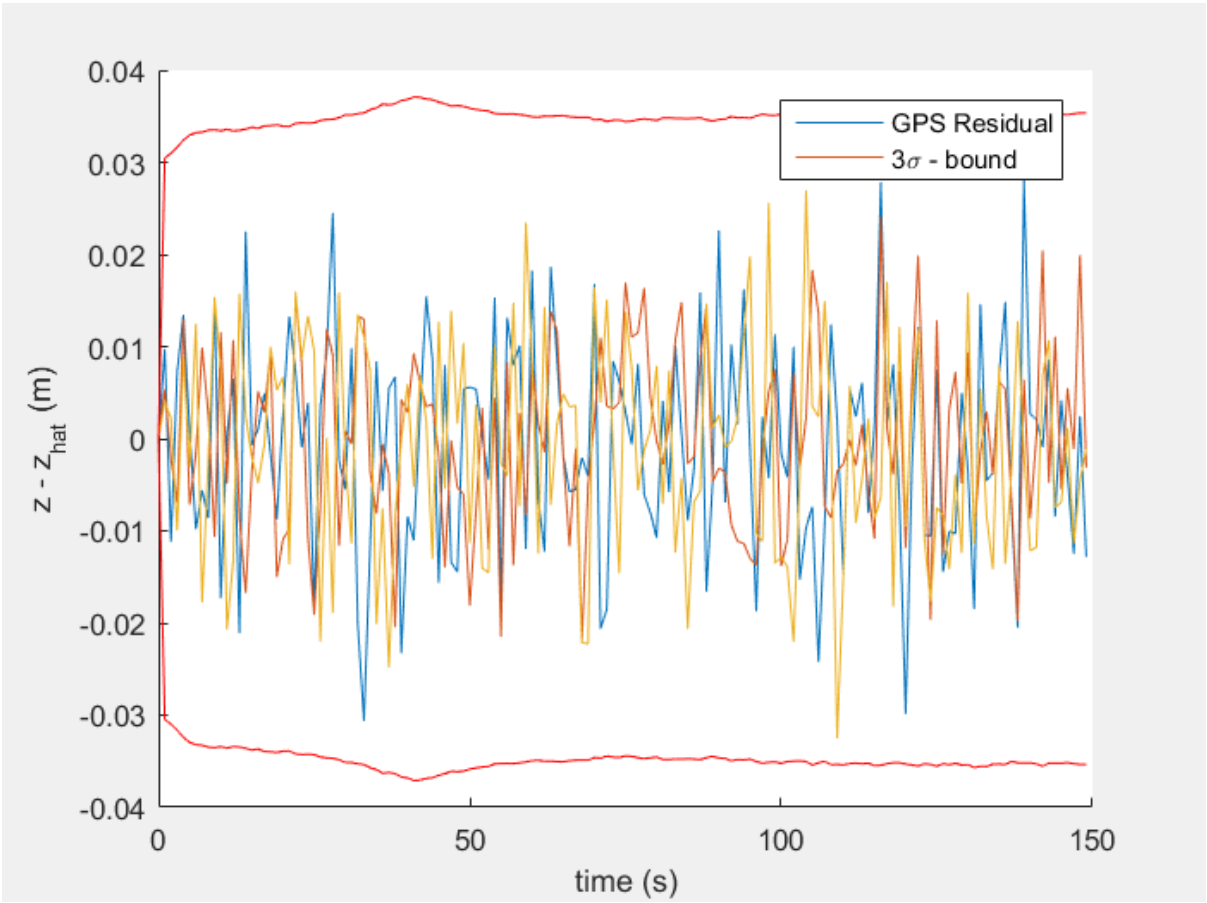




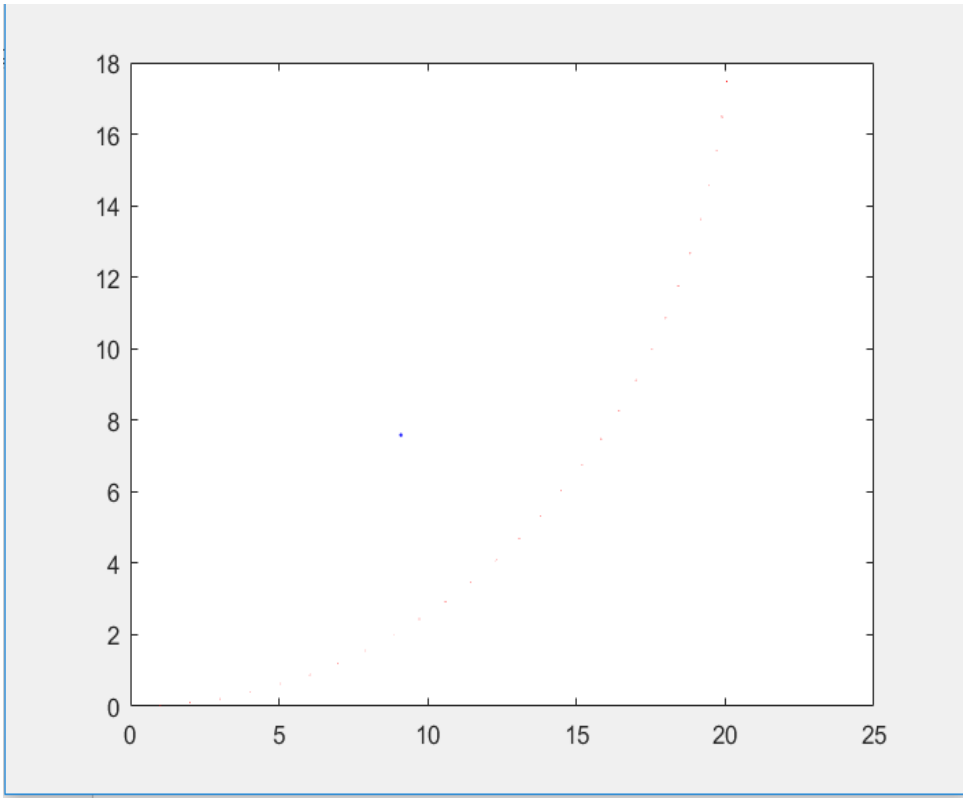

State Error
3σ - bound
x-x_hat (m)
time (s)
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
0
50
100
150


State Error
3σ - bound
y-y_hat (m)
time (s)
0.025
0.02
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
-0.025
0
50
100
150

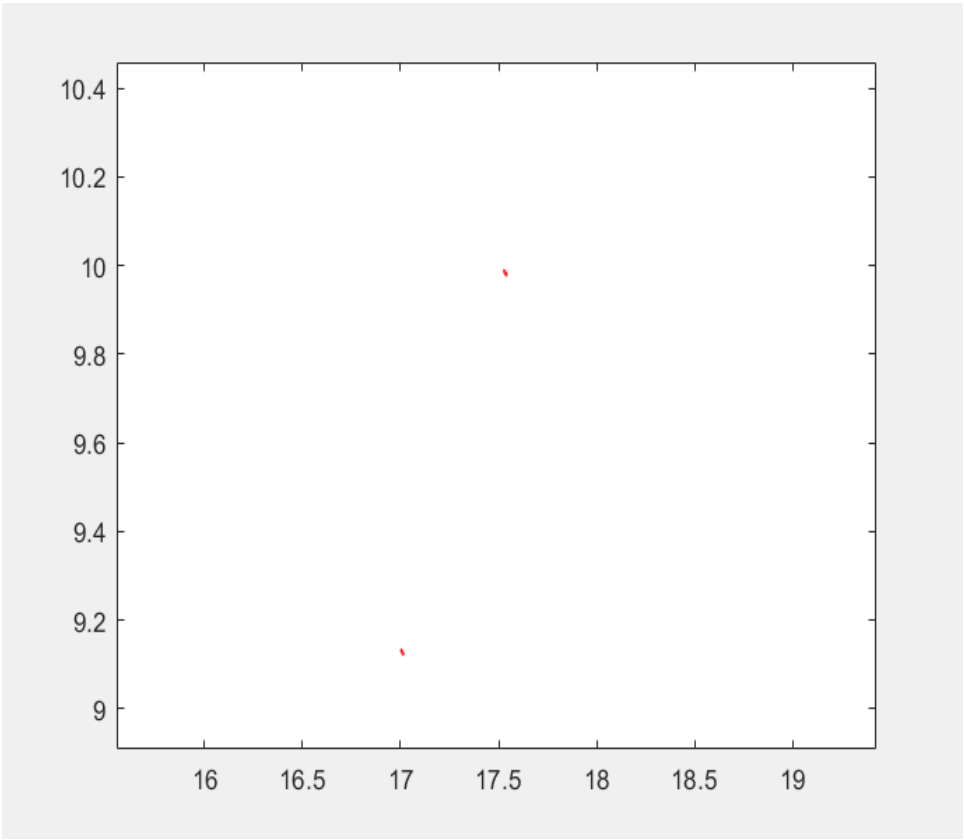

State Error
3σ - bound
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
0
50
100
150
time (s)
φ-φ_hat (rad)


GPS Residual
3σ - bound
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
0
50
100
150
time (s)
z - z_hat (m)

