Lizzy Compton and Terra Ficke

Kouma-Konda, Togo Monthly Minimum data

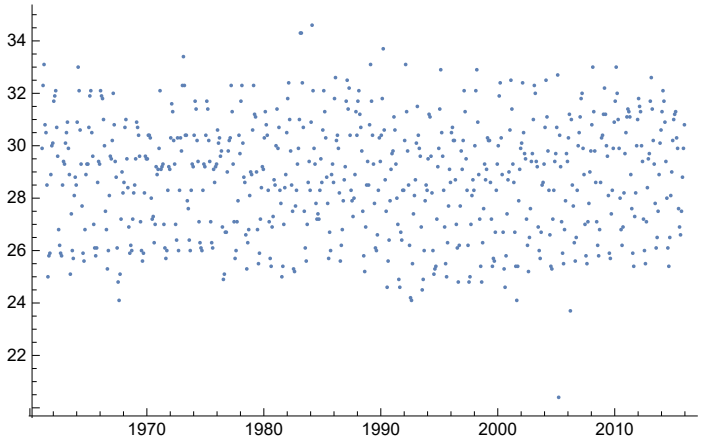
In[1]:=

In[2]:=
```
KoumaKondaMax = Partition[
   Flatten[Import["M:\\MAT 375\\Mini-Project 2\\Max_Temps_Kouma_Konda.xlsx"]], 4];
```

In[3]:=
```
MaxYears = KoumaKondaMax[[2 ;; Length[KoumaKondaMax], 2]];
MaxTemps = KoumaKondaMax[[2 ;; Length[KoumaKondaMax], 4]];
```

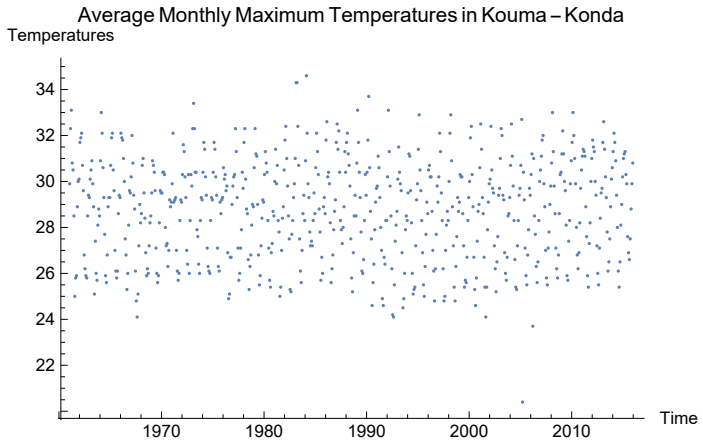
In[5]:=
```
MaxData = Table[{MaxYears[[i]], MaxTemps[[i]]}, {i, Length[MaxYears]}];
p1 = ListPlot[MaxData]
```

Out[6]=



In[7]:=
```
Show[p1, AxesLabel → {HoldForm[Time], HoldForm[Temperatures]},
 PlotLabel → HoldForm[Average Monthly Maximum Temperatures in Kouma – Konda],
 LabelStyle → {GrayLevel[0]}]
```

Out[7]=

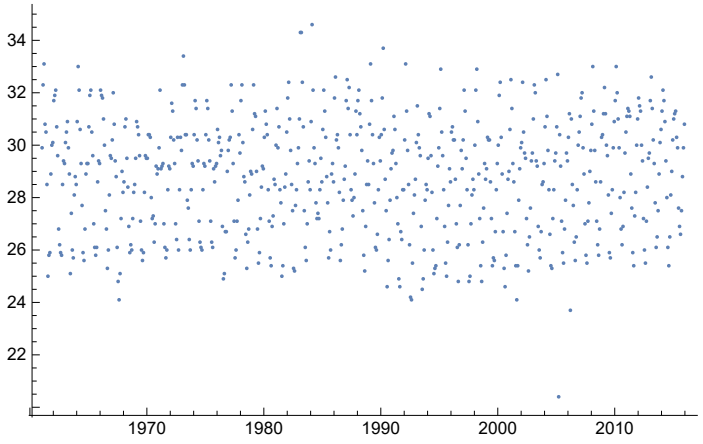


In[8]:=
```
lm = LinearModelFit[MaxData, {x, Sin[2 * Pi * x], Cos[2 * Pi * x]}, x]
```

