

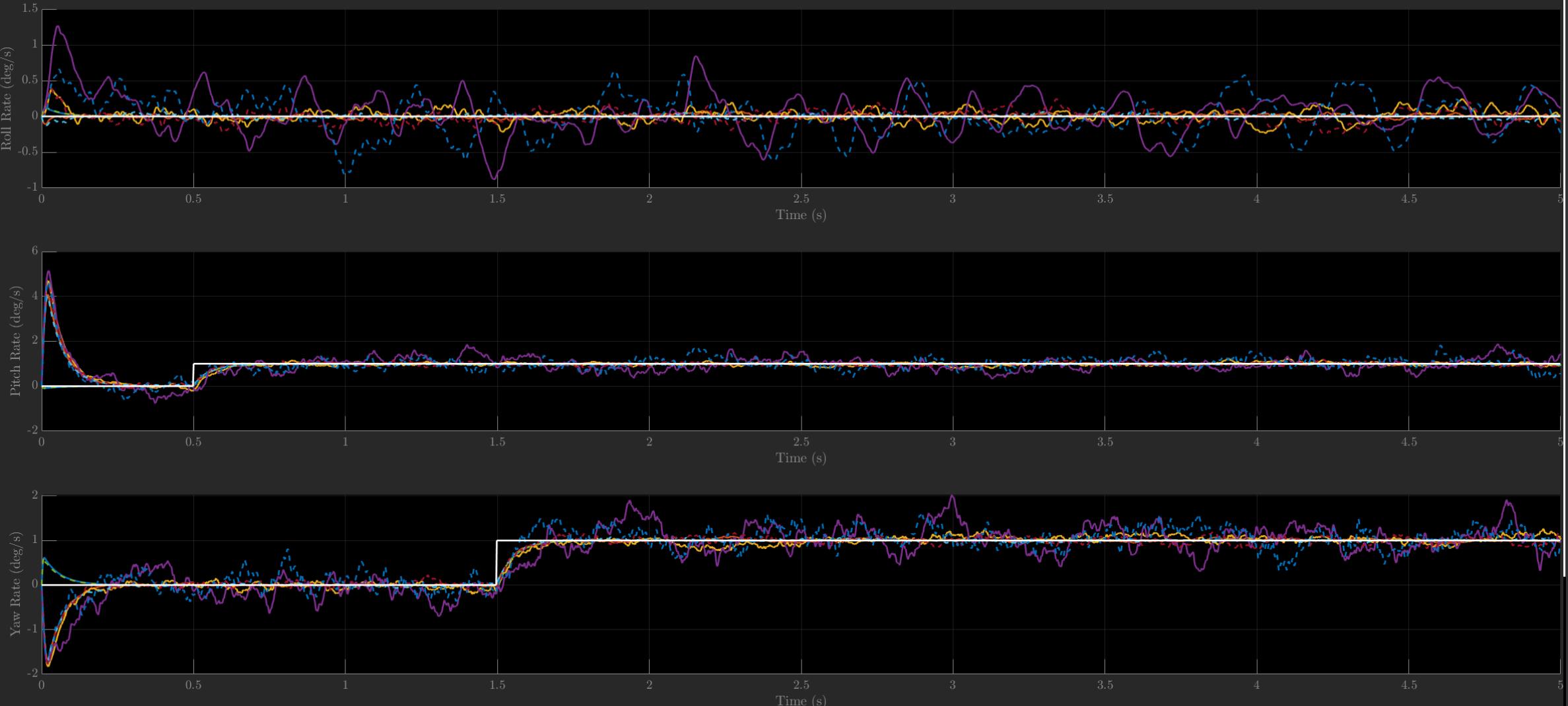
- The plots are a comparison of both NDI and INDI with noise added to the attitude rates (p , q , r)
- Noise was added to the state vector going into the controller, using `randn`, as we discussed during our meeting
- Noise density (variance) range: $[0, 1e-5, 1e-4, 1e-3]$
- Plots included for both ‘Guidance’ and ‘Rate’ control loops
- Both NDI and INDI seem to struggle when the noise level is at $1e-3$
I haven’t looked into why this happens in detail yet

Rate Loop

Angular Rates

Legend:

- Noise density 0 NDI
- Noise density 1e-05 NDI
- Noise density 0.0001 NDI
- Noise density 0.001 NDI
- Noise density 0 INDI
- Noise density 1e-05 INDI
- Noise density 0.0001 INDI
- Noise density 0.001 INDI
- Cmd

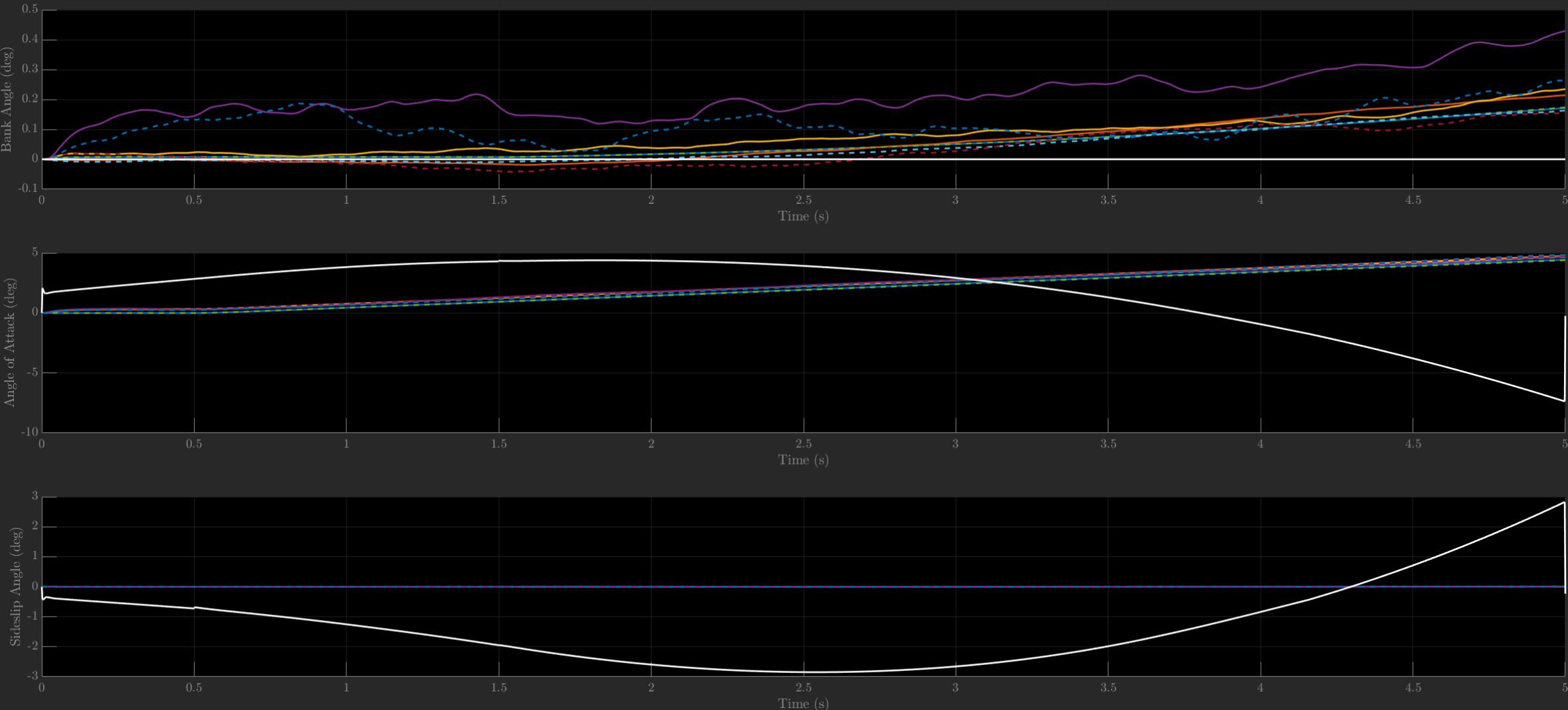


- Angular rate comparison shows that both NDI and INDI have a noticeable drop in performance when the noise level is 1e-3