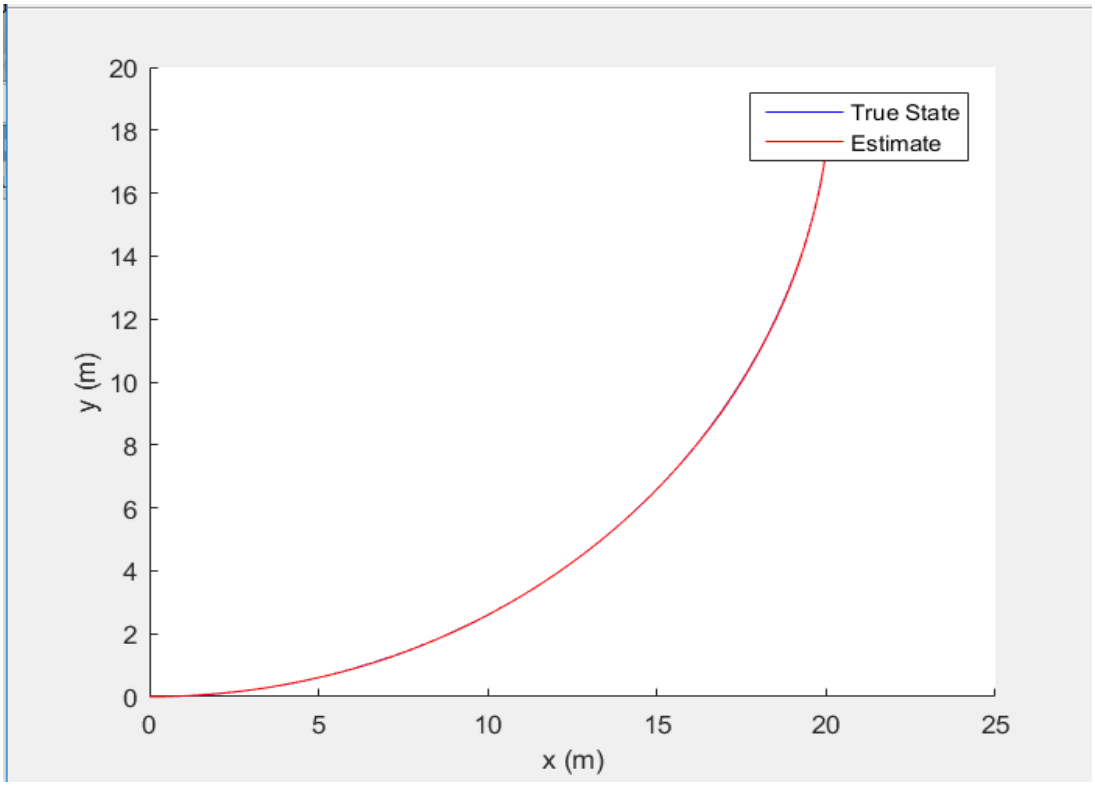
Error Ellipse

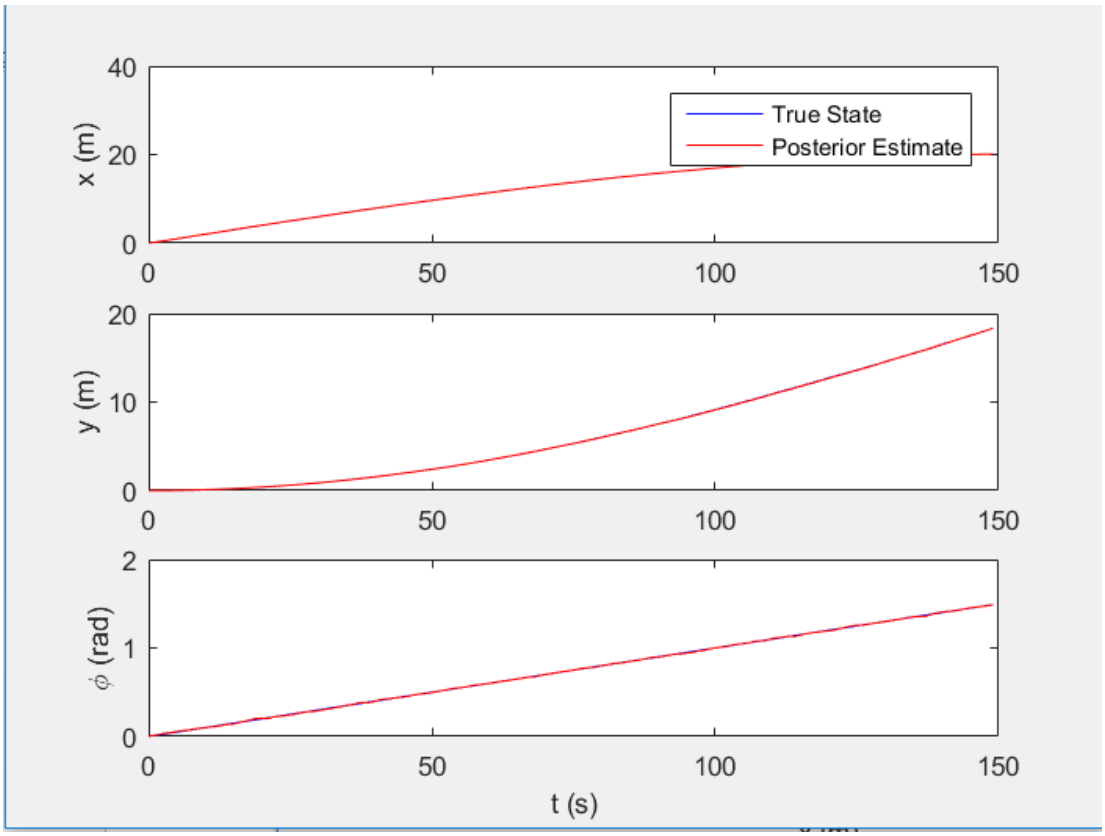


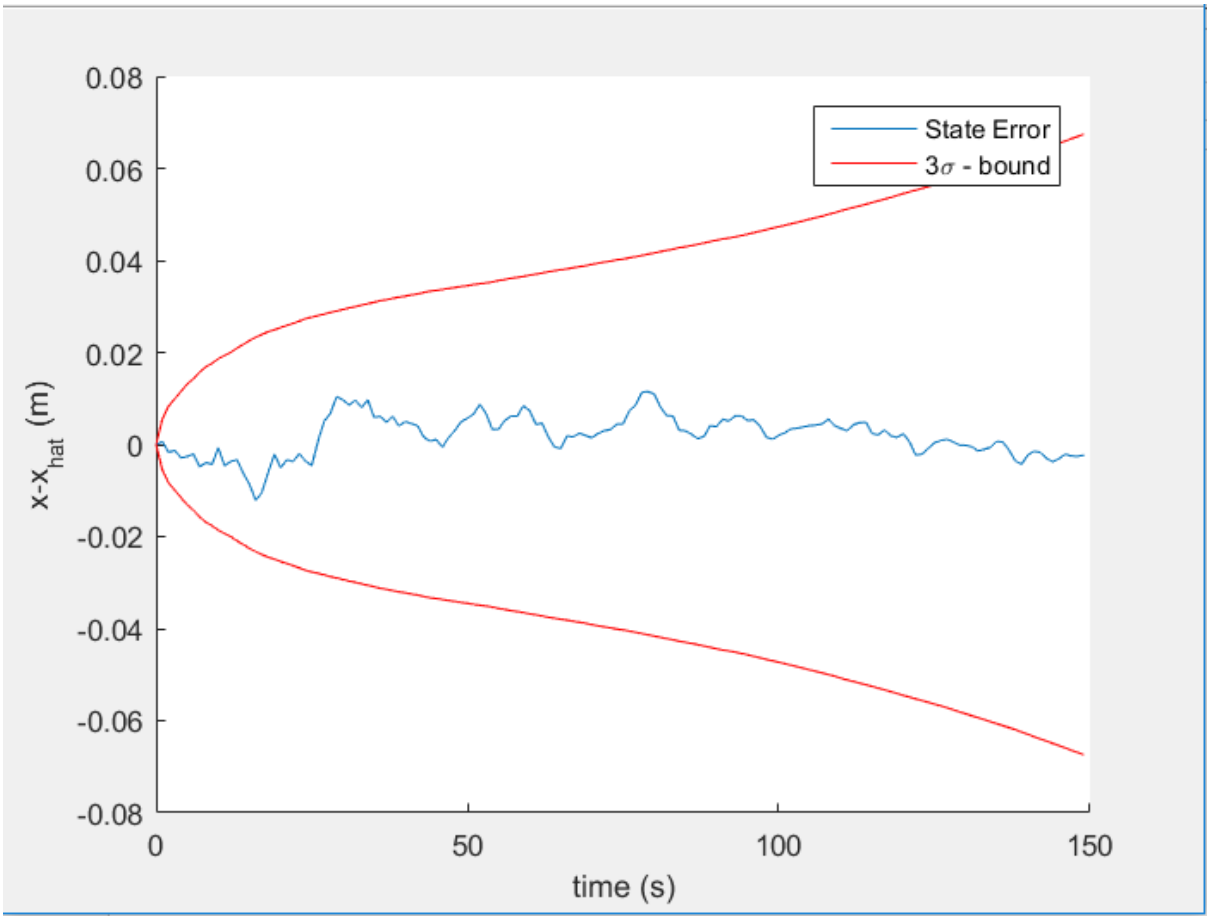
Zoomed in error ellipse

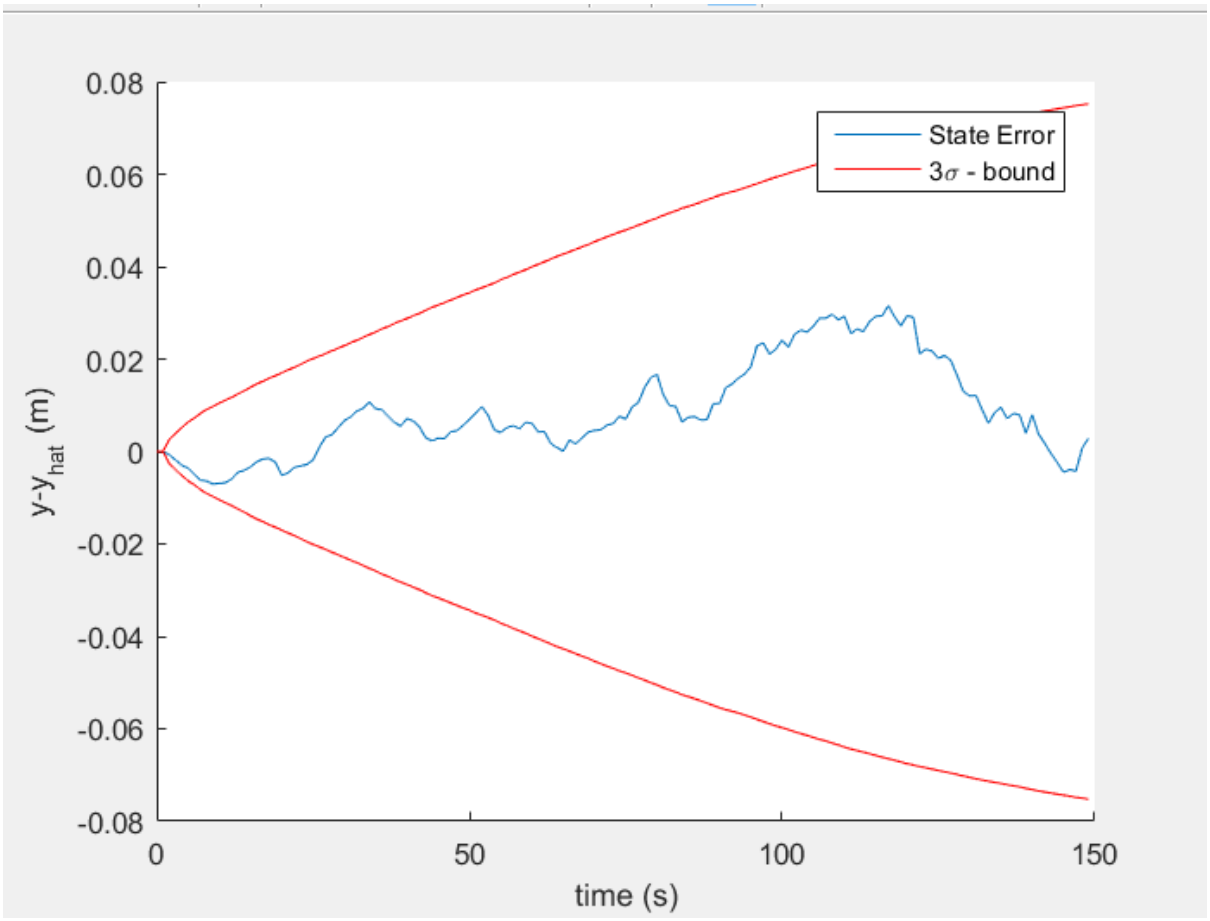


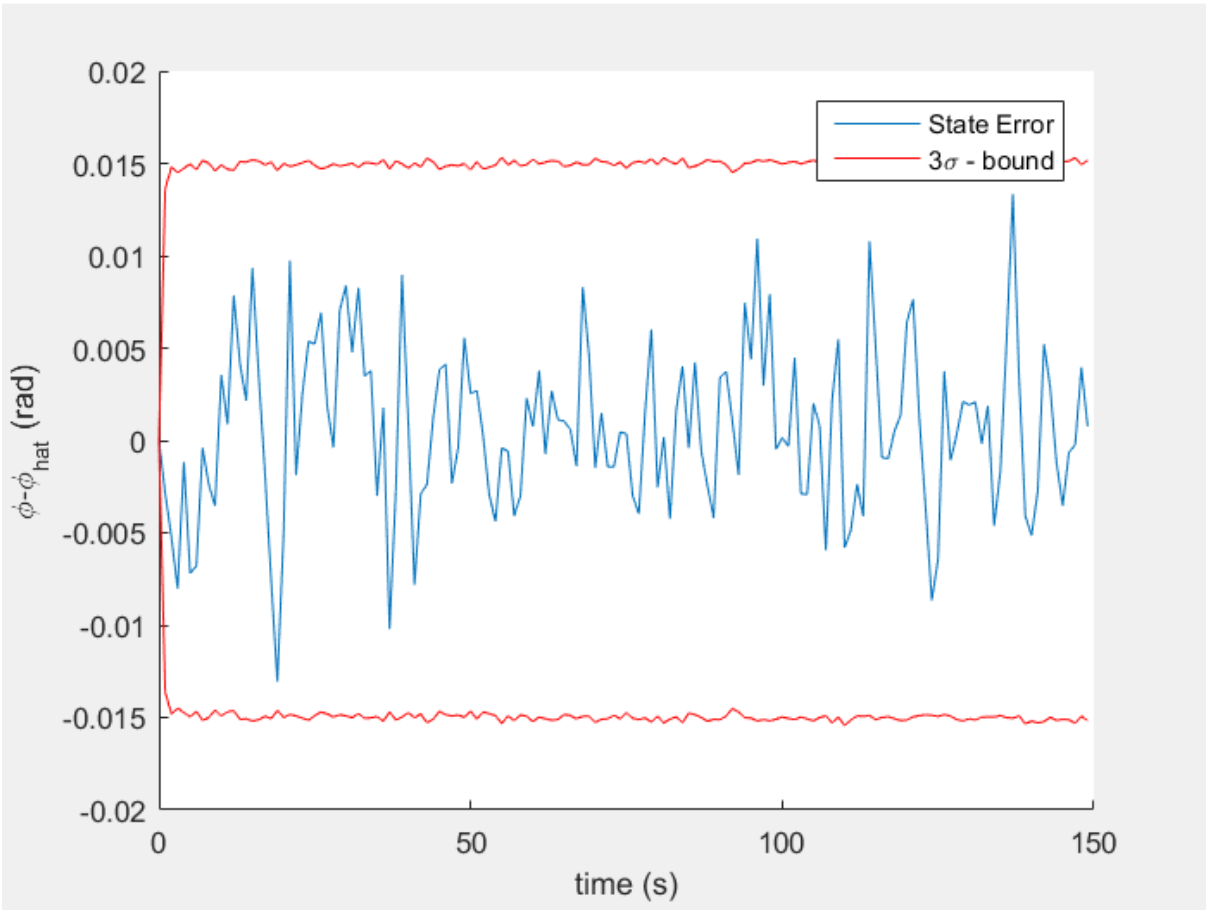
2. Bearing only measurement

