In[154]:=
```
ParticleTimeSeries[d_, n_] :=
  Module[
   {dir = d, name = n},
   file = dir <> "/txt_stack/" <> name <> ".txt";
   particles = Import[file, "Table"];
   nparticles = Differences[Position[particles, "t", 2]][[1, 1]] - 1;
   dt = particles[[2 + nparticles, 3]];
   particlesT = Partition[particles[[2 ;;]], nparticles, nparticles + 1];
   {nparticles, dt, particlesT}
  ];

MSD[d_, n_, nl_] :=
  Module[
   {dir = d, name = n, nlags = nl},
   {nparticles, dt, particlesT} = ParticleTimeSeries[dir, name];
   nt = Length[particlesT];
   msds = Table[{(t - 1) * dt,
      Mean[
       Catenate[
        Table[
         SquaredEuclideanDistance[
          particlesT[[t + lag, i, 1 ;; 2]], particlesT[[1 + lag, i, 1 ;; 2]]]
         , {i, 1, nparticles}, {lag, 0, nt - t, Ceiling[(nt - t) / nlags]}
        ]
       ]
      ]},
     {t, 1, nt}
    ];
   msds
  ];
```

In[135]:=
```
mdwout = "/Volumes/homes/Code/cytomod/shila/semiflexible/out/network/";
```

In[5]:=
```
dts = {".00001", ".00004", ".00007", ".00010",
    ".00040", ".00070", ".00100", ".00400", ".00700", ".01000"};
dtdirs = Table["sticky_clnk_rigid_dt" <> dt, {dt, dts}];
```

In[136]:=
```
newmsds = Table[MSD[mdwout <> dtdirs[[i]], "rods", 50], {i, 2, Length[dts]}];
```

In[168]:=
```
Length[newmsds]
```

Out[168]= 9

In[169]:=
```
msds = Table[
    Table[
     {newmsds[[t, i, 1]], Mean[newmsds[[t, i, 2]]]},
     {i, 1, Length[newmsds[[t]]]}],
    {t, 1, Length[newmsds]}];
```

In[160]:=
```
msd1 = MSD[mdwout <> dtdirs[[1]], "rods", 50];
```

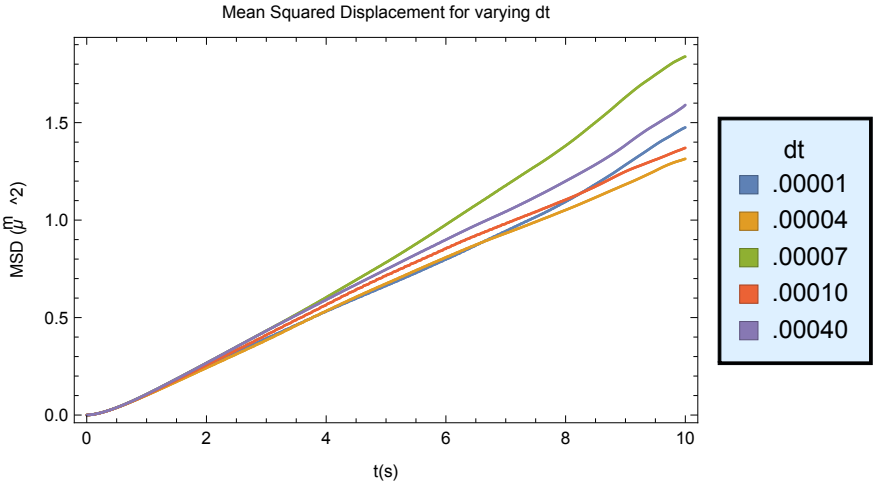
In[176]:=
```
msds = Insert[msds, msd1, 1];
```

In[178]:=
```
Length[msds]
```

Out[178]= 10

In[179]:=
```
ListPlot[msds[[1 ;; 5]], Frame → True,
 FrameLabel → {"t(s)", "MSD (μm^2)", "Mean Squared Displacement for varying dt"},
 PlotLegends → SwatchLegend[dts, LegendLabel → "dt",
   LegendFunction → (Framed[#, Background → LightBlue] &)]
]
```