Angles

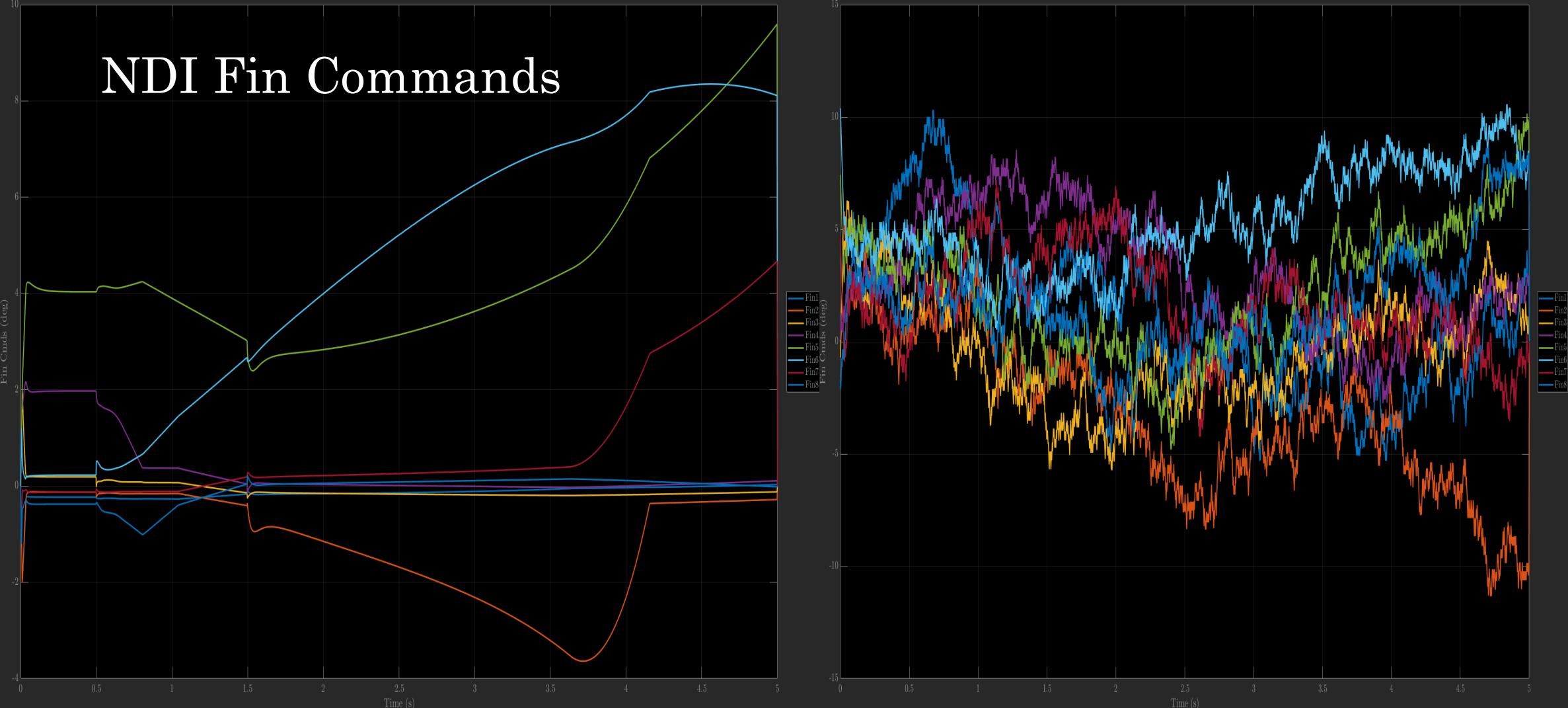
Legend:

- Noise density 0 NDI
- Noise density 1e-05 NDI
- Noise density 0.0001 NDI
- Noise density 0.001 NDI
- Noise density 0 INDI
- Noise density 1e-05 INDI
- Noise density 0.0001 INDI
- Noise density 0.001 INDI
- Cmd



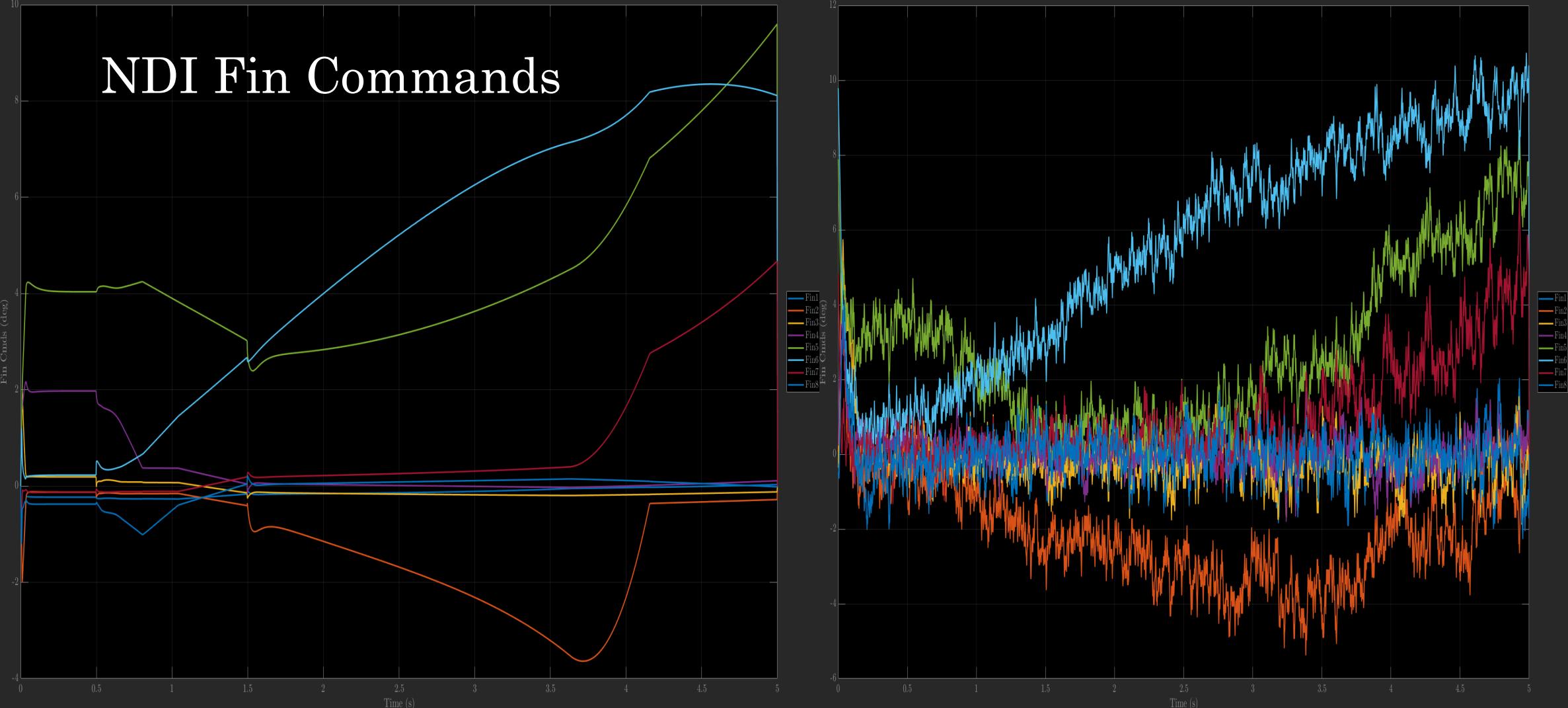
- Only the bank channel seems to be strongly affected by noise

