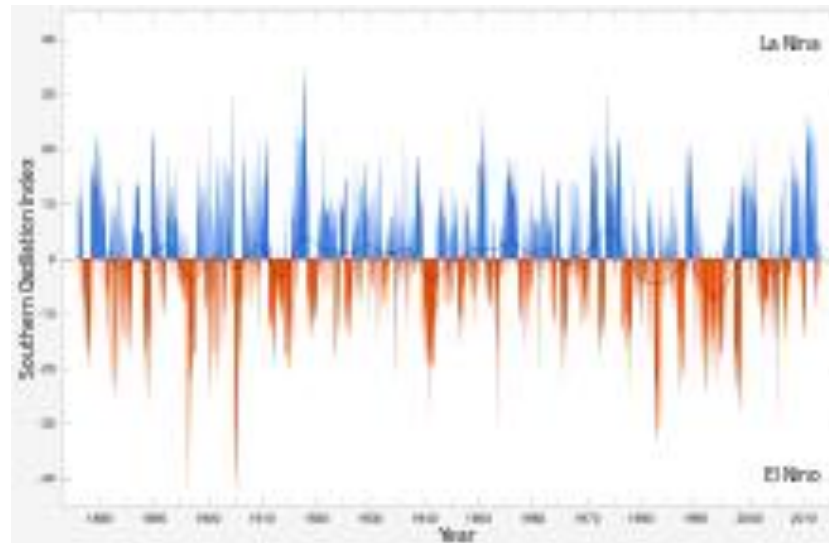
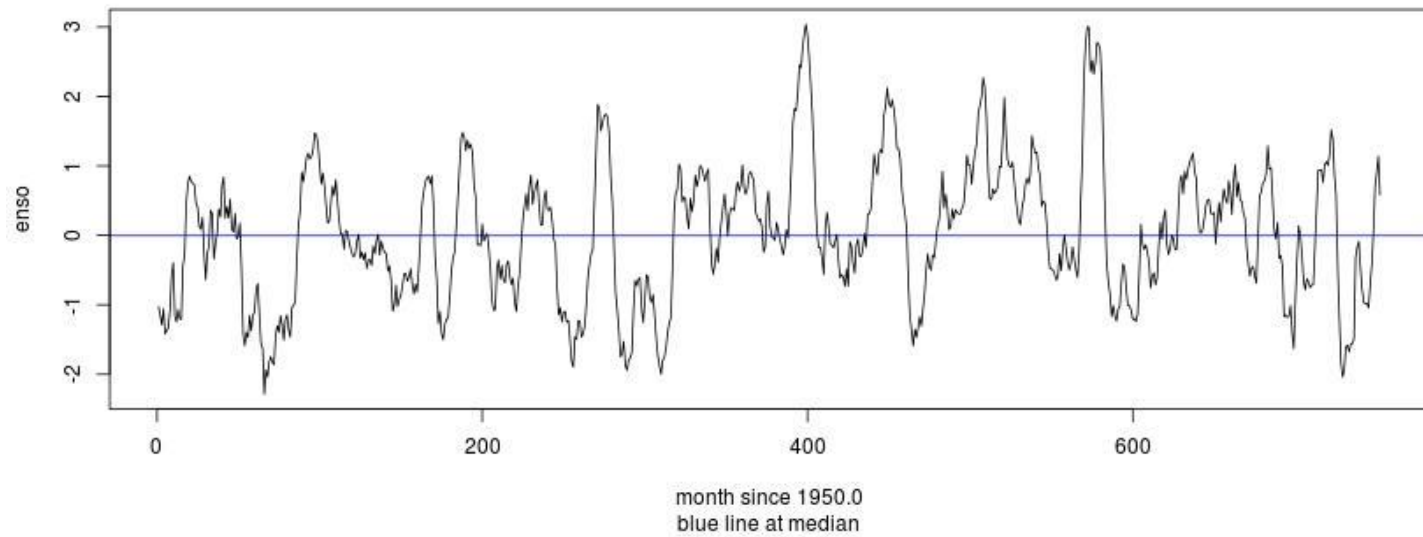