Out[8]=
$$\text{FittedModel}\left[27.0101 + 0.000883214\,x + 1.98763\,\text{Cos}[2\,\pi x] + 1.892\,\text{Sin}[2\,\pi x]\right]$$

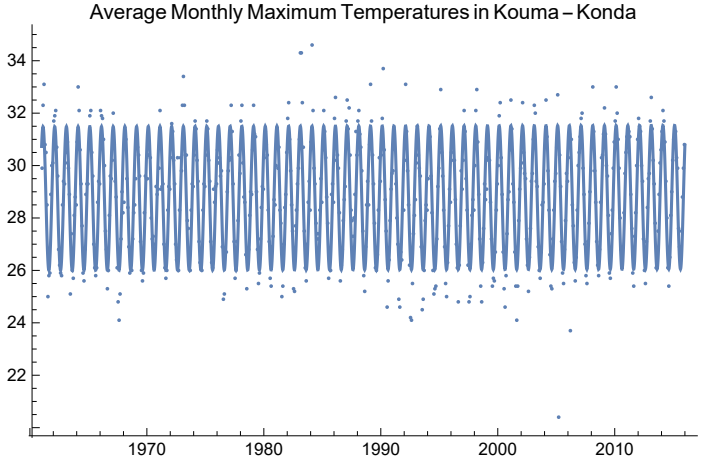
In[9]:=
```
p1 = ListPlot[MaxData]
p2 = Plot[lm[x], {x, 1961, 2016}];
Show[ListPlot[MaxData], Plot[lm[x], {x, 1961, 2016}],
 PlotLabel → HoldForm[Average Monthly Maximum Temperatures in Kouma – Konda],
 LabelStyle → {GrayLevel[0]}]
```

Out[9]=



Average Monthly Maximum Temperatures in Kouma – Konda

Out[11]=



In[12]:=

In[13]:=
```
lm["RSquared"]
```

Out[13]= 0.786378

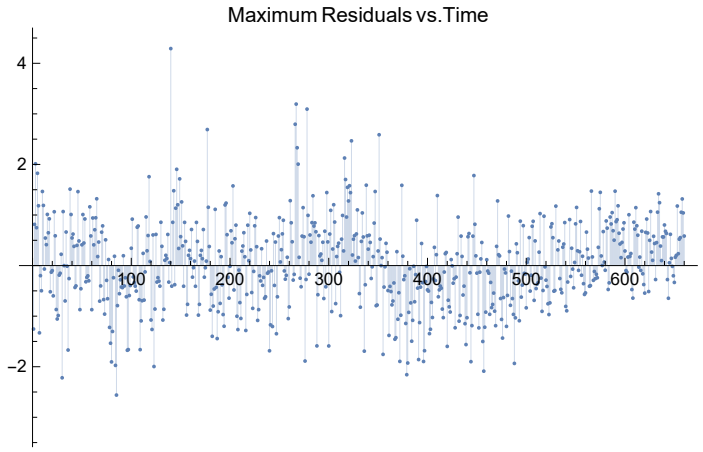
In[14]:=
```
lm["ParameterConfidenceIntervals"]
```

Out[14]= {{17.2985, 36.7217}, {−0.0040005, 0.00576692}, {1.78234, 2.00165}, {1.87798, 2.09727}}

In[15]:=
```
(*Linear model only significant in the ocilations*)
```

In[16]:=
```
ListPlot[lm["FitResiduals"], Filling → Axis,
 PlotLabel → HoldForm[Maximum Residuals vs. Time], LabelStyle → {GrayLevel[0]} ]
```