NDI Fin Commands



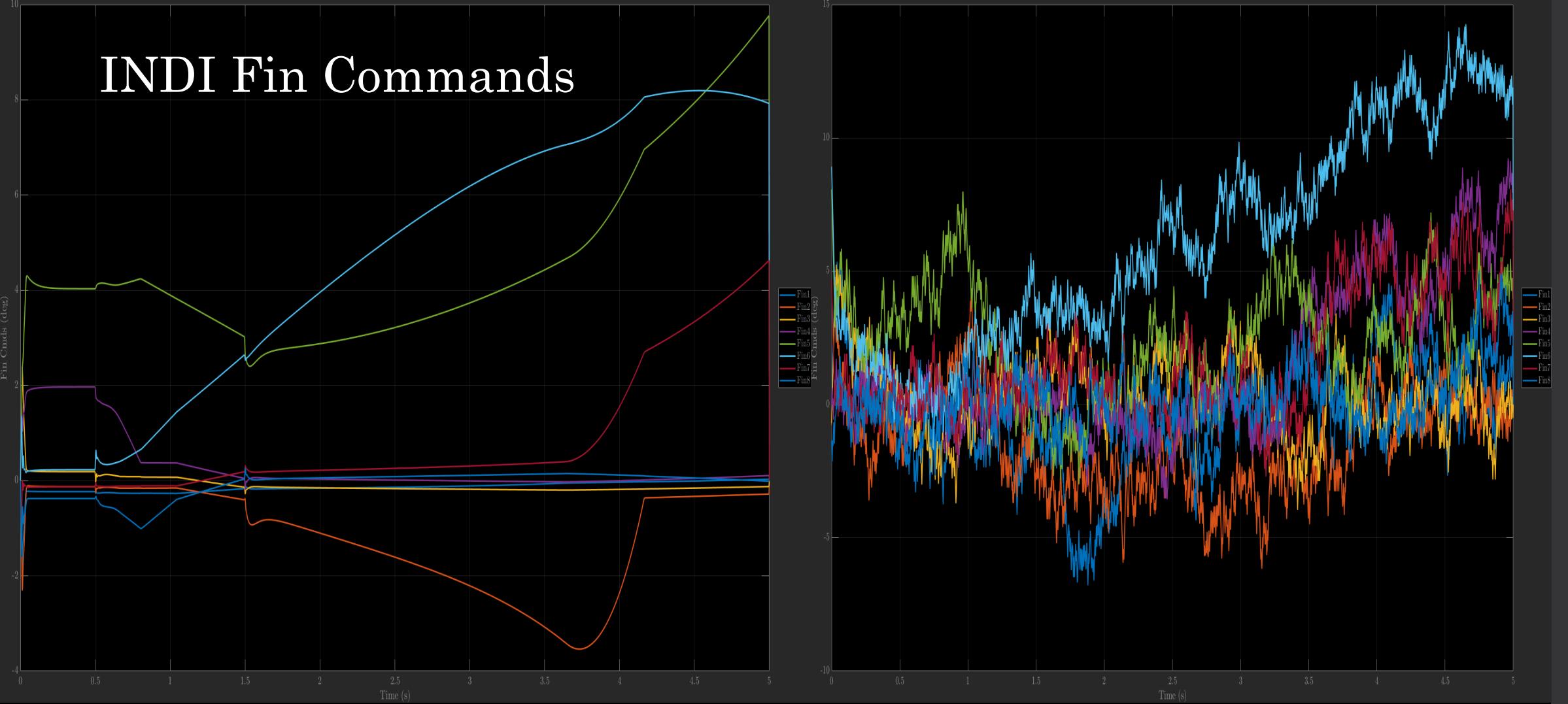
- NDI fin commands, using rate loop, no noise (left) compared to 1e-3 noise. **Note** that the y-axis limits are different for each plot
- Fin commands seem sporadic, and do not track the general shape of the no-noise case

NDI Fin Commands



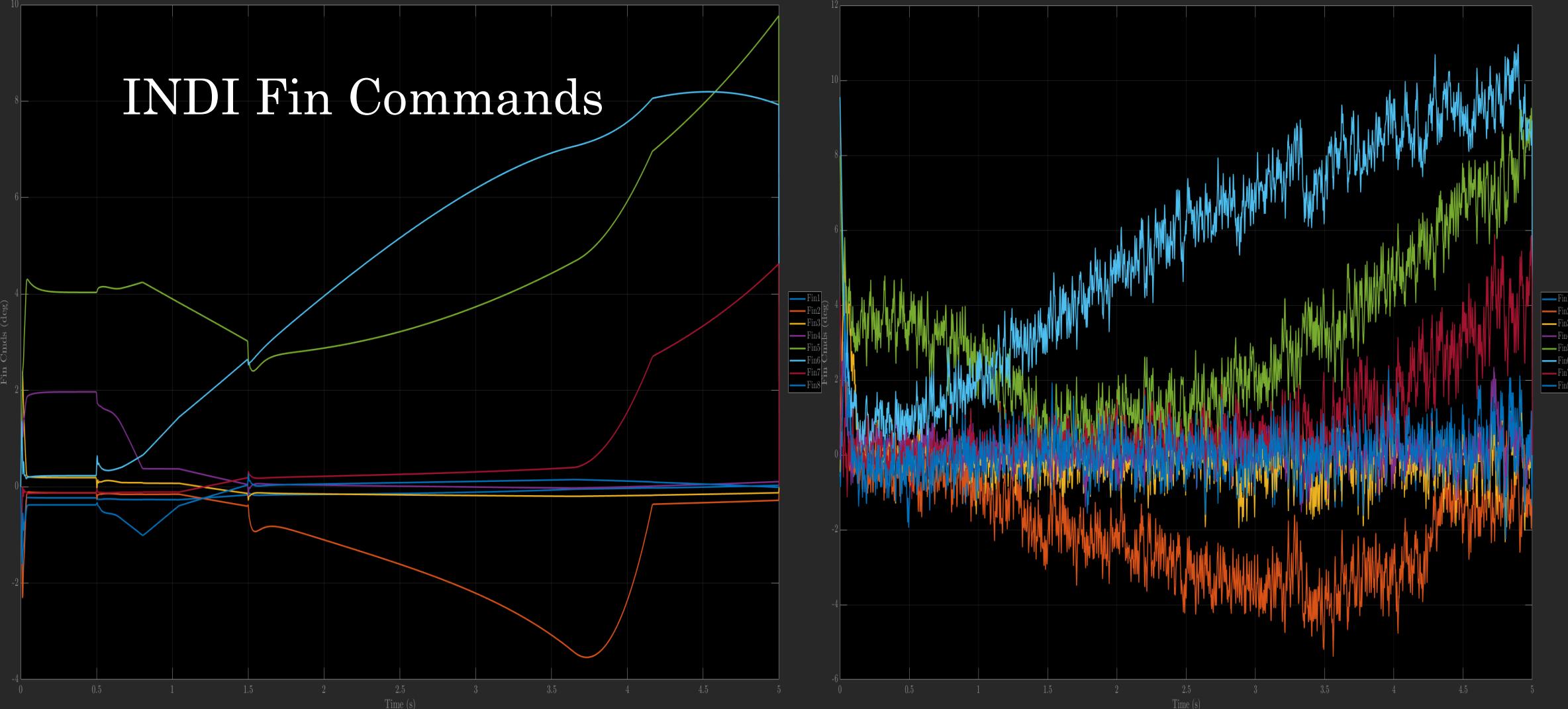
- NDI fin commands, using rate loop, no noise (left) compared to 1e-4 noise. **Note** that the y-axis limits are different for each plot
- Commands seem to track the general shape of the no-noise case when the noise level is reduced from 1e-3 to 1e-4

INDI Fin Commands



- INDI fin commands, using rate loop, no noise (left) compared to 1e-3 noise. **Note** that the y-axis limits are different for each plot
- Fin commands seem sporadic, and do not track the general shape of the no-noise case