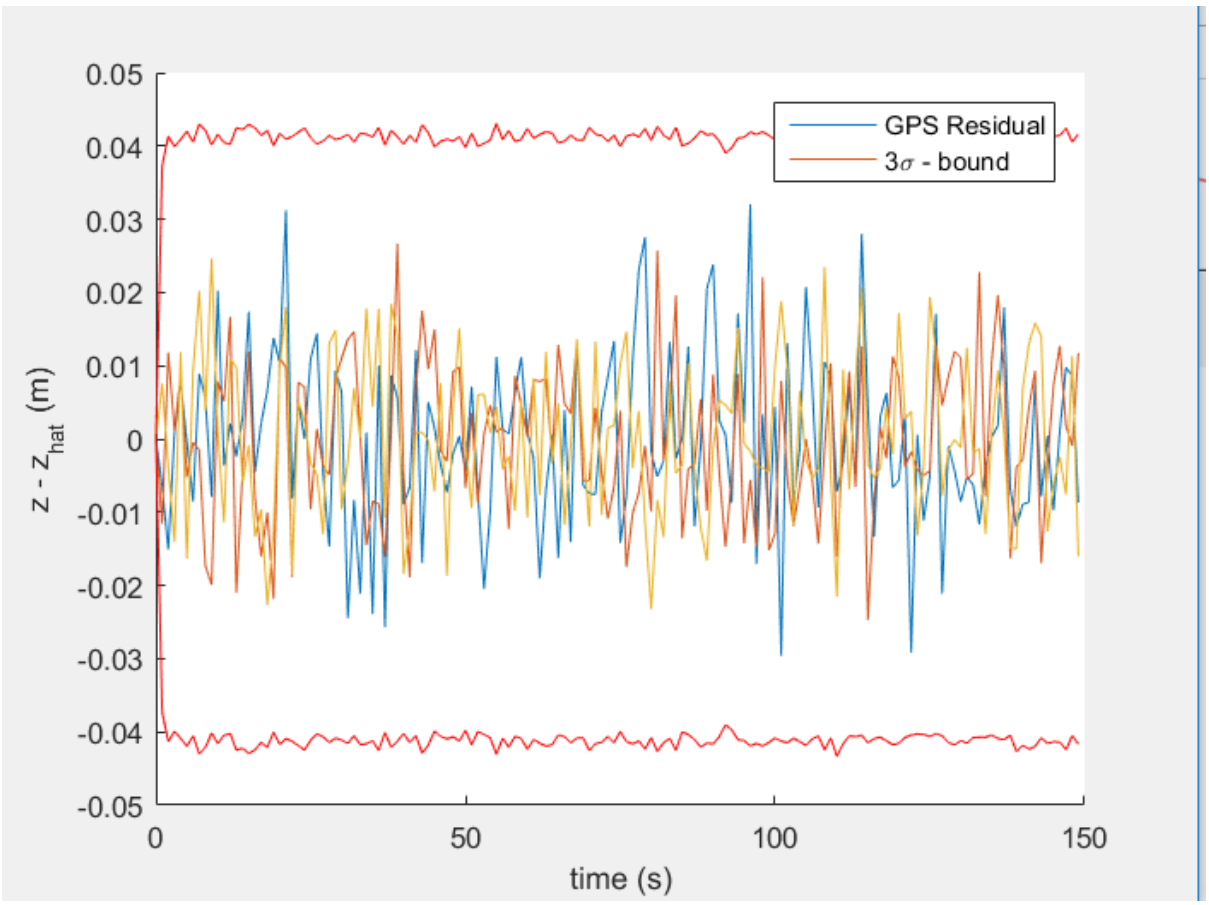




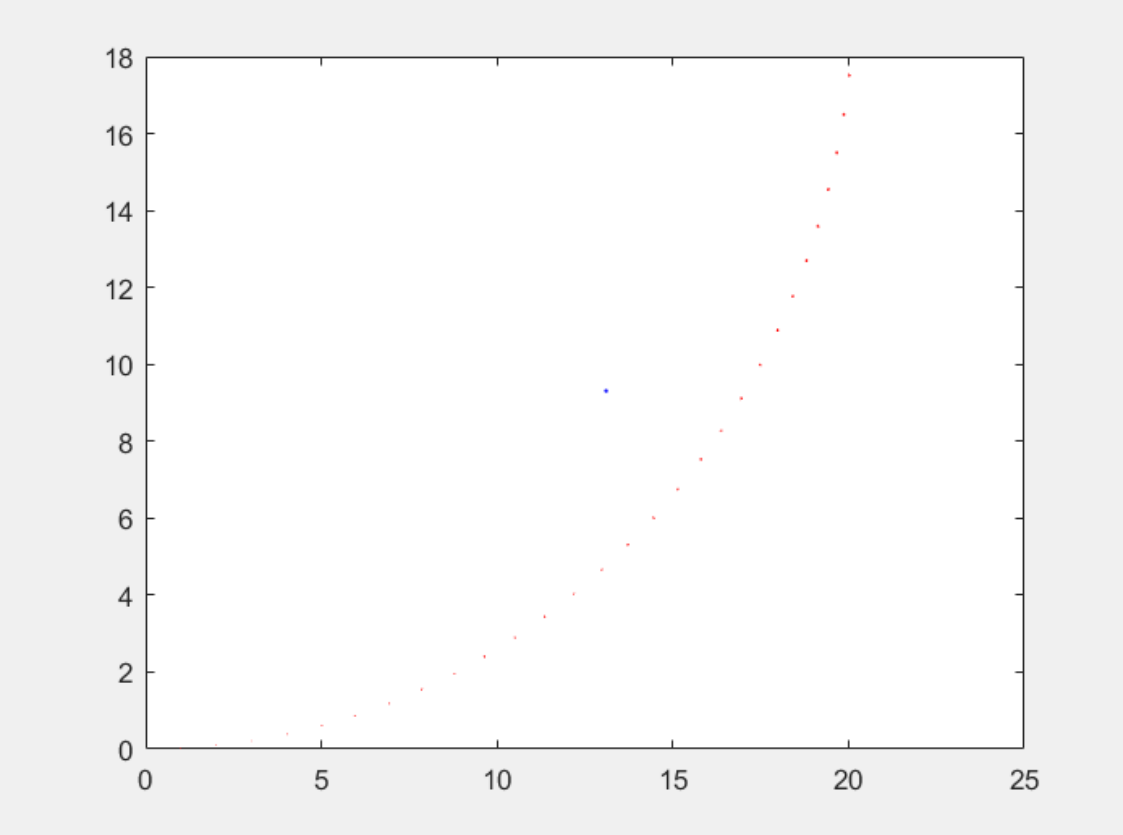

State Error
3σ - bound
x-x_hat (m)
time (s)
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
0
50
100
150


State Error
3σ - bound
y-y_hat (m)
time (s)
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
0
50
100
150