Out[179]=

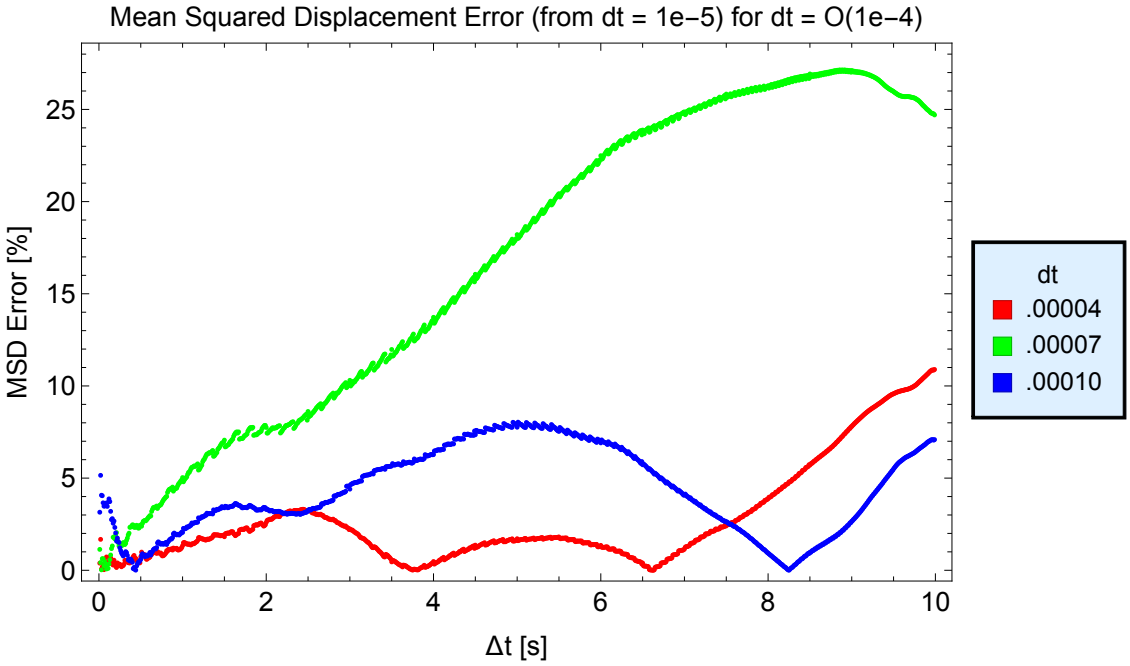


In[180]:=
```
InterpFs =
  Table[
   ListInterpolation[msds[[i, All, 2]], msds[[i, All, 1]]],
   {i, 2, Length[dts]}
  ];
```

In[181]:=
```
errs =
  Table[
   Transpose[
    {msds[[1, 2 ;; -2, 1]],
     Abs[
        Map[InterpFs[[k - 1]], msds[[1, 2 ;; -2, 1]]] - msds[[1, 2 ;; -2, 2]]
       ]
       / msds[[1, 2 ;; -2, 2]] * 100
    }
   ],
   {k, 2, Length[dts]}
  ];
```