El Niño Southern Oscillation, or ENSO, refers to the effects of a band of [sea surface temperatures](#) which are anomalously warm or cold (*called 'El Nino' and 'La Nina'*) for long periods of time that develops off the western coast of South America and causes climatic changes across the tropics and subtropics

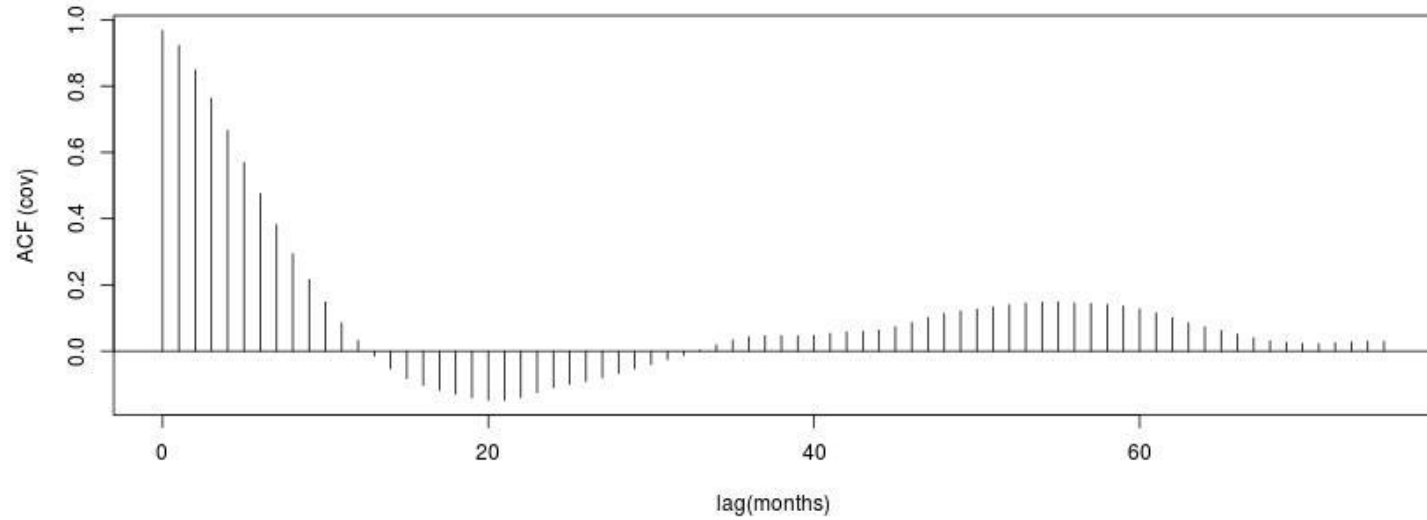
Extremes “cause” floods, droughts