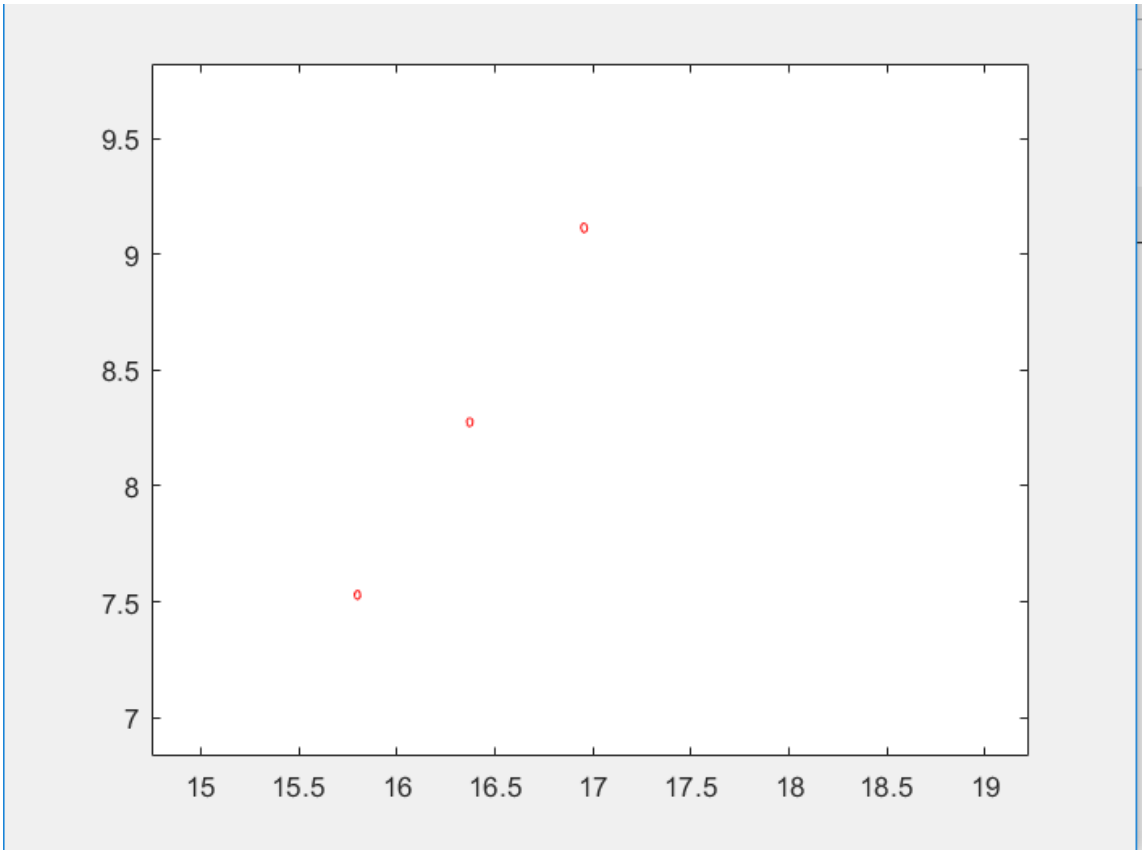

State Error
3σ - bound
0.02
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
0
50
100
150
time (s)
ϕ-ϕhat (rad)


GPS Residual
3σ - bound
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.05
0
50
100
150
time (s)
z - zhat (m)