INDI Fin Commands



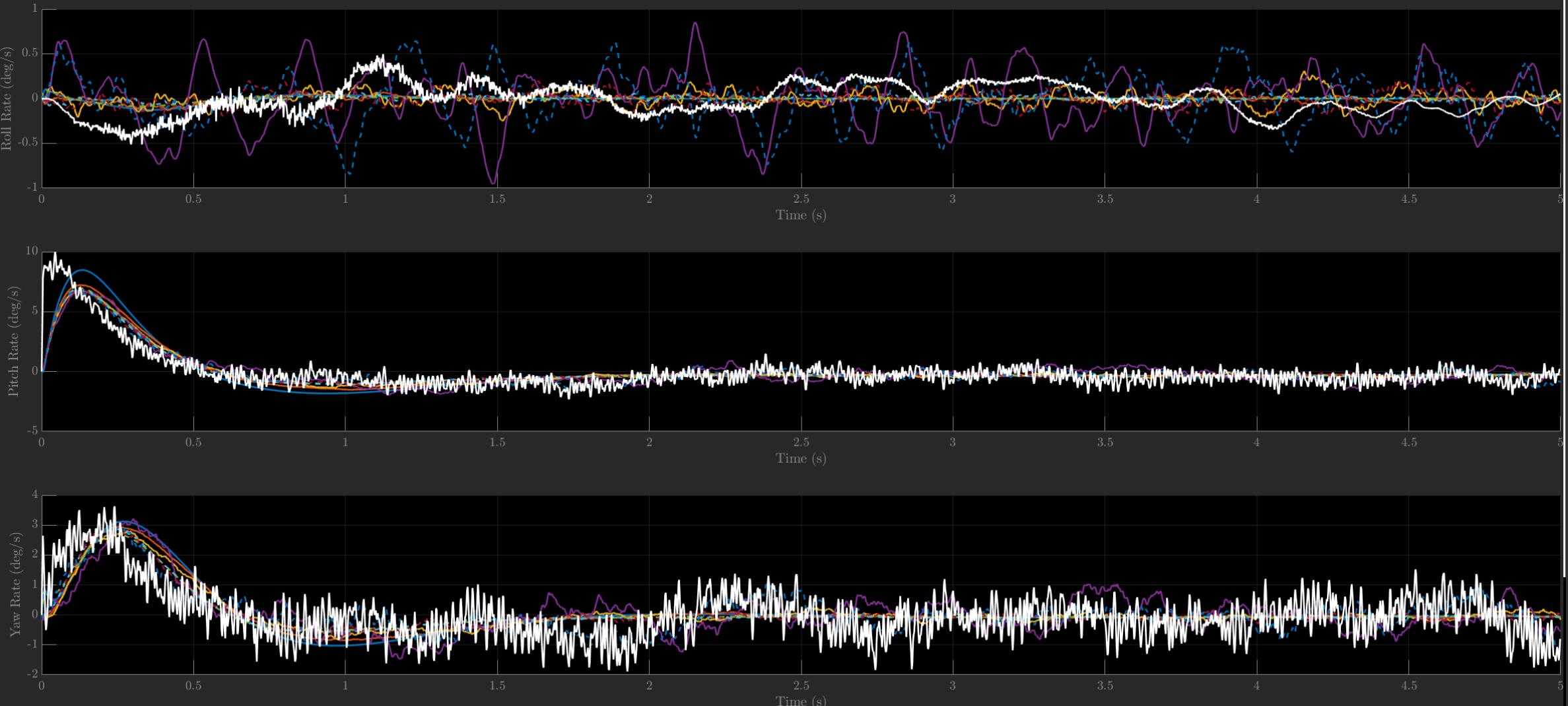
- INDI fin commands, using rate loop, no noise (left) compared to 1e-4 noise. **Note** that the y-axis limits are different for each plot
- Commands seem to track the general shape of the no-noise case when the noise level is reduced from 1e-3 to 1e-4

Guidance Loop

Angular Rates

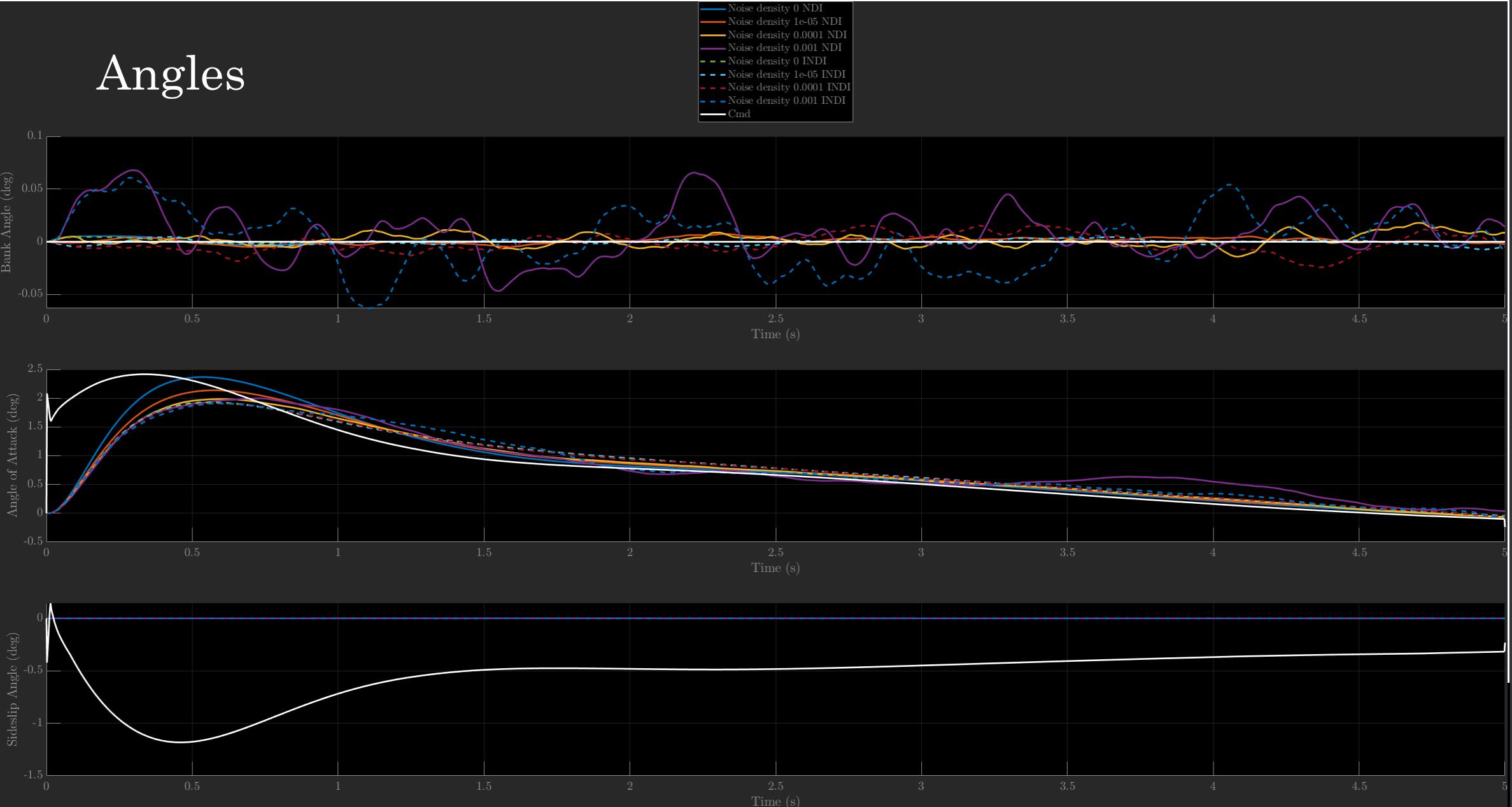
Legend:

- Noise density 0 NDI
- Noise density 1e-05 NDI
- Noise density 0.0001 NDI
- Noise density 0.001 NDI
- Noise density 0 INDI
- Noise density 1e-05 INDI
- Noise density 0.0001 INDI
- Noise density 0.001 INDI
- Cmd