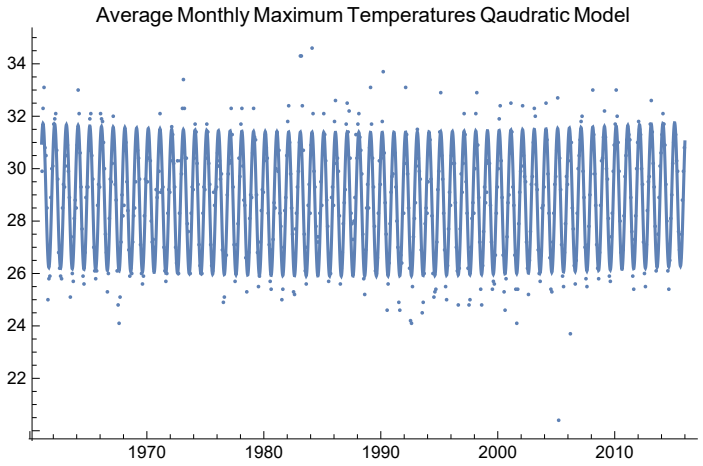
Out[16]=



In[17]:=
```
qm = LinearModelFit[MaxData, {x, x^2, Sin[2 * Pi * x], Cos[2 * Pi * x] }, x]
Show[ListPlot[MaxData], Plot[qm[x], {x, 1961, 2016}],
 PlotLabel → HoldForm[Average Monthly Maximum Temperatures Qaudratic Model],
 LabelStyle → {GrayLevel[0]}]
```

Out[17]=
```
FittedModel[ 1935.31 − 1.91857 x + ≪23≫ x^2 + 1.98758 Cos[2 π x] + 1.892 Sin[2 π x] ]
```

Out[18]=



In[19]:=
```
qm["RSquared"]
```

Out[19]=
```
0.788852
```

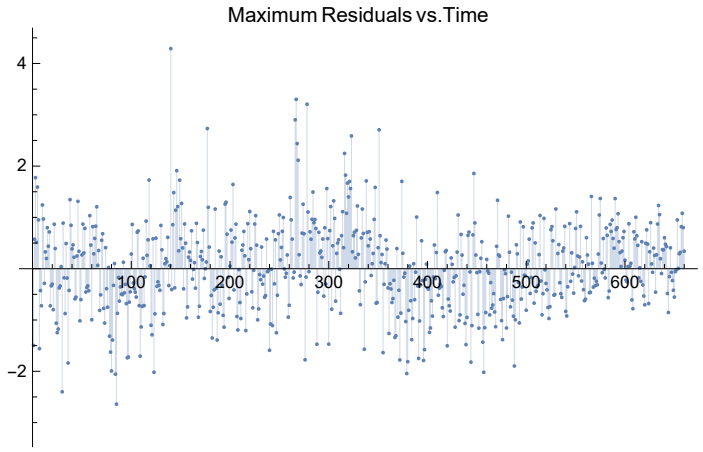
In[20]:=
```
qm["ParameterConfidenceIntervals"]
```

Out[20]=
```
{{582.523, 3288.09}, {−3.27924, −0.557904},
 {0.000140507, 0.000824771}, {1.78289, 2.0011}, {1.87849, 2.09667}}
```

In[21]:=
```
(*So the quadratic model is significant in all pararmeters,
however the linear term is negative and the quadratic
 term is positive so I dont know what the overall increase is*)
```

In[22]:=
```
ListPlot[qm["FitResiduals"], Filling → Axis,
 PlotLabel → HoldForm[Maximum Residuals vs. Time], LabelStyle → {GrayLevel[0]}]
```

Out[22]=



Trying again with outliers of Feb, Mar 1983, Feb 1984, Mar 2005 - 34 and 24 were our cutoff