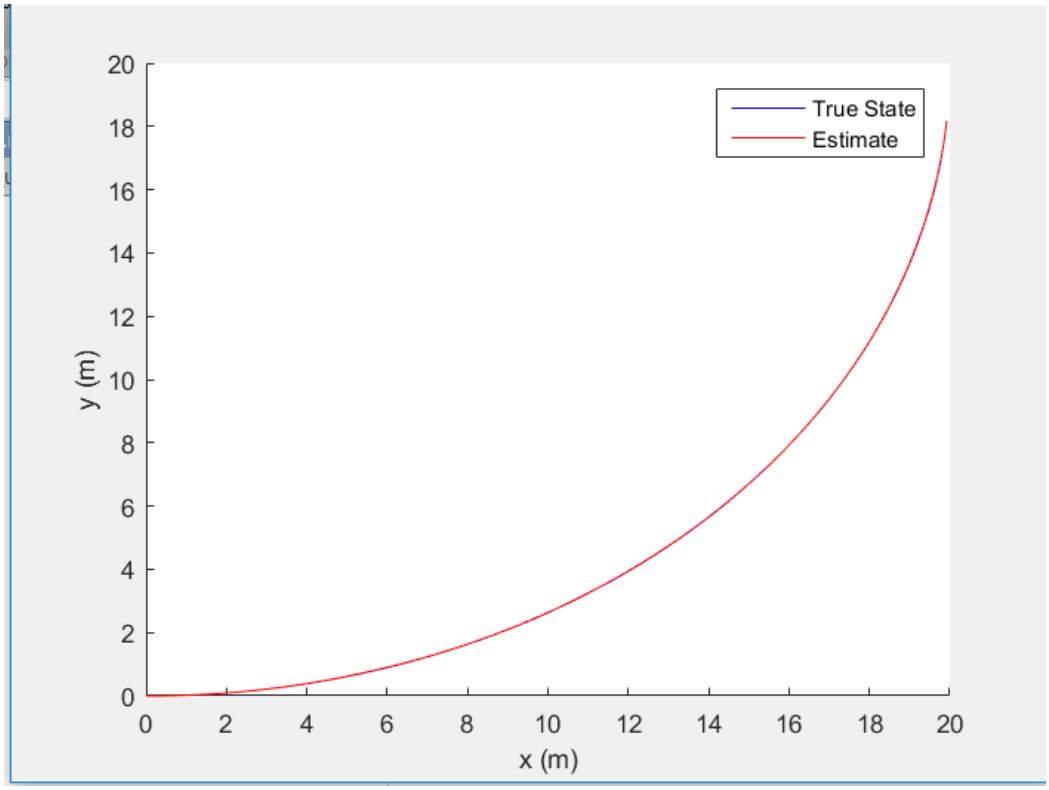
Error Ellipse

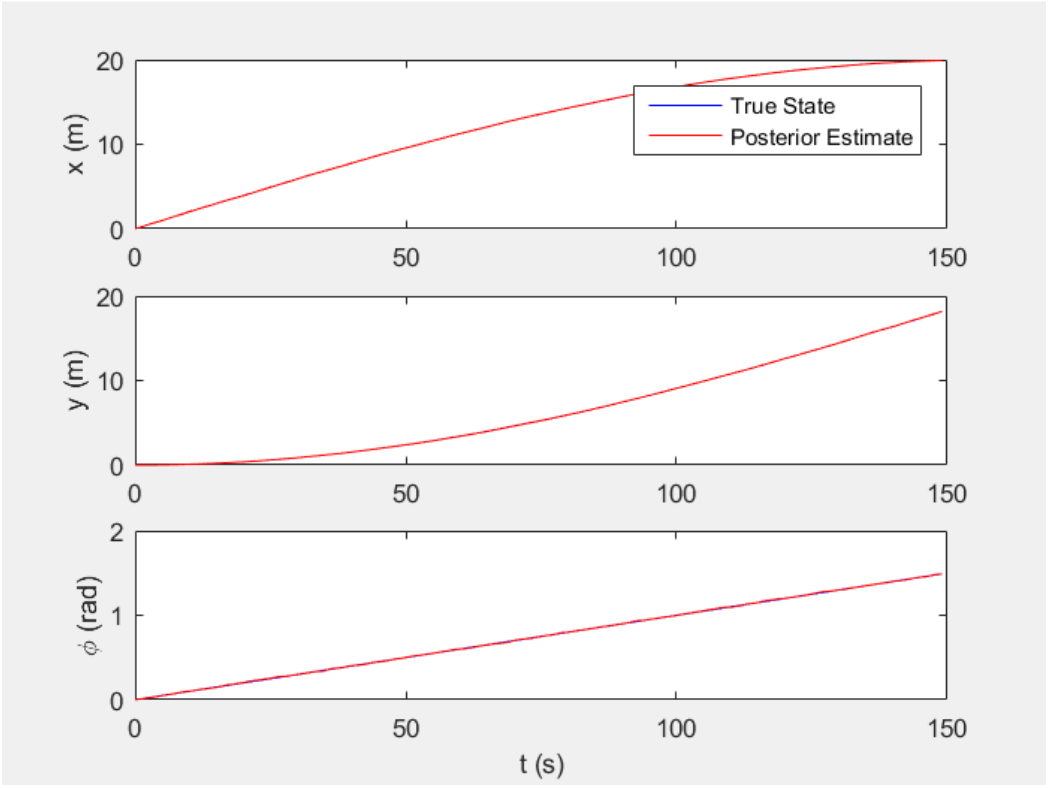


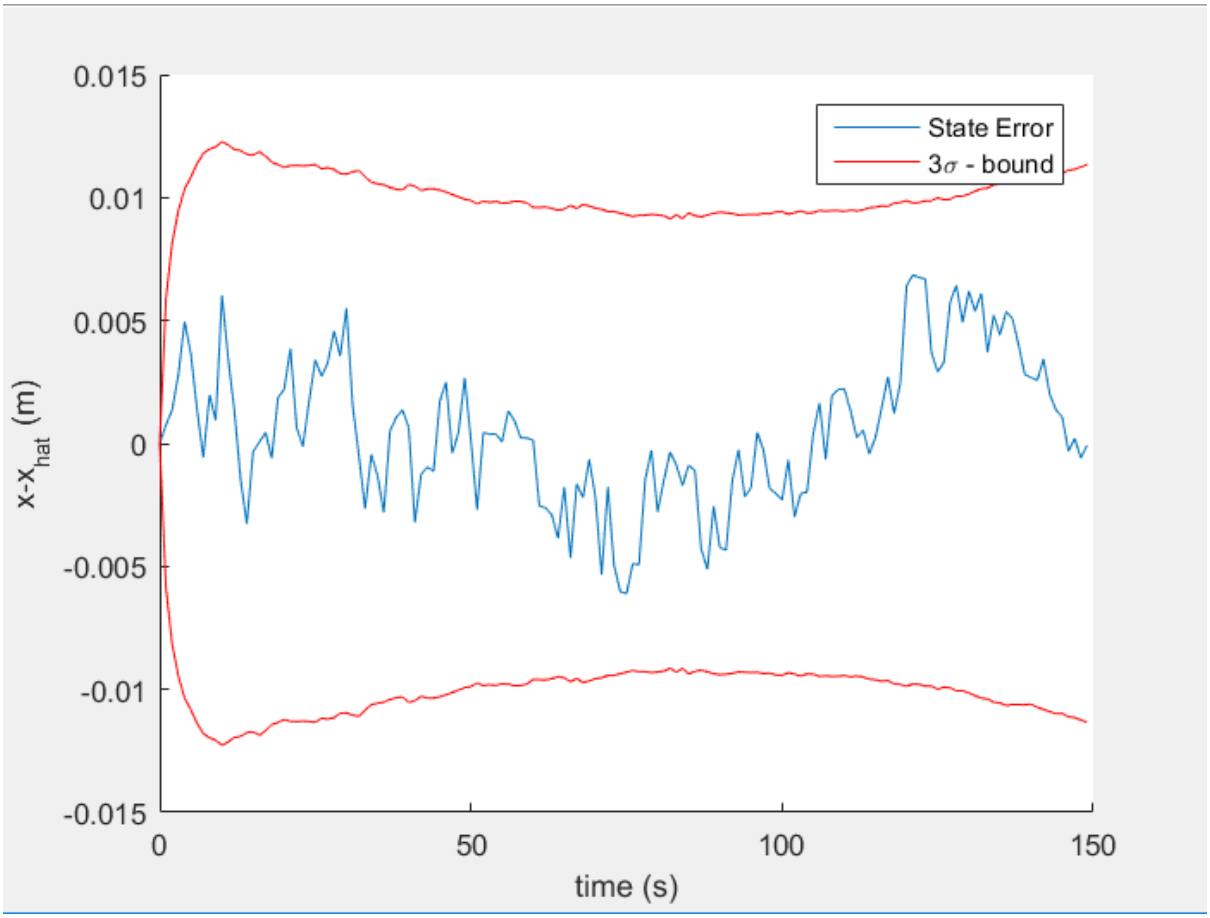
Zoomed in Error Ellipse

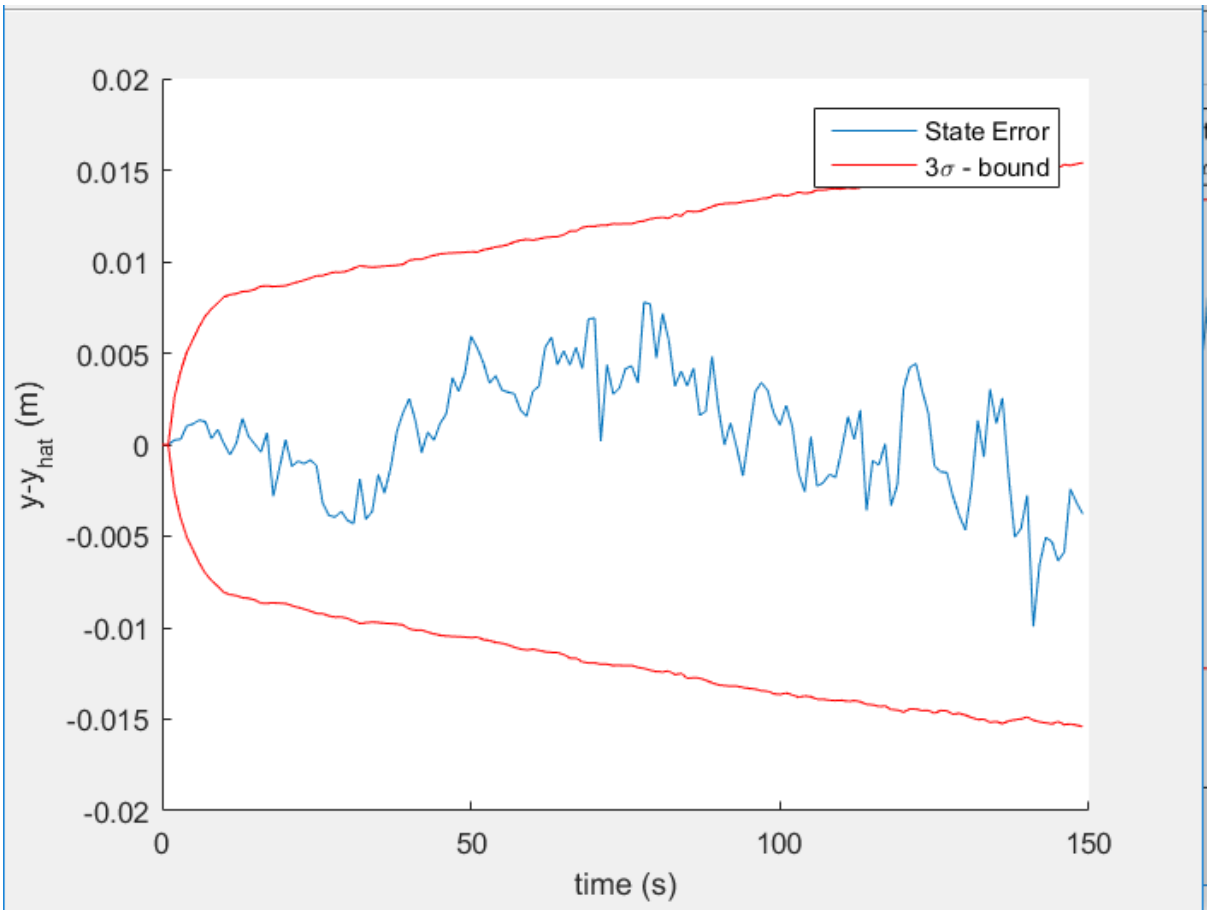


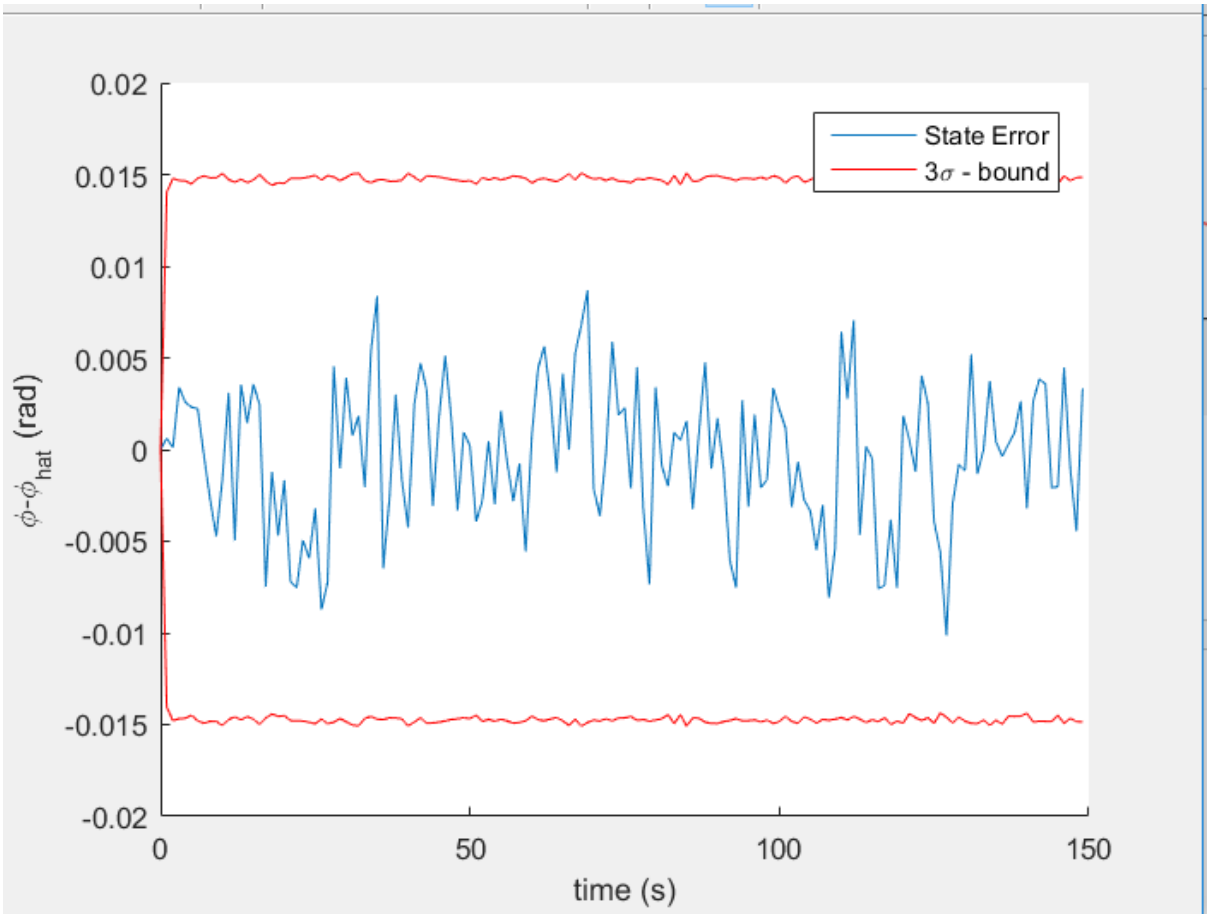
3. Distance and Bearing Measurement

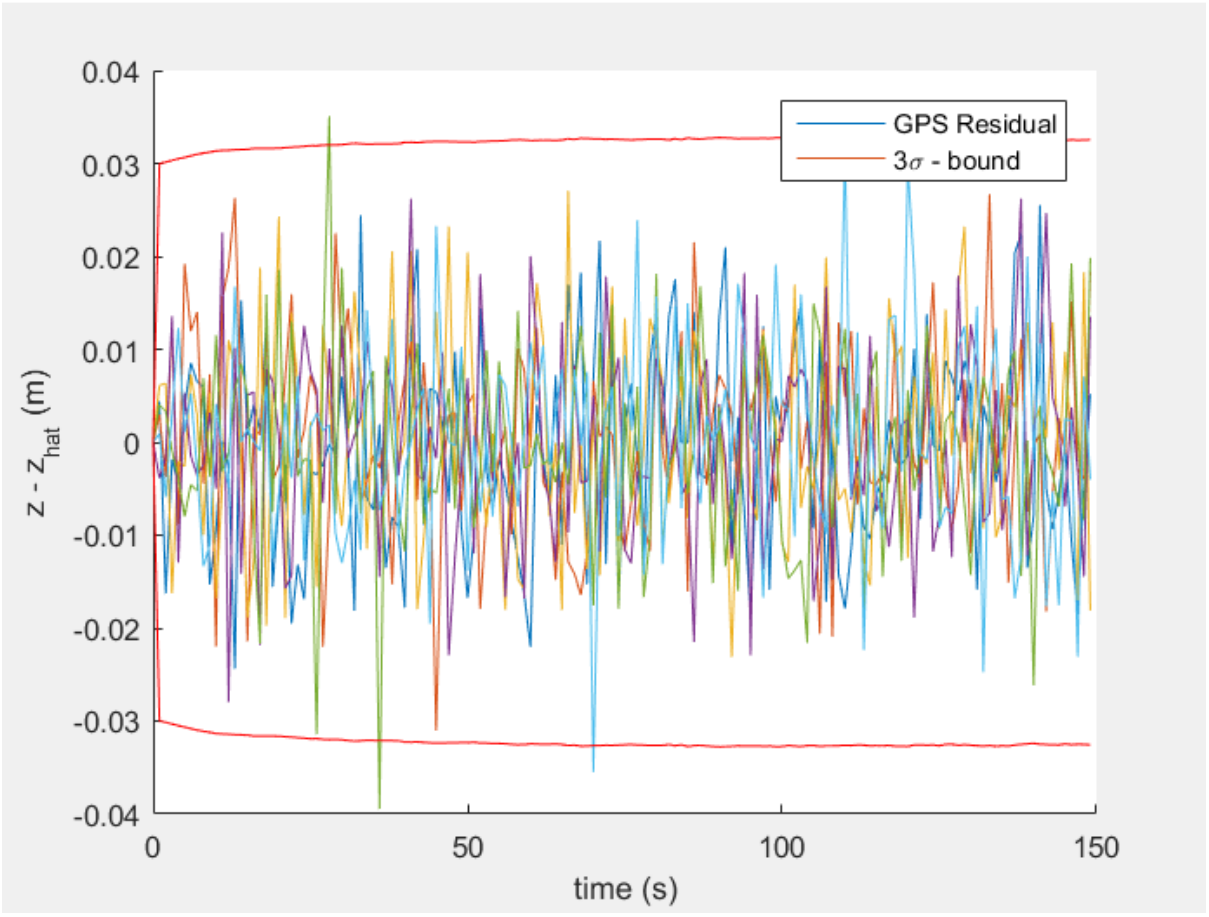




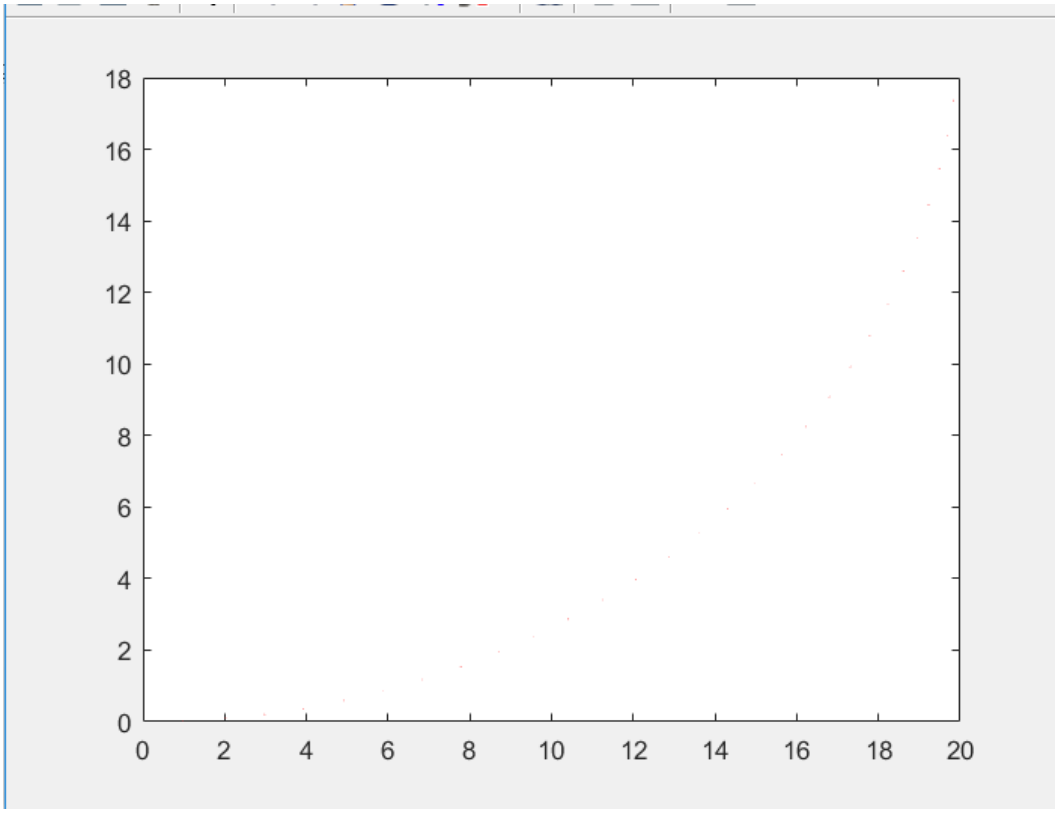

State Error
3σ - bound
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
x-x_hat (m)
0
50
100
150
time (s)


State Error