Multivariate ENSO

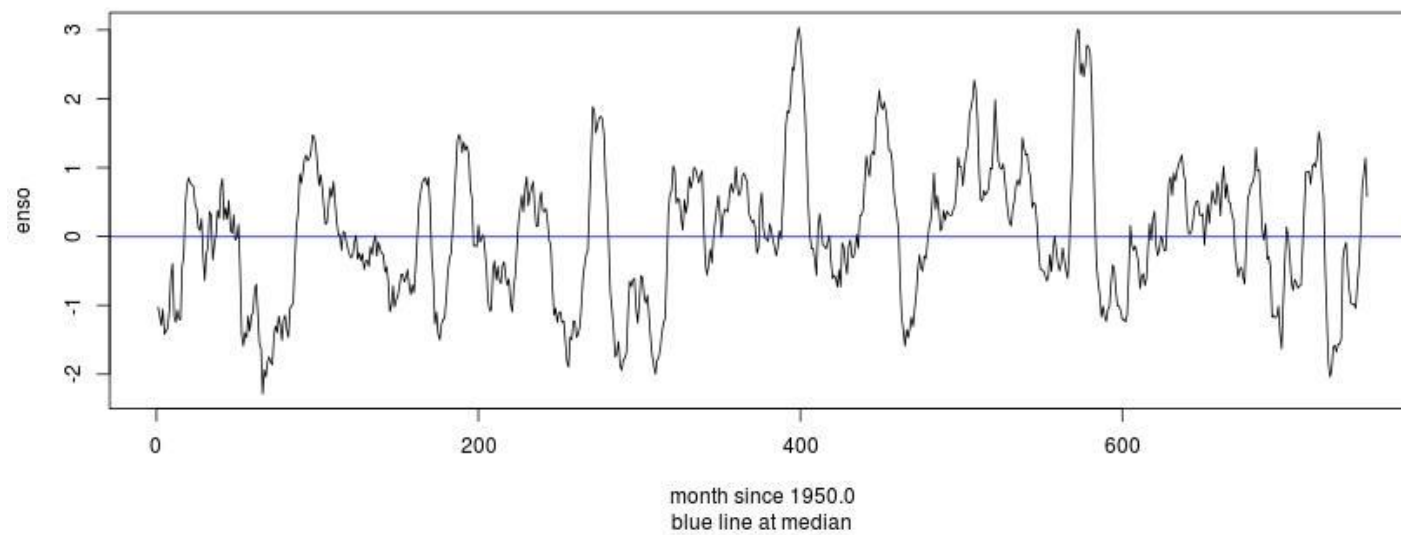


Series enso

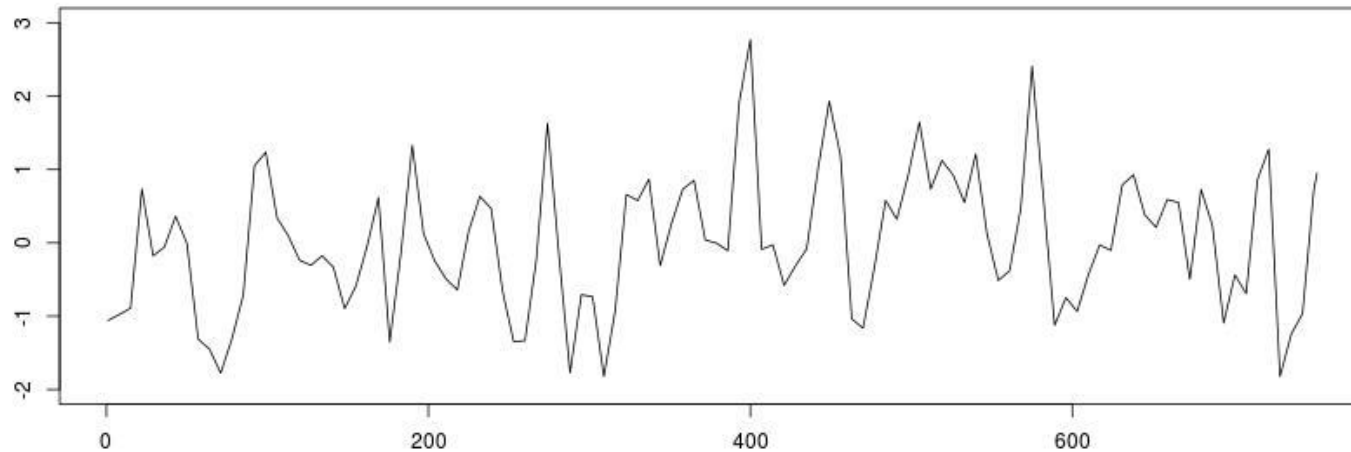


plot, acf

Multivariate ENSO

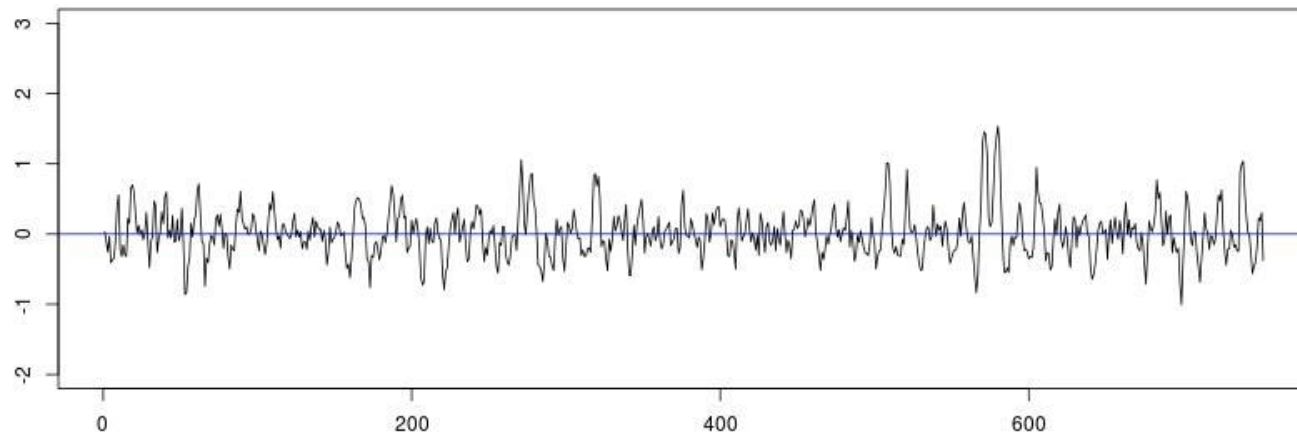