Kouma-Konda, Togo Monthly Minimum data

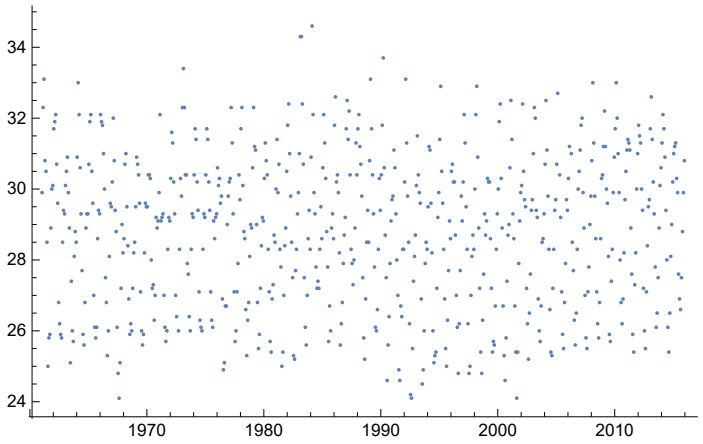
In[23]:=

In[24]:=
```
KoumaKondaMax2 =
  Partition[Flatten[Import["M:\\MAT 375\\Mini-Project 2\\Max_Temps_Adj.xlsx"]], 4];
```

In[25]:=
```
MaxYears2 = KoumaKondaMax2[[2 ;; Length[KoumaKondaMax2], 2]];
MaxTemps2 = KoumaKondaMax2[[2 ;; Length[KoumaKondaMax2], 4]];
```

In[27]:=
```
MaxData2 = Table[{MaxYears2[[i]], MaxTemps2[[i]]}, {i, Length[MaxYears2]}];
p1 = ListPlot[MaxData2]
```

Out[28]=

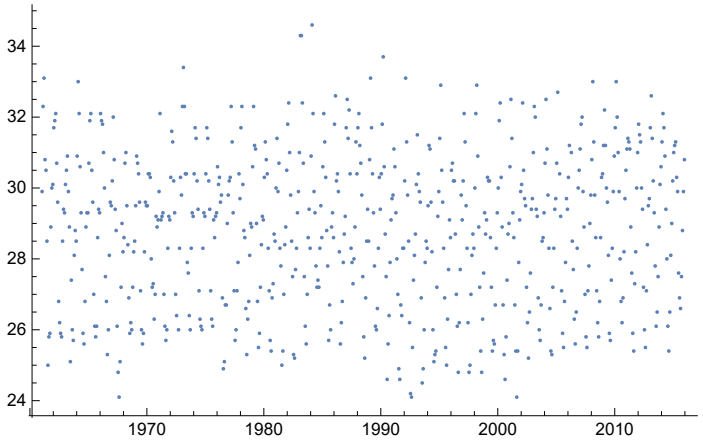


In[29]:=
```
lm2 = LinearModelFit[MaxData2, {x, Sin[2 * Pi * x], Cos[2 * Pi * x]}, x]
```

Out[29]= FittedModel[22.3539 + 0.00323549 x + 2.01154 Cos[2 π x] + 1.95598 Sin[2 π x]]

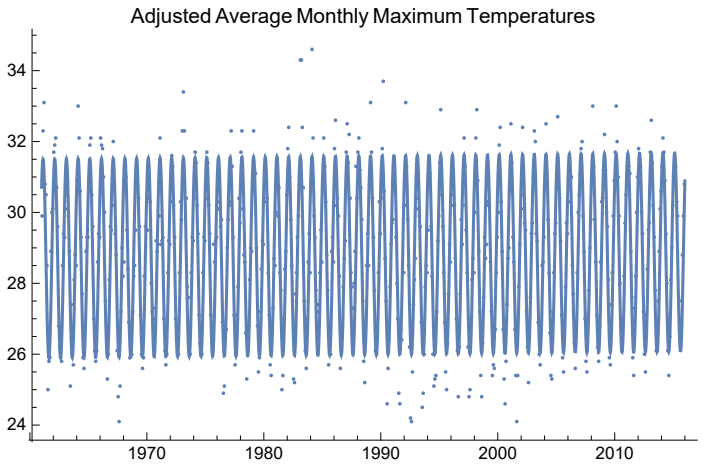
In[30]:=
```
ListPlot[MaxData2]
```

Out[30]=



In[31]:=
```
Show[ListPlot[MaxData2], Plot[lm2[x], {x, 1961, 2016}],
 PlotLabel → HoldForm[Adjusted Average Monthly Maximum Temperatures ],
 LabelStyle → {GrayLevel[0]}]
```