3σ - bound
0.02
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
y-y_hat (m)
0
50
100
150
time (s)

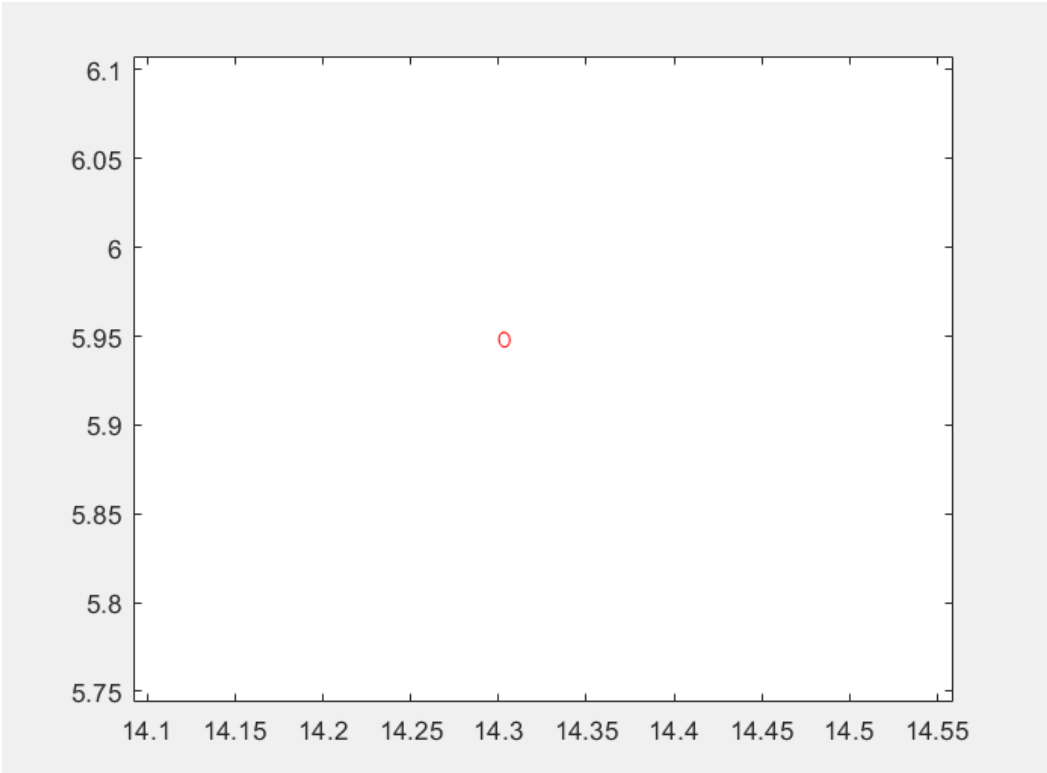

State Error
3σ - bound
0.02
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
0
50
100
150
time (s)
ϕ̇-ϕ̇hat (rad)


GPS Residual
3σ - bound
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
0
50
100
150
time (s)
z - zhat (m)

Error Ellipse

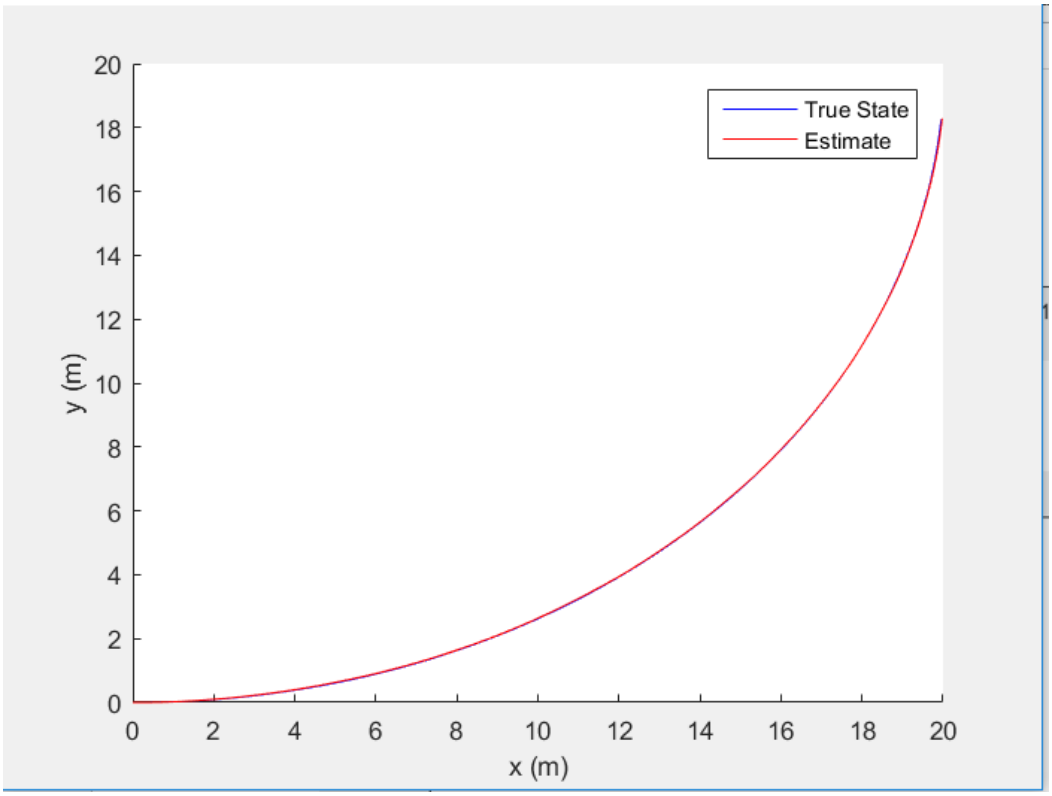


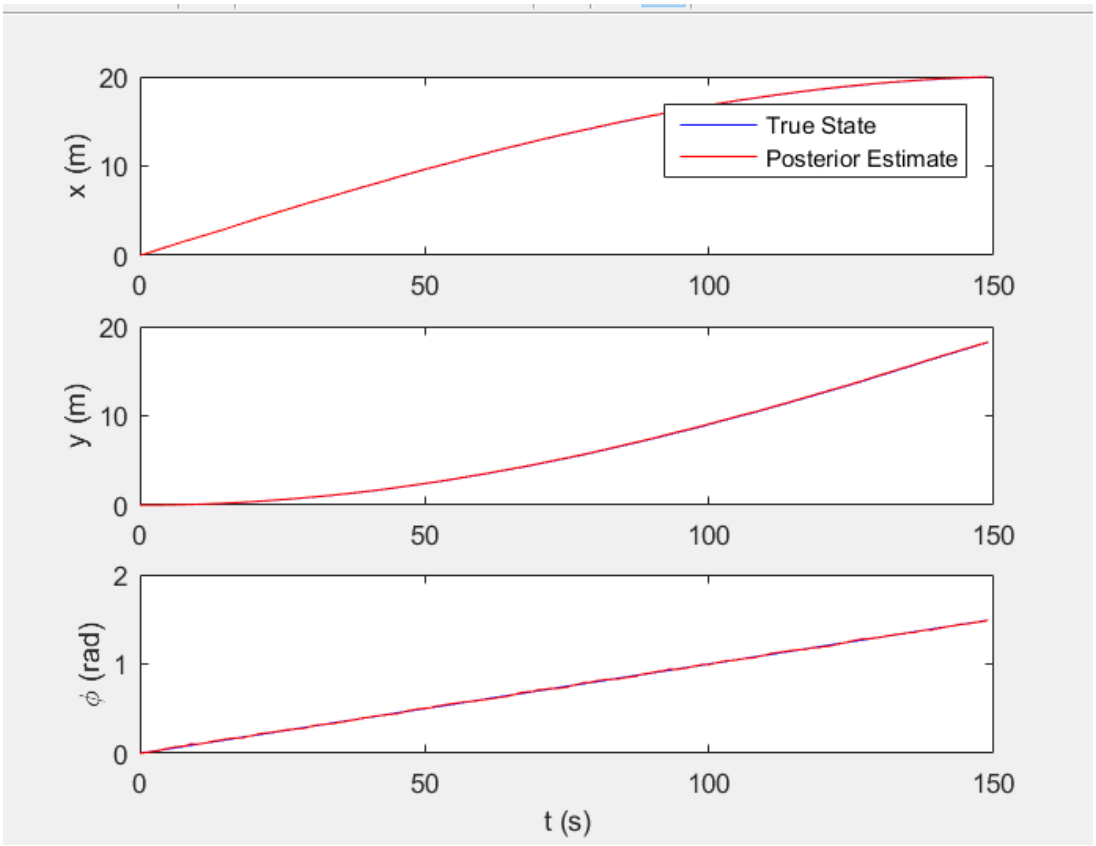
Error Ellipse (Zoomed In)

