

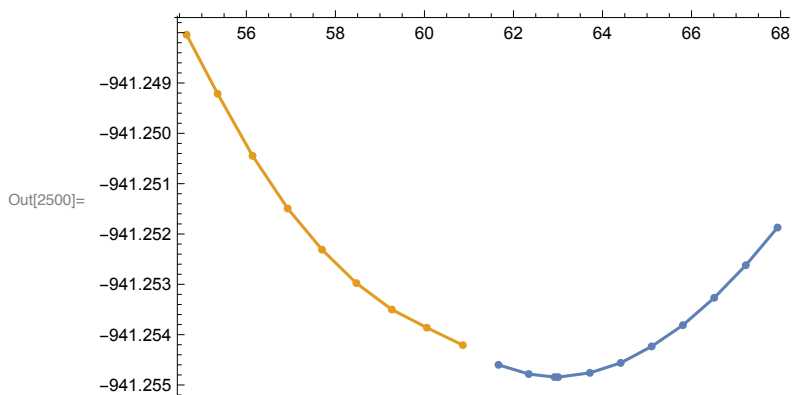
```
In[2494]:= SetDirectory["/Volumes/MicroSD/2_PostDoc_SD/CaCO3/Common_Tangent-master"]
oneDat = Import["1.dat"][[2 ;; -1]]
twoDat = Import["2.dat"][[2 ;; -1]]
```

```
Out[2494]:= /Volumes/MicroSD/2_PostDoc_SD/CaCO3/Common_Tangent-master
```

```
Out[2495]= {{61.6634, -941.255}, {62.3429, -941.255},
{62.9227, -941.255}, {63.0043, -941.255}, {63.716, -941.255},
{64.4085, -941.255}, {65.1047, -941.254}, {65.805, -941.254},
{66.5094, -941.253}, {67.2181, -941.253}, {67.9312, -941.252}}
```

```
Out[2496]= {{54.6569, -941.248}, {55.3555, -941.249}, {56.1392, -941.25},
{56.9292, -941.251}, {57.6993, -941.252}, {58.4712, -941.253},
{59.2667, -941.254}, {60.0548, -941.254}, {60.8627, -941.254}}
```

```
In[2500]:= Show[ListLinePlot@{oneDat, twoDat}, ListPlot@{oneDat, twoDat}]
```



```
In[2502]:= ClearAll@x
```

```
In[2646]:= fitOneDatx = Fit[oneDat, {1, x, x^2, x^3}, x]
fitTwoDatx = Fit[twoDat, {1, x, x^2, x^3}, x]
fitOneDat = fitOneDatx /. x -> y
fitTwoDat = fitTwoDatx /. x -> z
```

```
Out[2646]= -939.849 - 0.0583396 x + 0.000789491 x^2 - 3.45387 × 10-6 x^3
```

```
Out[2647]= -939.815 - 0.0652345 x + 0.000982731 x^2 - 4.91953 × 10-6 x^3
```