Out[31]=



In[32]:=
```
lm2["RSquared"]
```

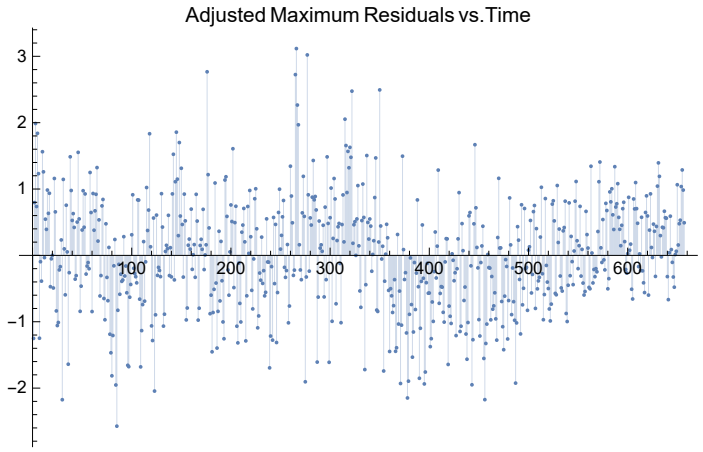
Out[32]= 0.842012

In[33]:=
```
lm2["ParameterConfidenceIntervals"]
```

Out[33]= {{14.0922, 30.6155}, {−0.000919163, 0.00739015}, {1.8626, 2.04937}, {1.91842, 2.10466}}

In[34]:=
```
ListPlot[lm2["FitResiduals"], Filling → Axis,
 PlotLabel → HoldForm[Adjusted Maximum Residuals vs. Time], LabelStyle → {GrayLevel[0]}]
```

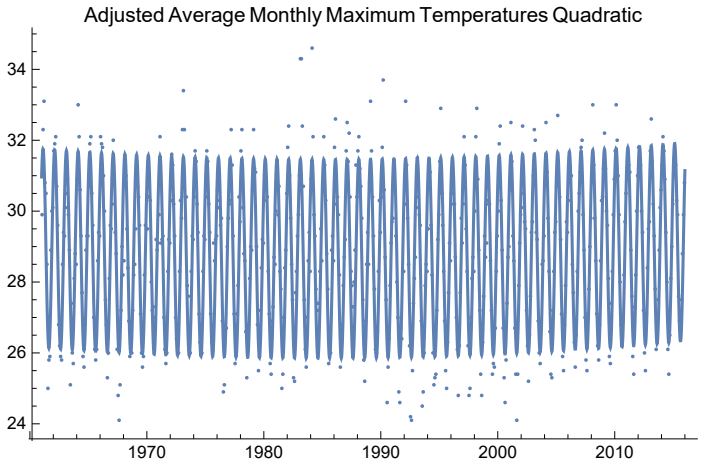
Out[34]=



In[40]:=
```
qm2 = LinearModelFit[MaxData2, {x, x^2, Sin[2 * Pi * x], Cos[2 * Pi * x] }, x]
Show[ListPlot[MaxData2], Plot[qm2[x], {x, 1961, 2016}],
 PlotLabel → HoldForm[Adjusted Average Monthly Maximum Temperatures Quadratic],
 LabelStyle → {GrayLevel[0]}]
```

Out[40]=
```
FittedModel[ 2020.25 − 2.00635 x + 0.000505303 ≪1≫ + 2.01153 Cos[2 π x] + 1.95612 Sin[2 π x] ]
```

Out[41]=



In[37]:=
```
qm2["RSquared"]
```

Out[37]=
```
0.84481
```

In[38]:=
```
qm2["ParameterConfidenceIntervals"]
```

Out[38]=
```
{{875.959, 3164.55}, {−3.15732, −0.855386},
 {0.000215899, 0.000794707}, {1.86349, 2.04874}, {1.91916, 2.10389}}
```

In[42]:=
```
ListPlot[qm2["FitResiduals"], Filling → Axis,
 PlotLabel → HoldForm[Adjusted Maximum Residuals vs. Time], LabelStyle → {GrayLevel[0]}]
```

Out[42]=