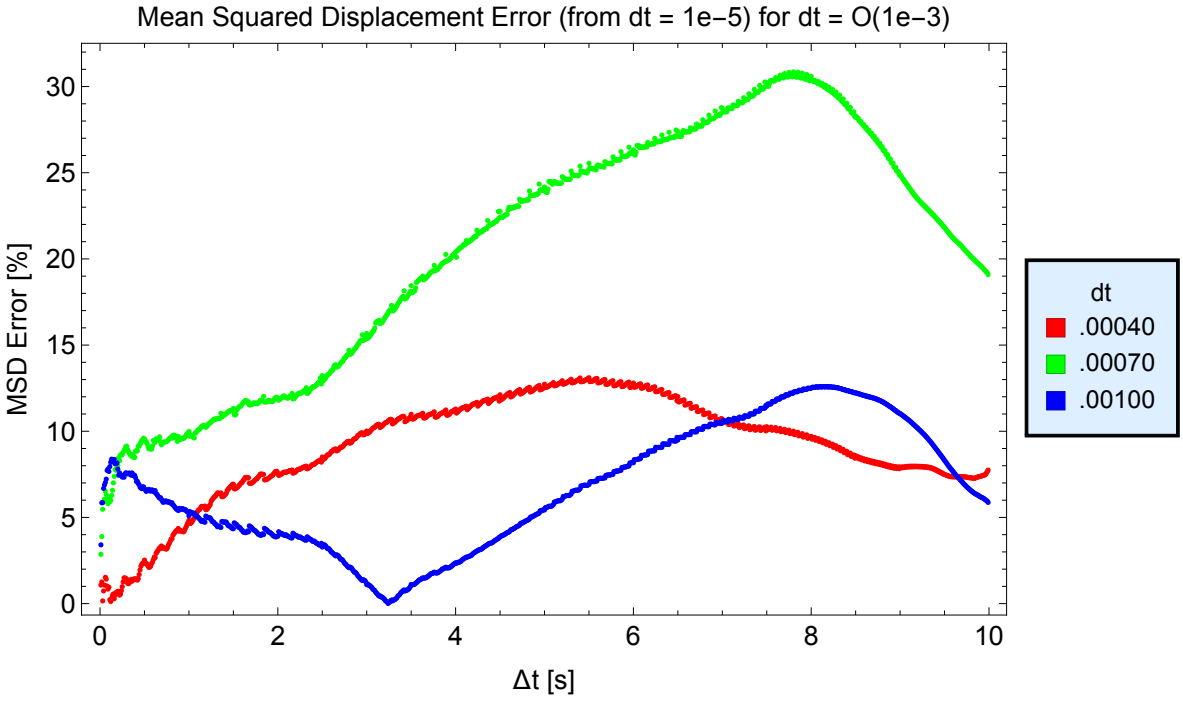
In[188]:=
```
ListPlot[errs[[1 ;; 3]], Frame → True,
 PlotStyle -> {Red, Green, Blue}, FrameLabel → {"Δt [s]", "MSD Error [%]",
   "Mean Squared Displacement Error (from dt = 1e-5) for dt = O(1e-4)"},
 PlotLegends → SwatchLegend[{Red, Green, Blue}, dts[[2 ;; 4]],
   LegendLabel → "dt", LegendFunction → (Framed[#, Background → LightBlue] &)],
 BaseStyle → {FontSize -> 14}
]
```

Out[188]=



In[189]:=
```
ListPlot[errs[[4 ;; 6]], Frame → True,
 PlotStyle -> {Red, Green, Blue}, FrameLabel → {"Δt [s]", "MSD Error [%]",
   "Mean Squared Displacement Error (from dt = 1e-5) for dt = O(1e-3)"},
 PlotLegends → SwatchLegend[{Red, Green, Blue}, dts[[5 ;; 7]],
   LegendLabel → "dt", LegendFunction → (Framed[#, Background → LightBlue] &)],
 BaseStyle → {FontSize -> 14}
]
```

Out[189]=



In[190]:=
```
ListPlot[errs[[7 ;; 9]], Frame → True,
 PlotStyle -> {Red, Green, Blue}, FrameLabel → {"Δt [s]", "MSD Error [%]",
   "Mean Squared Displacement Error (from dt = 1e-5) for dt = O(1e-2)"},
 PlotLegends → SwatchLegend[{Red, Green, Blue}, dts[[8 ;; 10]],
   LegendLabel → "dt", LegendFunction → (Framed[#, Background → LightBlue] &)],
 BaseStyle → {FontSize -> 14}
]
```

Out[190]=