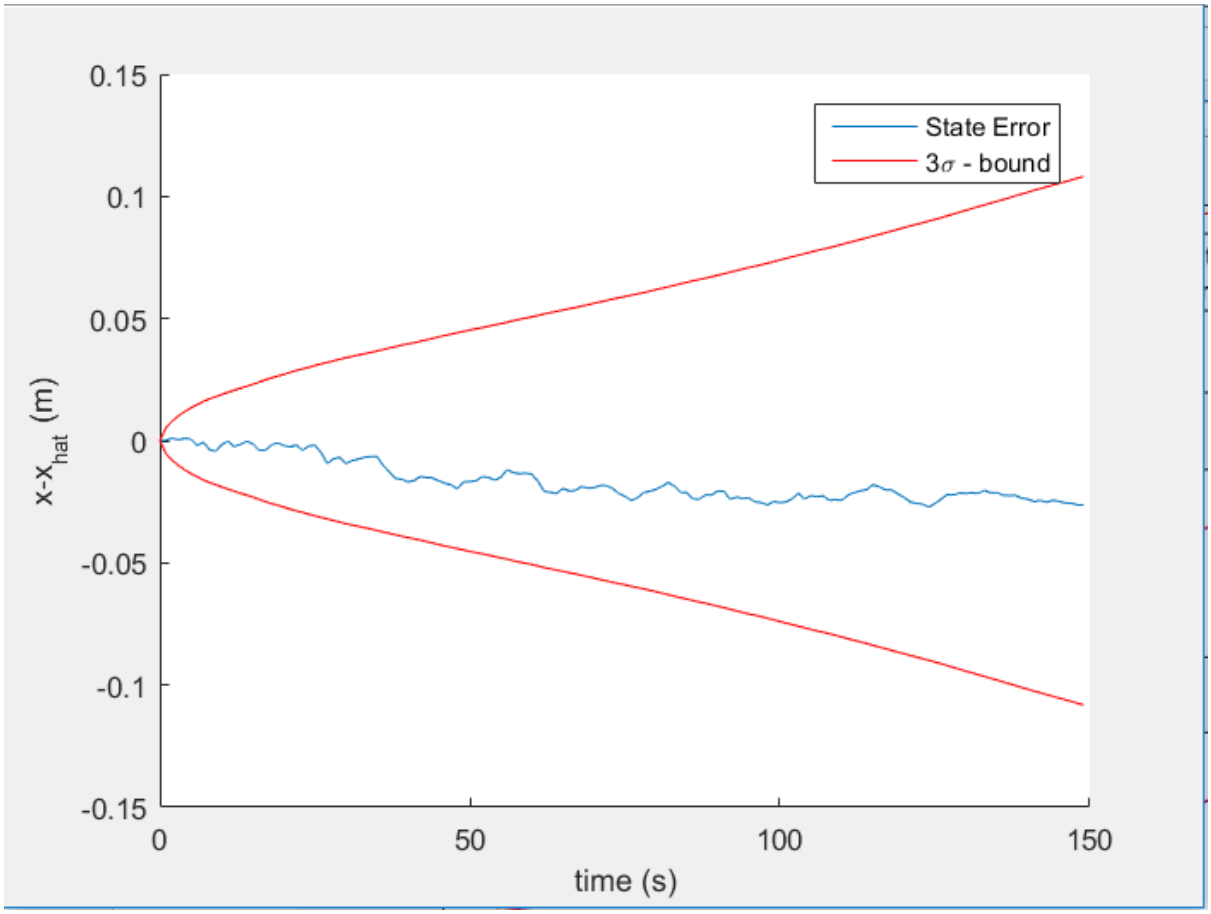


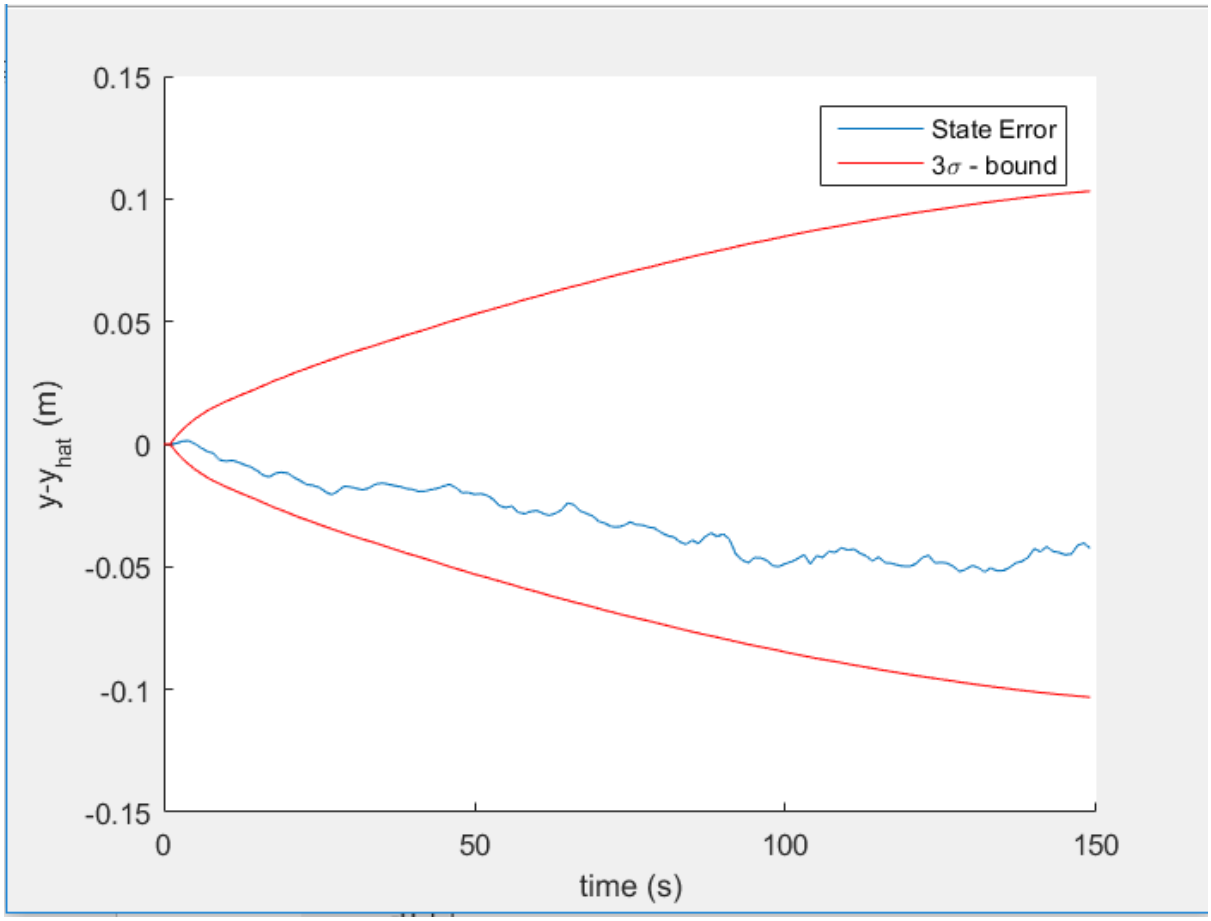
Extra Credit

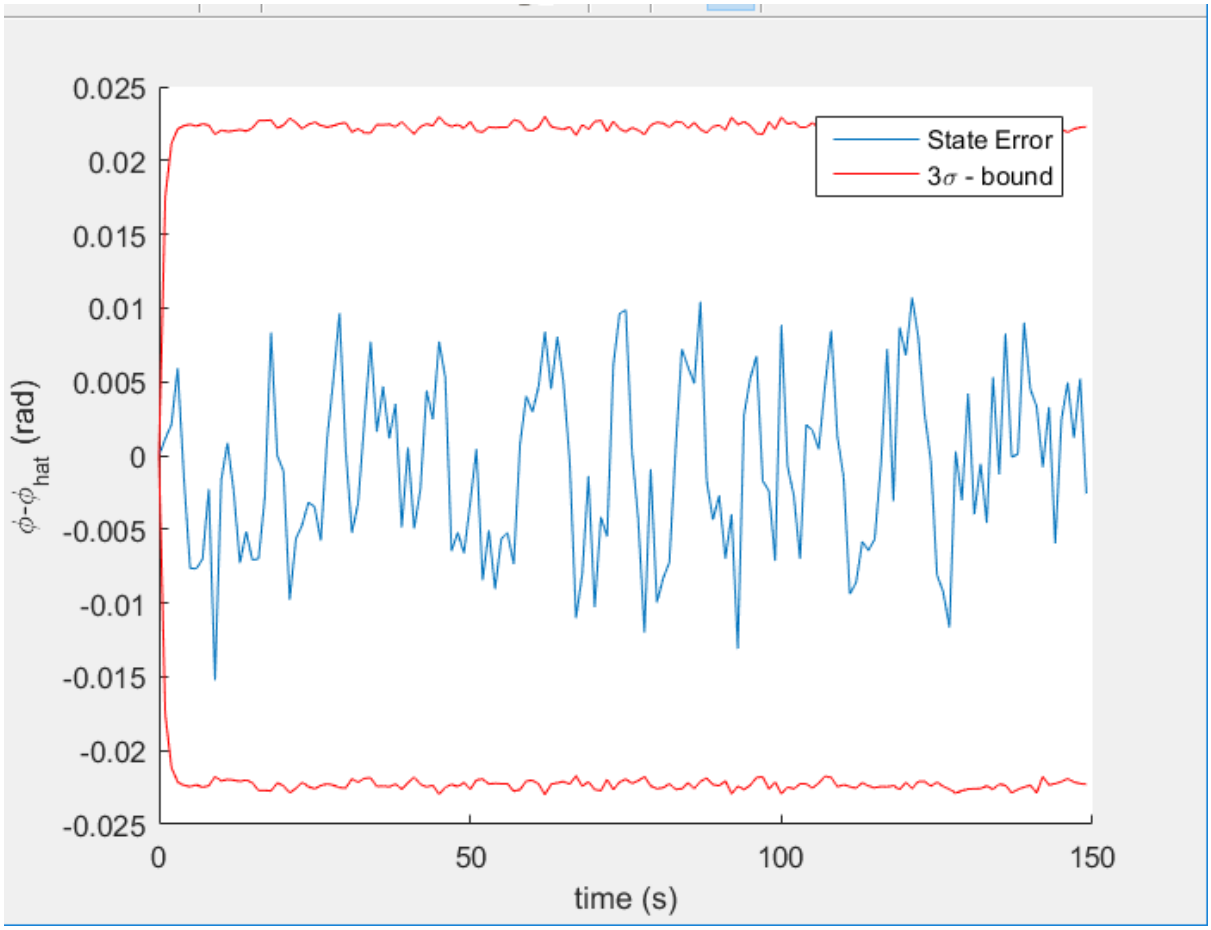
Bearing only measurement with one landmark.