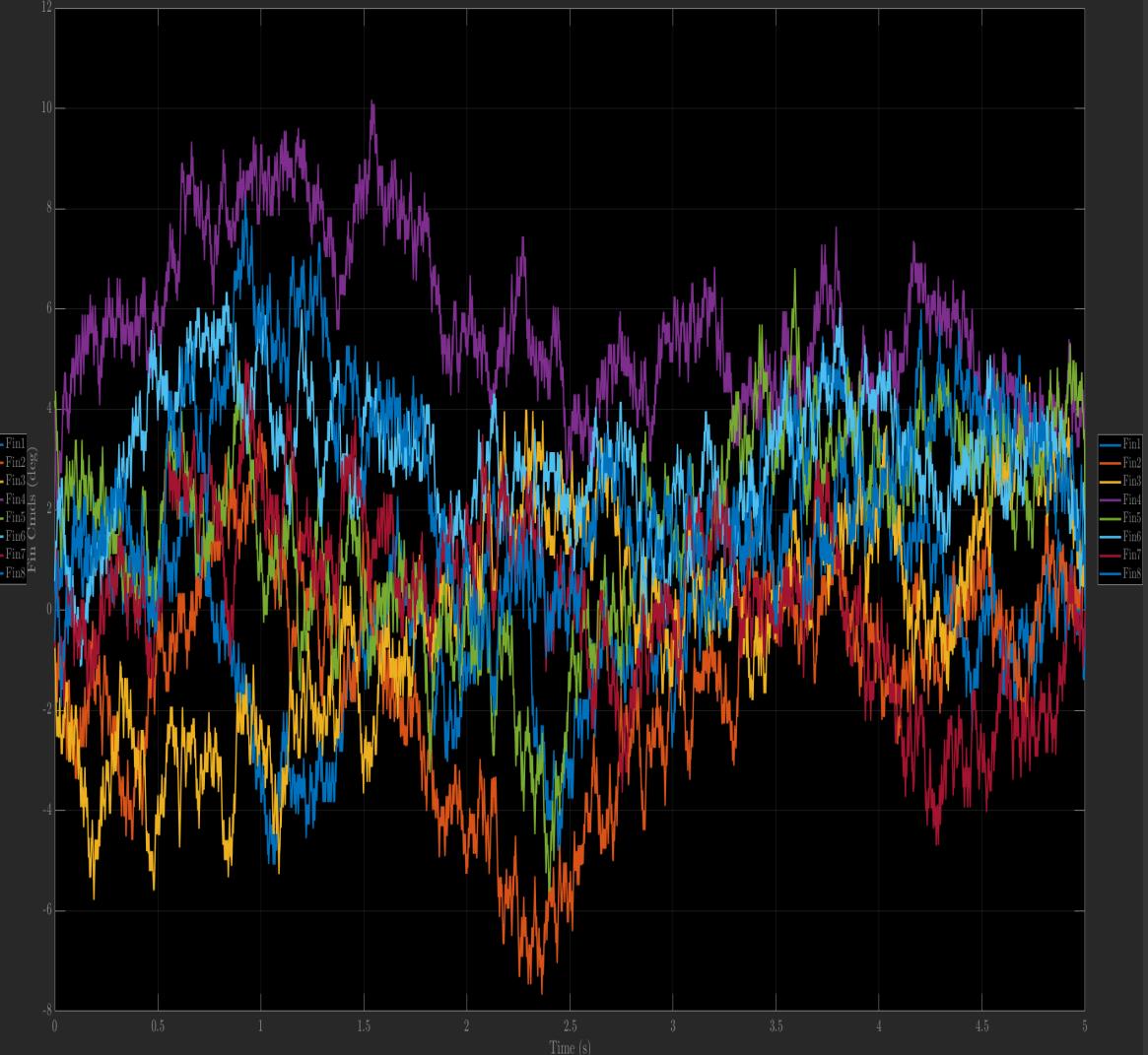
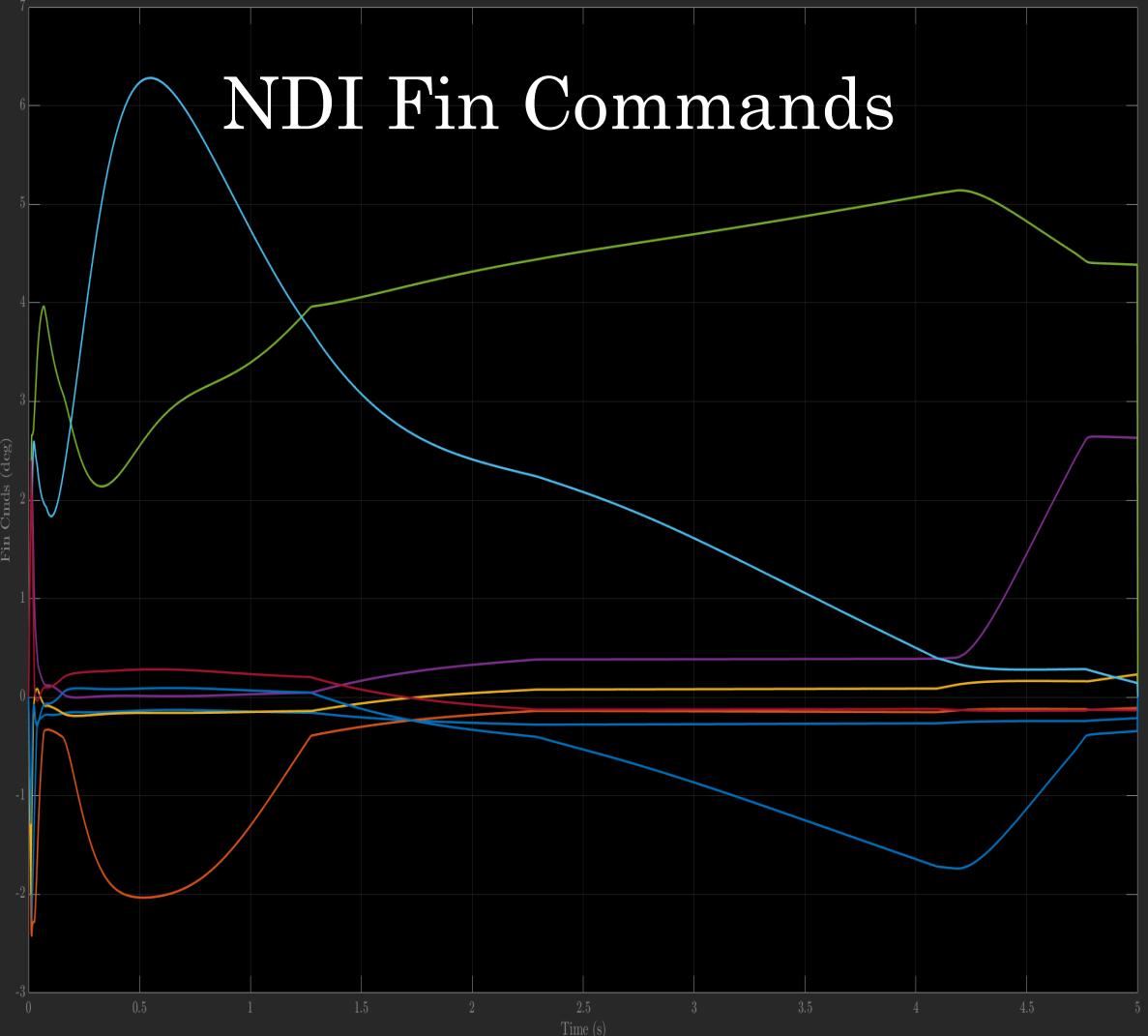
- Angular rate comparison shows that both NDI and INDI have a noticeable drop in performance when the noise level is $1e-3$