lowessfit

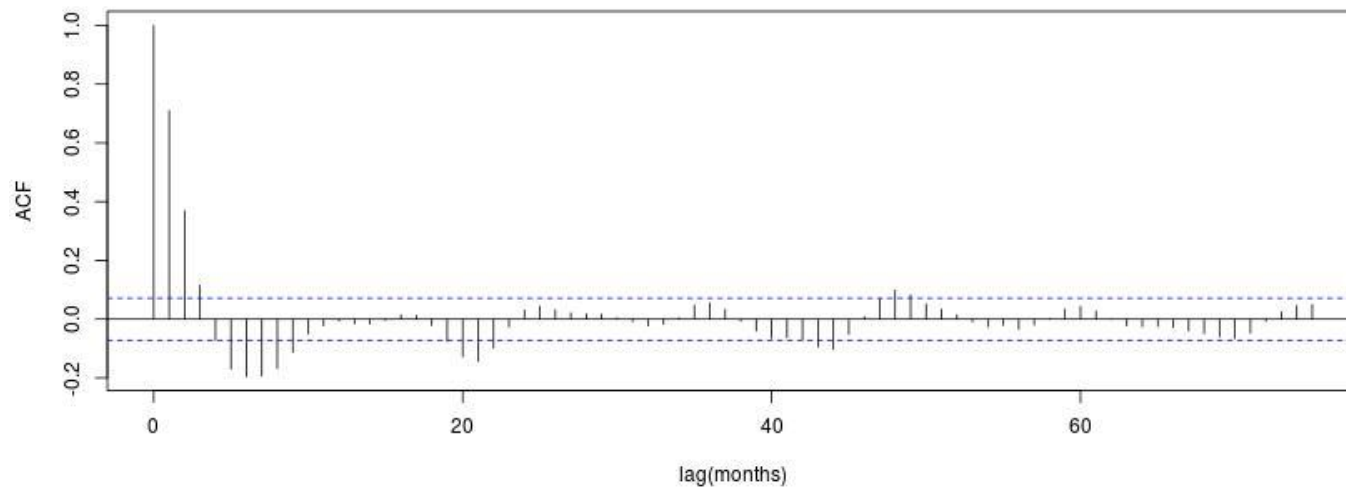


plot, lowess

residuals

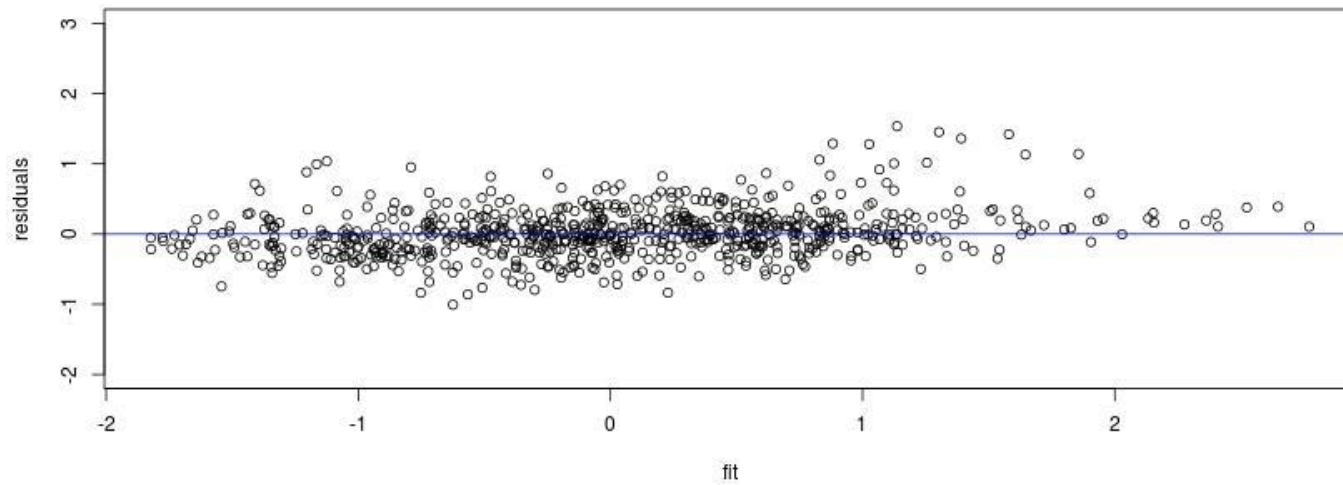


Series residual

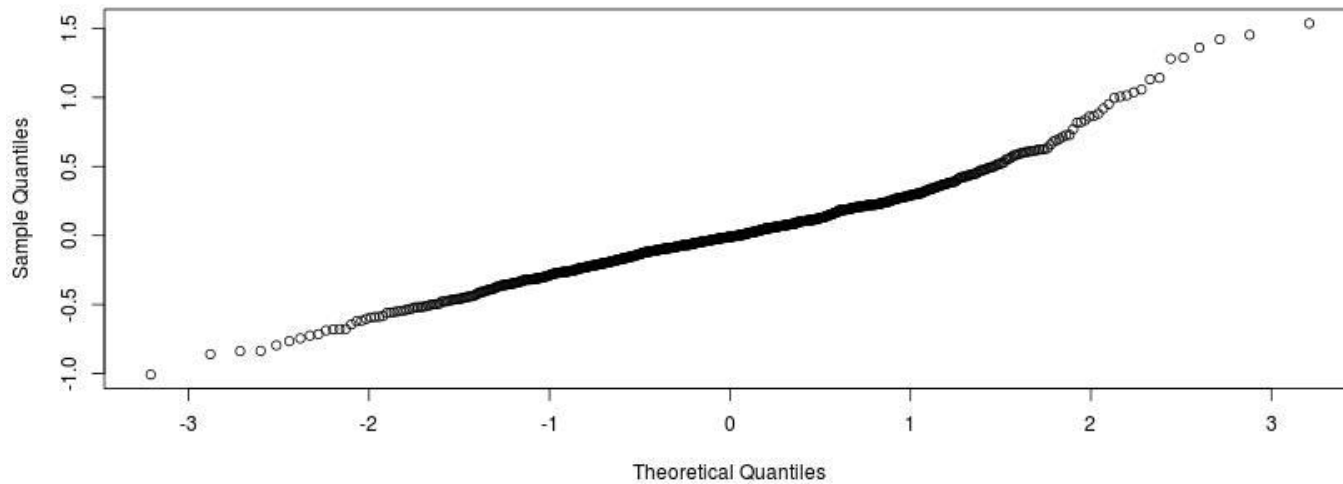