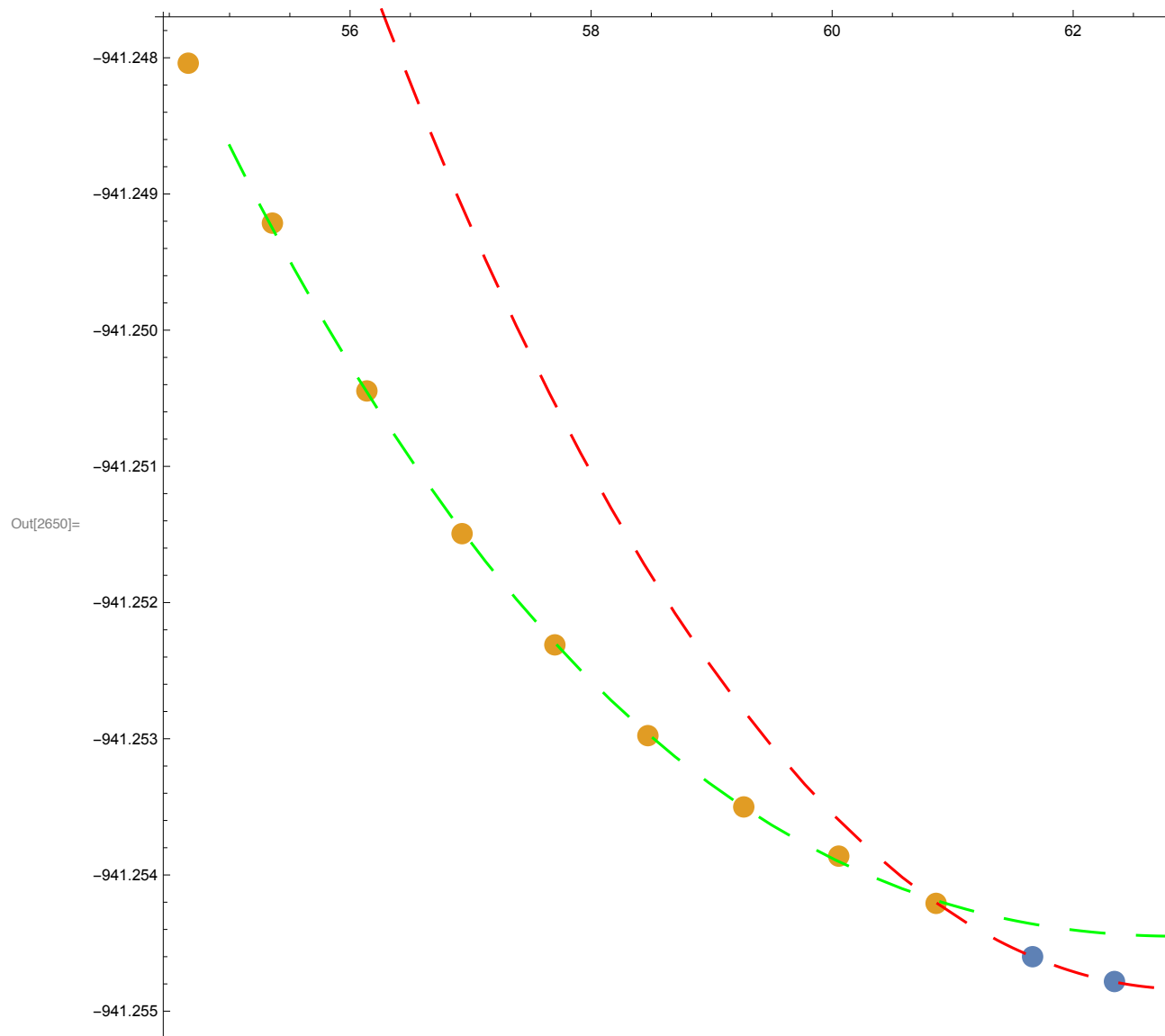
```
Out[2648]= -939.849 - 0.0583396 y + 0.000789491 y^2 - 3.45387 × 10-6 y^3
```

```
Out[2649]= -939.815 - 0.0652345 z + 0.000982731 z^2 - 4.91953 × 10-6 z^3
```

```

In[2650]:= Show[ListPlot[{oneDat, twoDat}, PlotLegends → {"OneDat", "TwoDat"}],
  Plot[fitOneDatx, {x, 55, 68},
    PlotStyle → Directive[Dashing[0.02], Red], PlotLegends → {"OneDatFit"}],
  Plot[fitTwoDatx, {x, 55, 68}, PlotStyle → Directive[Dashing[0.02], Green],
    PlotLegends → {"TwoDatFit"}], ImageSize → 1000]

```



```

In[2630]:= fitOneDat
fitOneDatDash = D[fitOneDat, y]
fitTwoDat
fitTwoDatDash = D[fitTwoDat, z]

```

```
Out[2630]= -939.849 - 0.0583396 y + 0.000789491 y^2 - 3.45387 × 10-6 y^3
```

```
Out[2631]= -0.0583396 + 0.00157898 y - 0.0000103616 y^2
```

```
Out[2632]= -939.815 - 0.0652345 z + 0.000982731 z^2 - 4.91953 × 10-6 z^3
```

```
Out[2633]= -0.0652345 + 0.00196546 z - 0.0000147586 z^2
```

```
In[2639]:= sol = Solve[{(fitOneDat - fitTwoDat) / (y - z) == fitTwoDatDash &&
  (fitOneDat - fitTwoDat) / (y - z) == fitOneDatDash}, {y, z}, Reals]
solConditions = Solve[{(fitOneDat - fitTwoDat) / (y - z) == fitTwoDatDash &&
  (fitOneDat - fitTwoDat) / (y - z) == fitOneDatDash &&
  56 < z < 64 && 56 < y < 64}, {y, z}, Reals]
```

... Solve: Solve was unable to solve the system with inexact coefficients. The answer was obtained by solving a corresponding exact system and numericizing the result.

```
Out[2639]= {{y -> 4.36525, z -> 7.31639}, {y -> 5.90593, z -> 5.90593},
  {y -> 60.8115, z -> 60.8115}, {y -> 61.4458, z -> 59.9939}, {y -> 65.1271, z -> 65.1271}}
```

... Solve: Solve was unable to solve the system with inexact coefficients. The answer was obtained by solving a corresponding exact system and numericizing the result.

```
Out[2640]= {{y -> 60.8115, z -> 60.8115}, {y -> 61.4458, z -> 59.9939}}
```

```
In[2641]:= solConditions[[2]]
```

```
Out[2641]= {y -> 61.4458, z -> 59.9939}
```

```
In[2670]:= a = fitTwoDat /. solConditions[[2]]
b = -fitOneDatDash * z /. solConditions[[2]]
c = (fitOneDatDash /. solConditions[[2]]) * x
commonTangent = a + b + c
```

```
Out[2670]= -941.254
```

```
Out[2671]= 0.0263296
```

```
Out[2672]= -0.000438871 x
```

```
Out[2673]= -941.228 - 0.000438871 x
```

```
In[2676]:= Show[ListPlot[{oneDat, twoDat}],  
Plot[{fitOneDatx, fitTwoDatx, commonTangent}, {x, 55, 68}], ImageSize -> 800]
```

Out[2676]=

