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| **Scenerio 1:**  **Keep a constant altitude of zero (no ground definition)**  **sig.m(1) = heaviside(t - 2)\*((0.2\*sin(1\*(t - 2)) + 0.01\*(t - 2) + 0.15\*sin(1.5\*(t - 2))));**  **Ts = 0.005 s; dt = 0.0002 s**  **Outcome: L1 augmentation worked** | | | |
| L1AC off | | L1AC on    Figure 1: [As] -5 -10 | |
| **Scenerio 2**  **Trajectories from in Lee’s: helix**  **traj.pd = [0.4\*t; 0.4\*sin(pi\*t); -0.6\*cos(pi\*t)]; traj.b1d = [cos(pi\*t); sin(pi\*t); 0];**  **sig.m(2) = heaviside(t - 2)\*0.01\*sin(0.75\*(t - 2)); sig.m(3) = heaviside(t - 2)\*0.01\*sin(t - 2)\*p1^2;**  **Outcome: deal with both time and state-dependent disturbance; decreasing [As] doesn’t improve** | | | |
| L1AC off | L1AC on | |  |
|  | Figure 2: [As] -5 -10  Deacreasing [As] does not improve estimation | | Figure 3: [As] -1 -2  Good enough |

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| **Scenerio 3**  **traj.pd = [0.4\*t; 0.4\*sin(pi\*t); -0.6\*cos(pi\*t)]; traj.b1d = [cos(pi\*t); sin(pi\*t); 0];**  **sig.m(2) = heaviside(t - 2)\*0.2\*sin(1.5\*(t - 2)); sig.m(3) = heaviside(t - 2)\*(0.1\*sin(t - 2) + 0.1\*sin(2\*(t - 2)));**  **Outcome: L1 can deal with large disturbance** | | |
| L1AC off | L1AC on |  |

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| **Scenerio 4**  **traj.pd = [0.4\*t; 0.4\*sin(pi\*t); -0.6\*cos(pi\*t)]; traj.b1d = [cos(pi\*t); sin(pi\*t); 0];**  **sig.b = (1 + 0.4\*sin(t - 2)); unknown input gain from 2 to 7s**  **Outcome: L1 deal with control effectiveness loss; the smaller Ts, the better results.**  **However, this sample includes both baseline and L1, needs to separate to assess** | | |
| L1AC off    Chart  Description automatically generated | Figure 4: Ts = 0.005; dt =0.0005 | Figure 5: Ts = 0.001; dt =0.0005    Chart, scatter chart  Description automatically generated |

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| **Scenerio 5**  **traj.pd = [0.4\*t; 0.4\*sin(pi\*t); -0.6\*cos(pi\*t)]; traj.b1d = [cos(pi\*t); sin(pi\*t); 0];**  **sig.b = (1 + 0.4\*sin(t - 2)); unknown input gain from 2 to 7s**  **Geometric control with dt = 0.0005; sampling time Ts varies**  **Outcome: Smaller Ts 🡺 Better estimation**  **When Ts become bigger to an extent, it appears singular matrix, why?** | |
| Finely-tuned GeoControl; L1 off; without unknown gain    L1 on; with unknown gain; Ts = 0.001 | L1 off; with unknown gain    L1 on; with unknown gain; Ts = 0.02; larger errors |

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| **Scenerio 5**  **traj.pd = [0.4\*t; 0.4\*sin(pi\*t); -0.6\*cos(pi\*t)]; traj.b1d = [cos(pi\*t); sin(pi\*t); 0];**  **Poorly-tuned GeoControl; No disturbance**  **Geometric control with dt = 0.0005; sampling time Ts = 0.001**  **Outcome: L1 cannot certainly help poorly-tuned geometric control; it worsens in this simulation**  **If considering existing disturbance, it works like the scenerios above** | |
| L1 off | L1 on |