plot, abline, acf

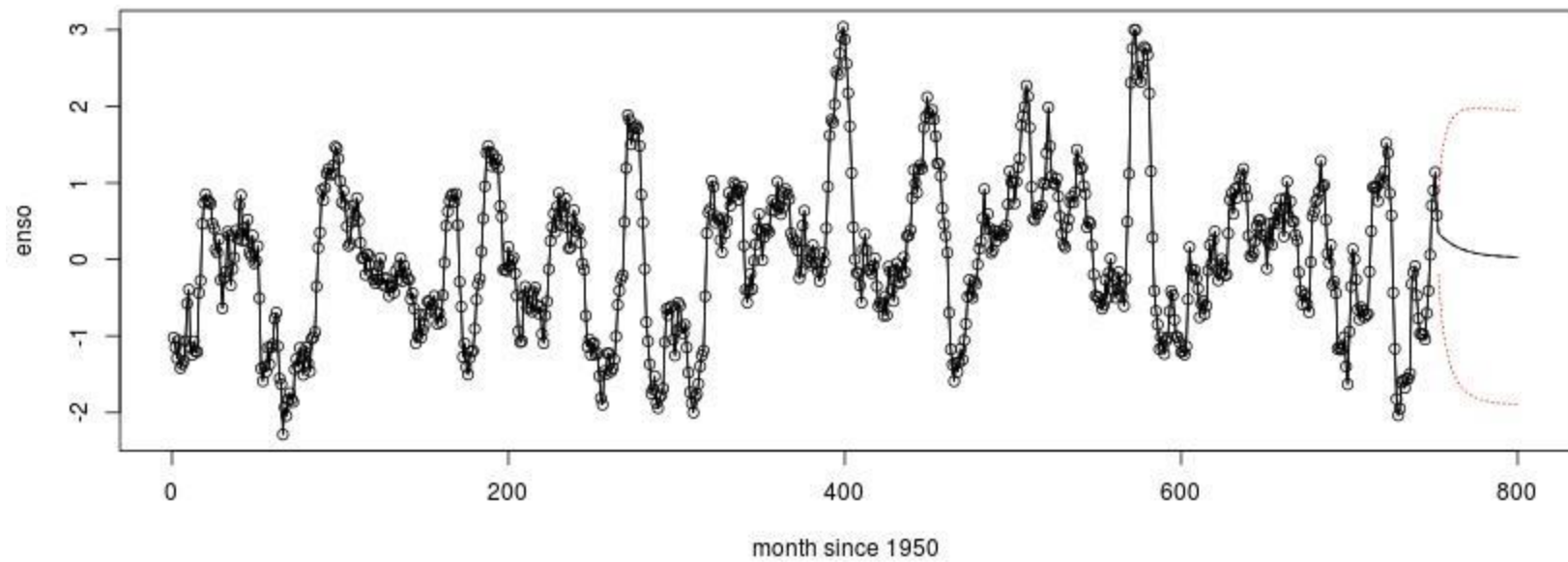
residuals vs. fit



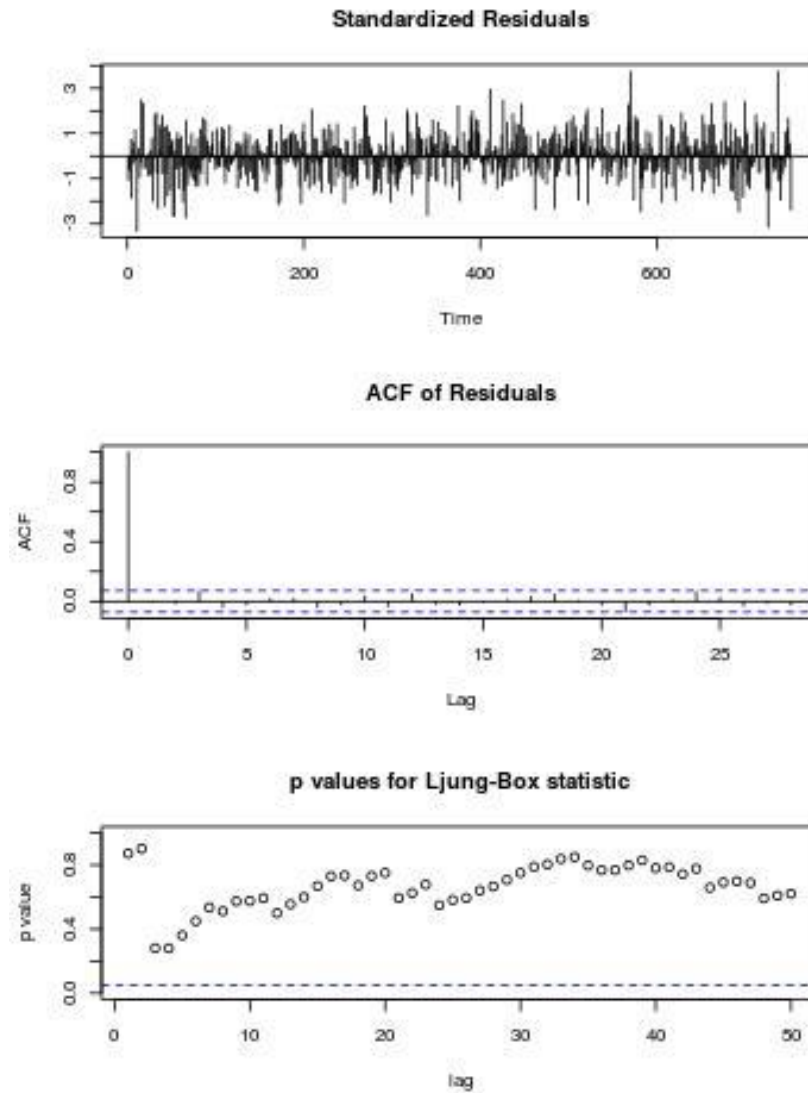
Normal Q-Q Plot



plot, qqnorm

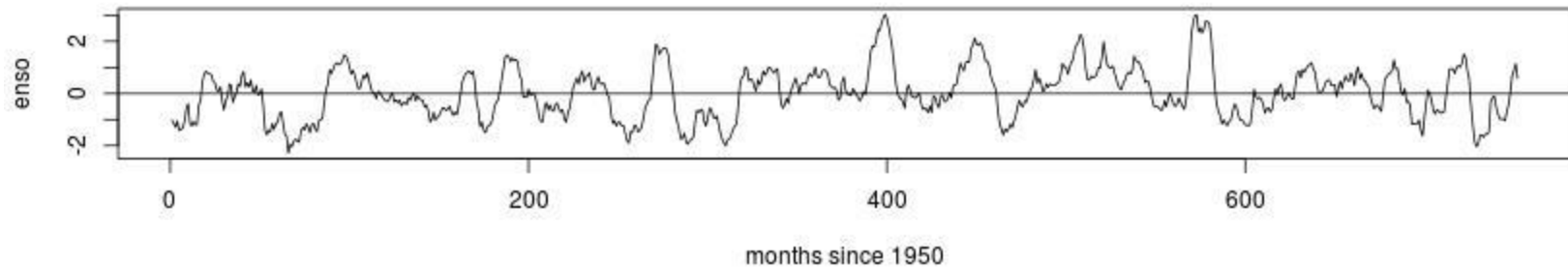