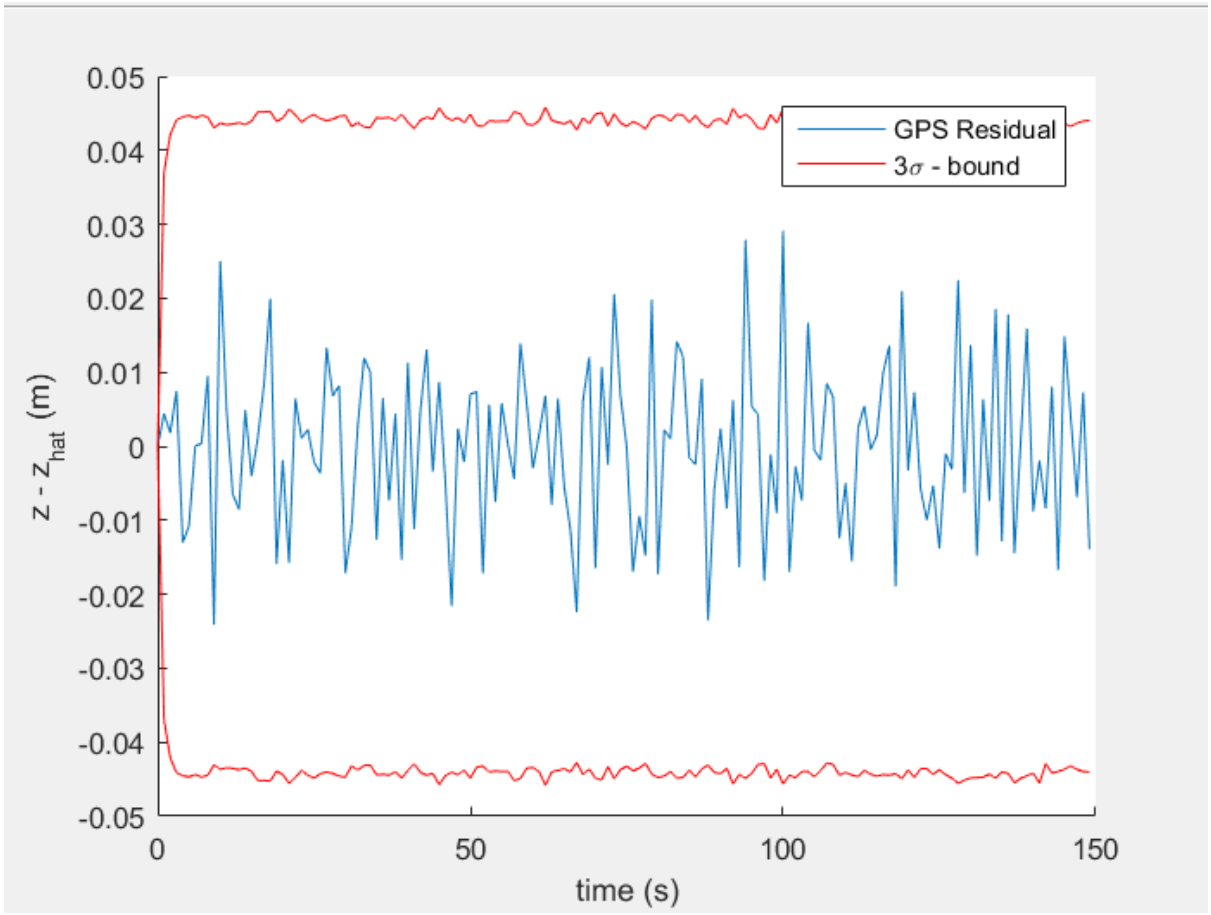




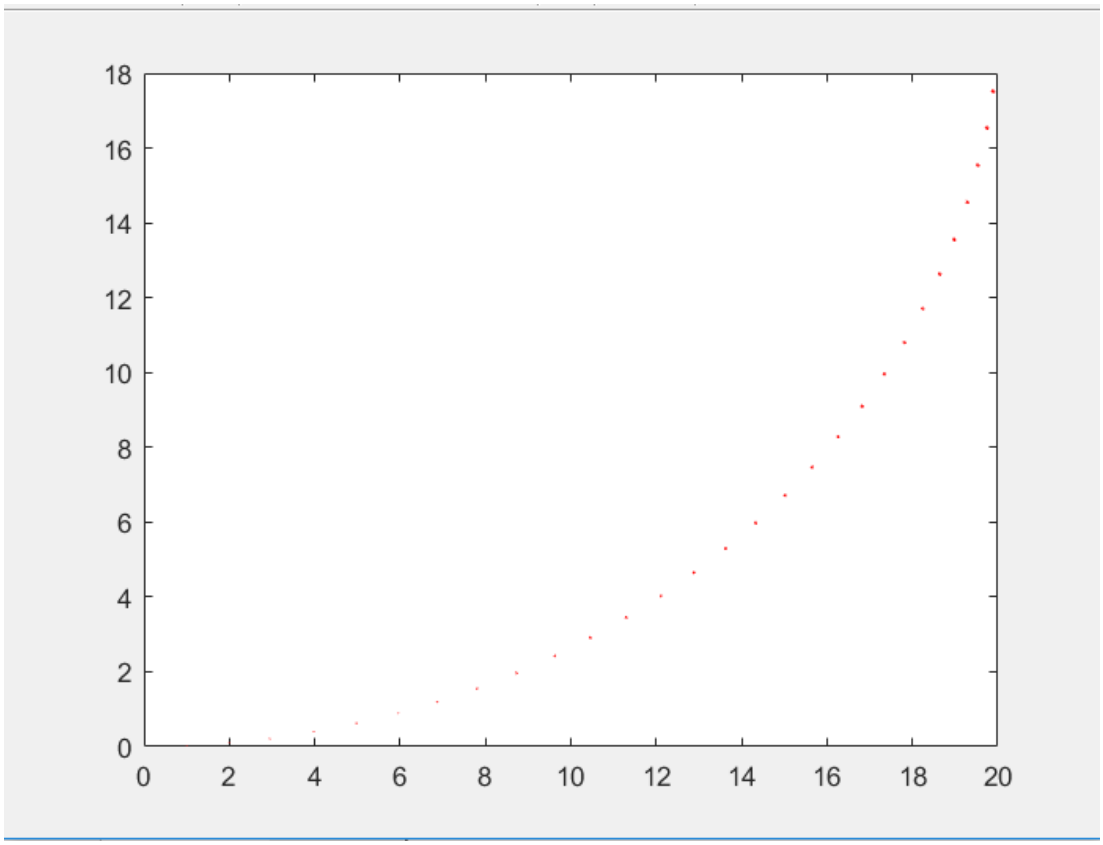
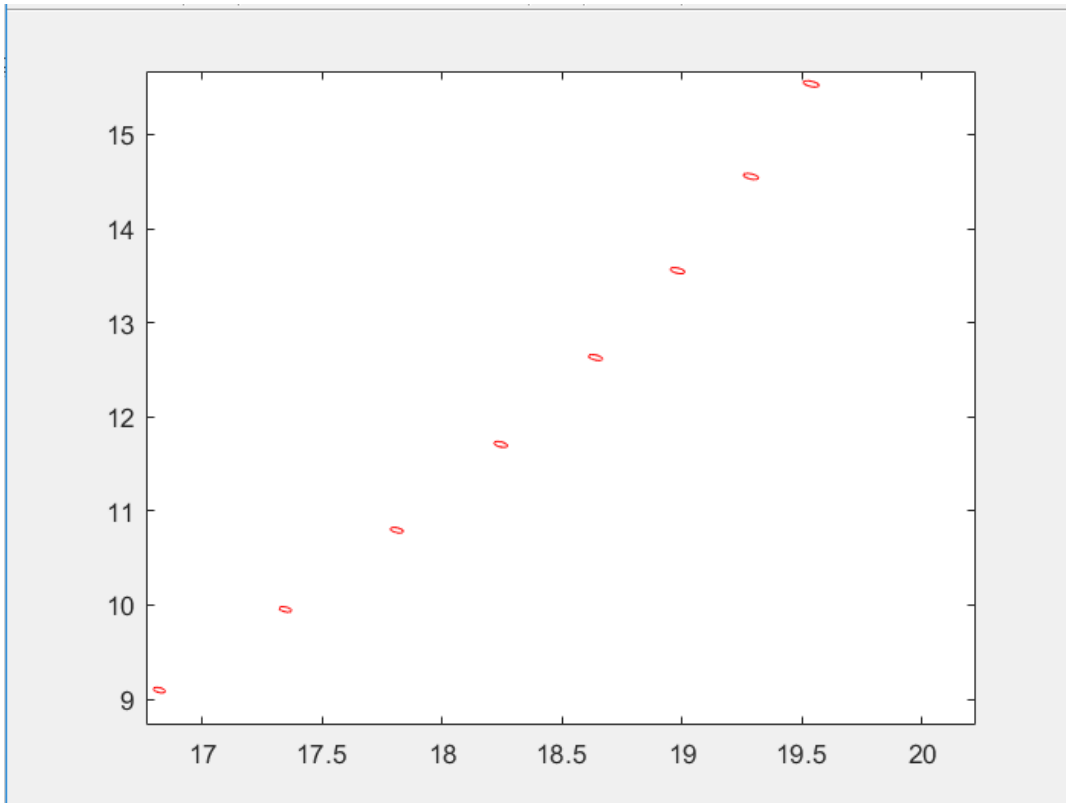

State Error
3σ - bound
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
x-x_hat (m)
0
50
100
150
time (s)


State Error
3σ - bound
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
y-y_hat (m)
0
50
100
150
time (s)


State Error
3σ - bound
0.025
0.02
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
-0.025
φ-φhat (rad)
0
50
100
150
time (s)


GPS Residual
3σ - bound
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.05
z - zhat (m)
0
50
100
150
time (s)

Error Ellipse



Error Ellipse – Zoomed In