Angles



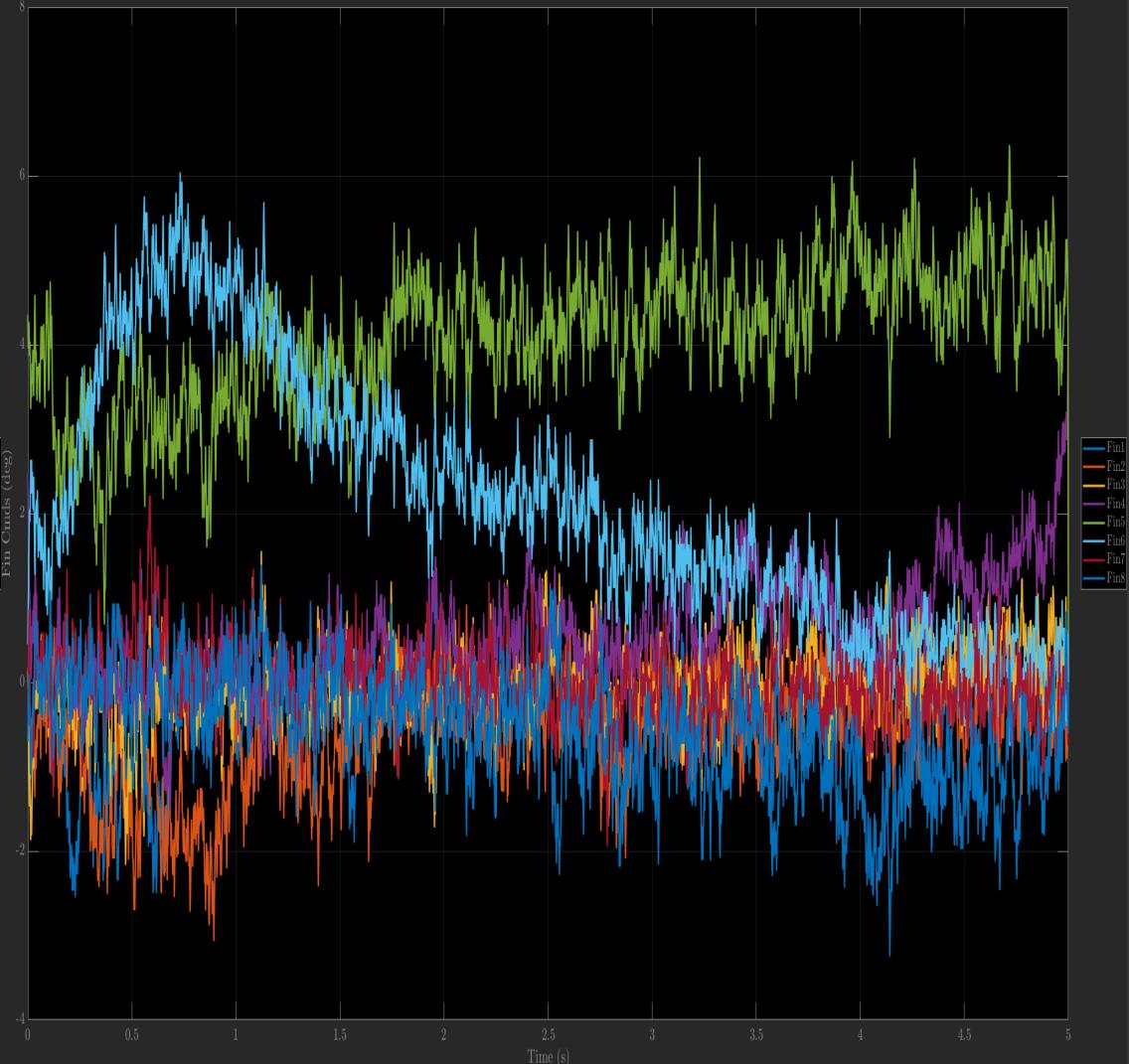
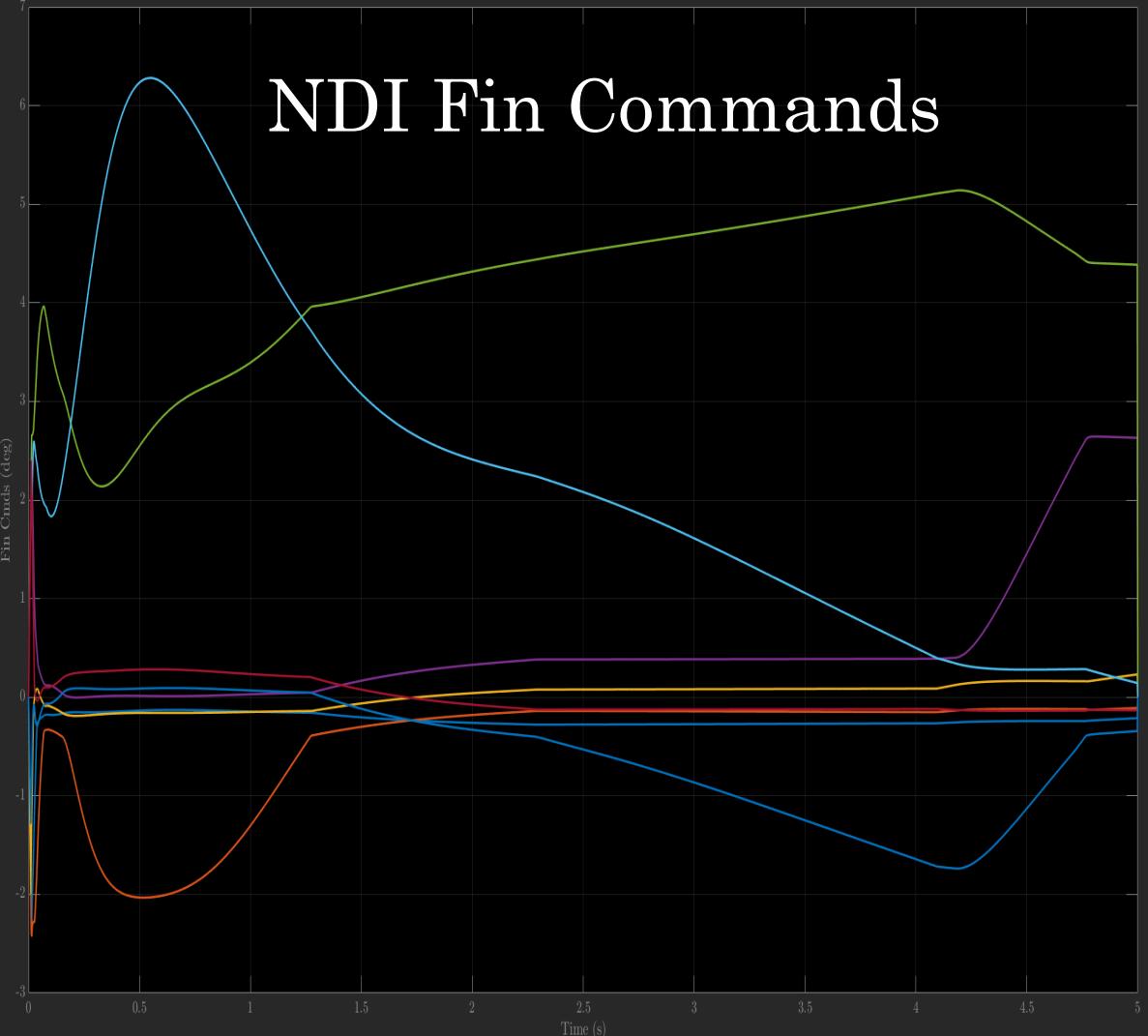
- Angle errors are relatively small, even with the 1e-3 noise level
- Increased noise degrades the AoA tracking performance

NDI Fin Commands



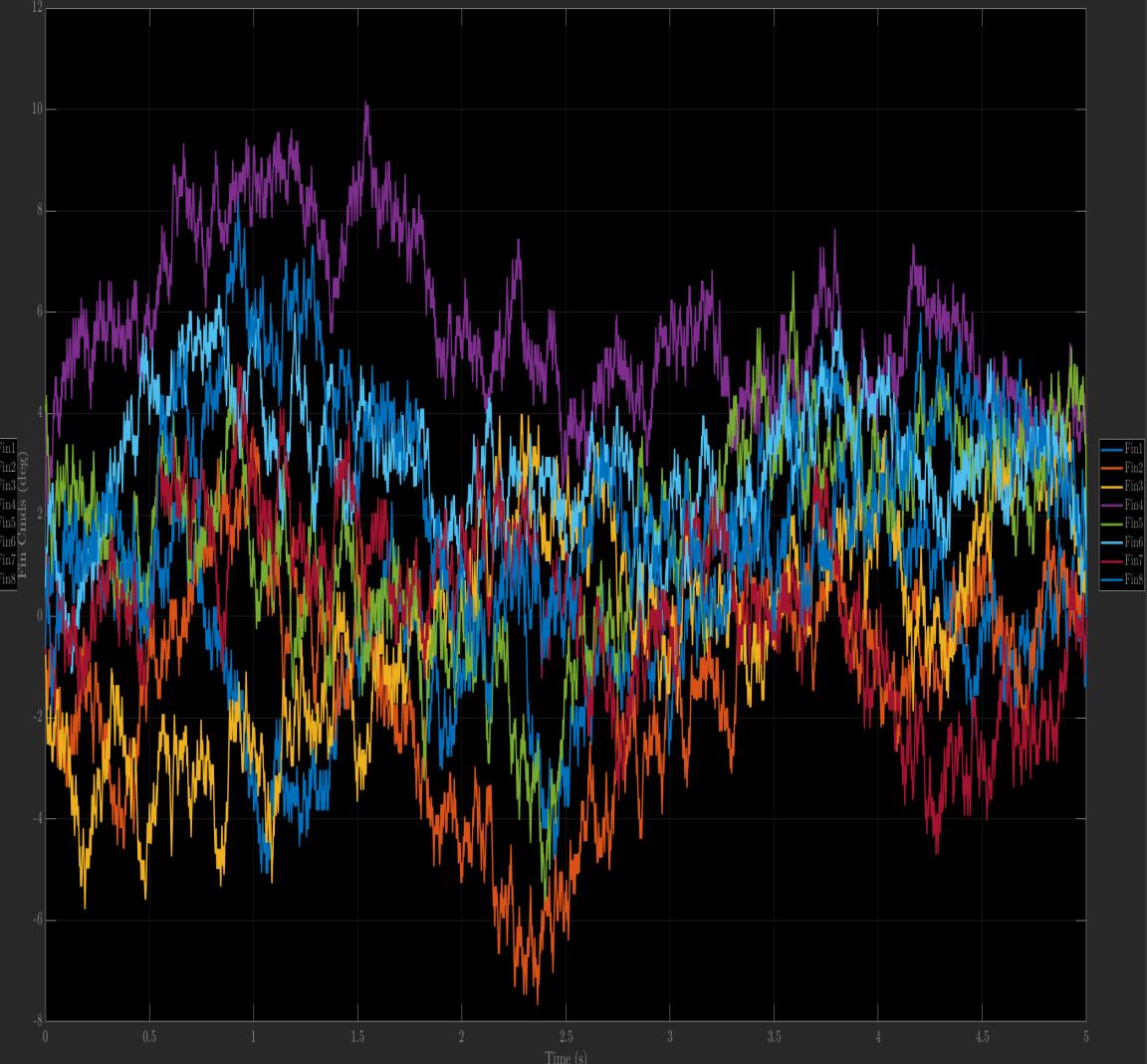
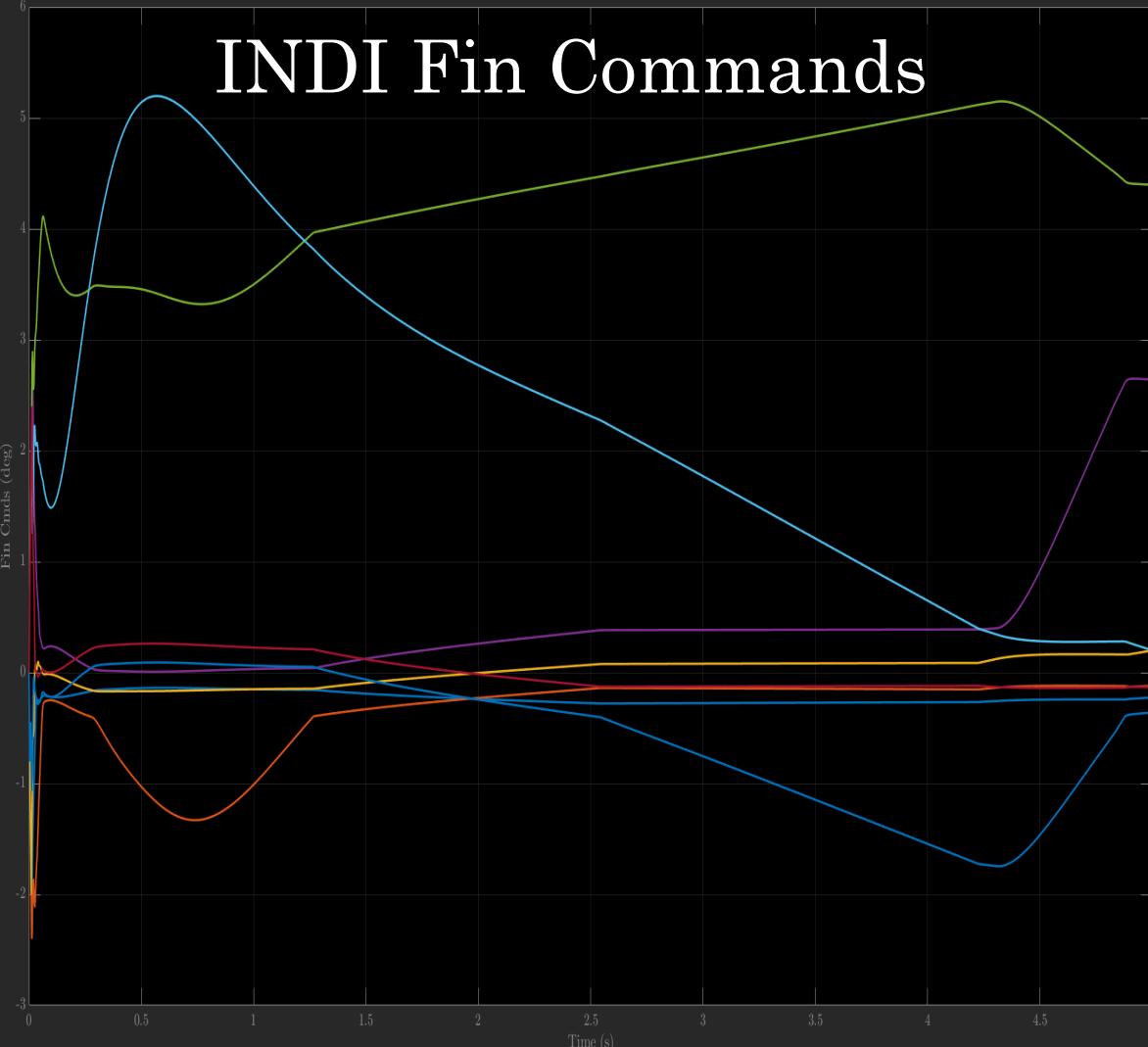
- NDI fin commands, using rate loop, no noise (left) compared to 1e-3 noise. **Note** that the y-axis limits are different for each plot
- Fin commands seem sporadic, and do not track the general shape of the no-noise case

NDI Fin Commands



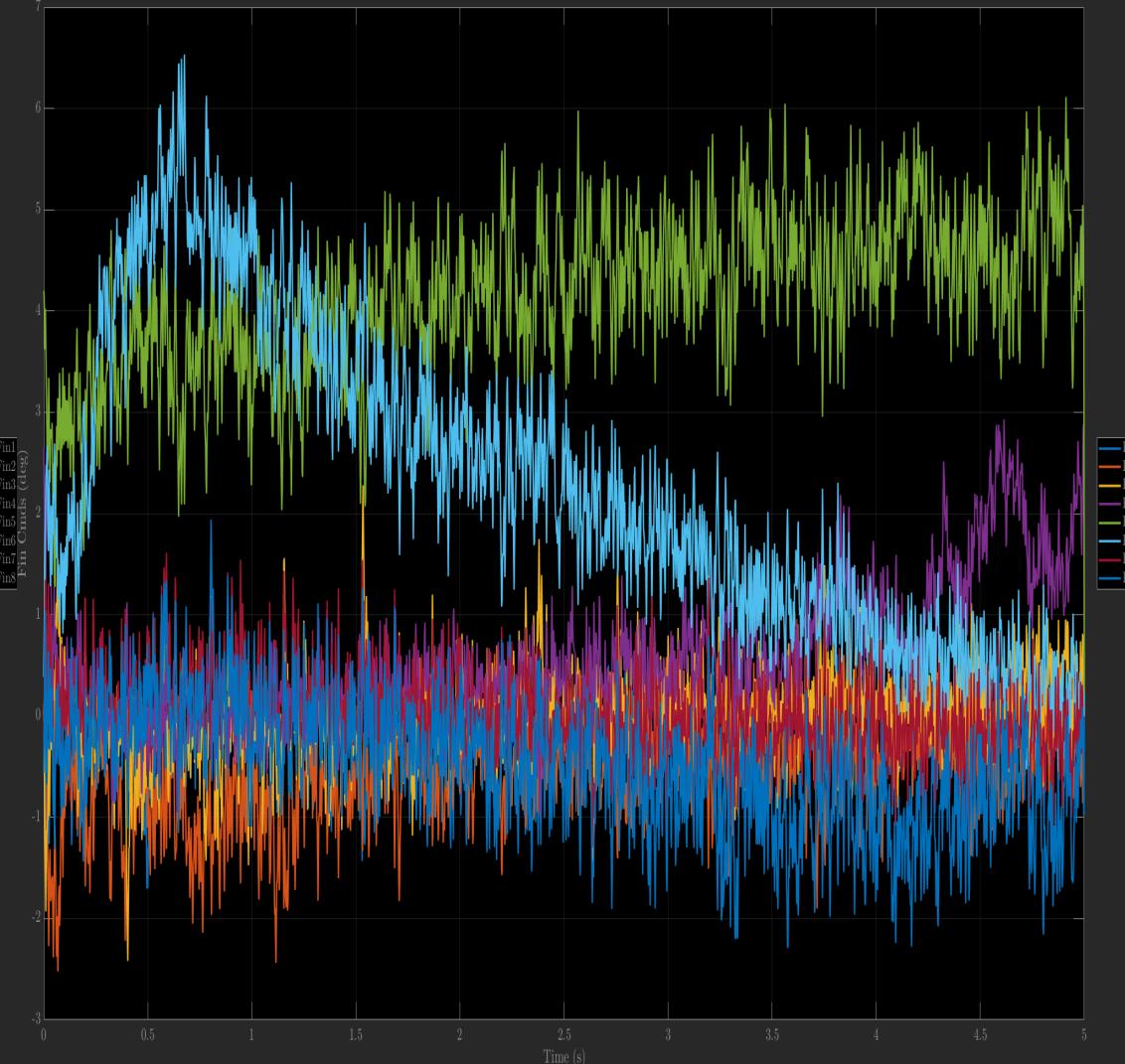
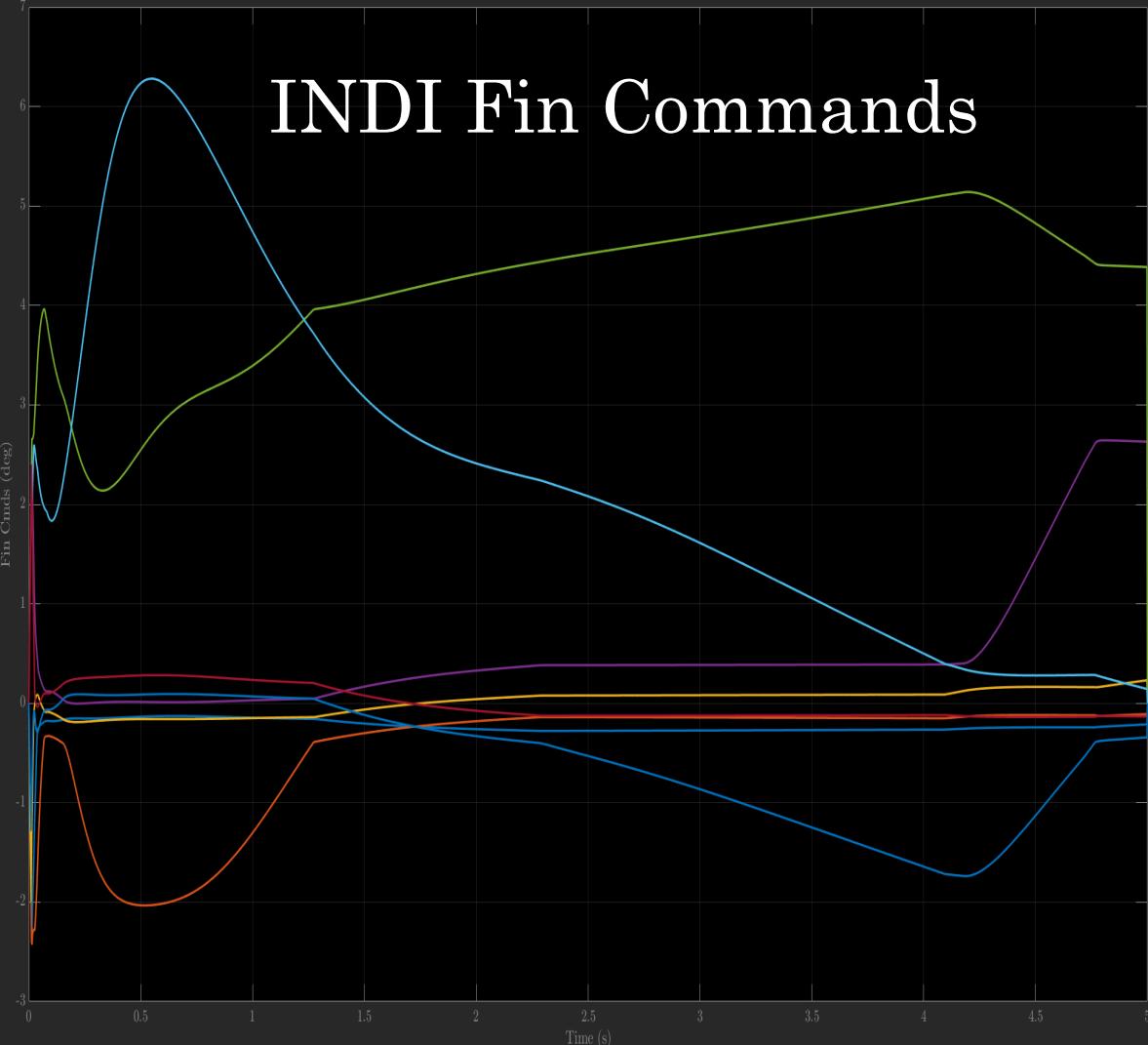
- NDI fin commands, using rate loop, no noise (left) compared to 1e-4 noise. **Note** that the y-axis limits are different for each plot
- Commands seem to track the general shape of the no-noise case when the noise level is reduced from 1e-3 to 1e-4
- Fin command magnitude is much lower, albeit still very noisy

INDI Fin Commands



- INDI fin commands, using rate loop, no noise (left) compared to 1e-3 noise. **Note** that the y-axis limits are different for each plot
- Fin commands seem sporadic, and do not track the general shape of the no-noise case

INDI Fin Commands



- NDI fin commands, using rate loop, no noise (left) compared to 1e-4 noise. **Note** that the y-axis limits are different for each plot
- Fin commands seem noisier compared to NDI