```
m1.enso<-arima(enso,order=c(1,0,1)),  
plot.Arima(m2.enso,, n.ahead=48
```

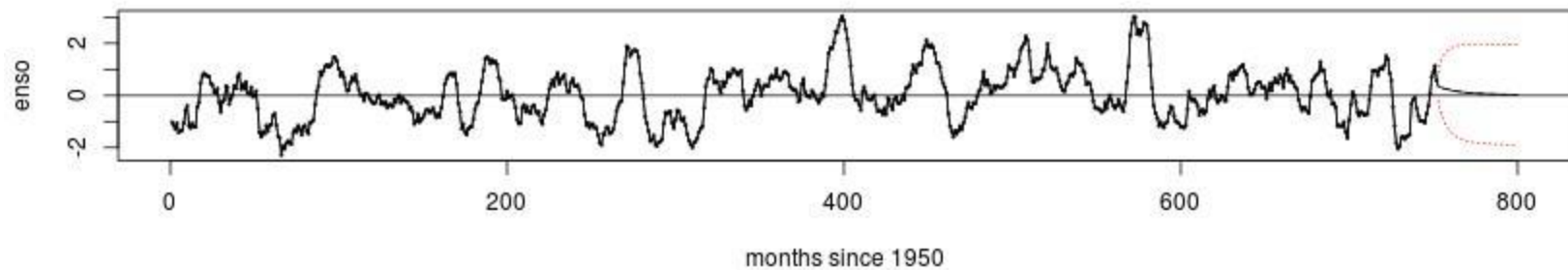


```
tsdiag(m2.enso,gof.lag=50)
```

Multivariate ENSO

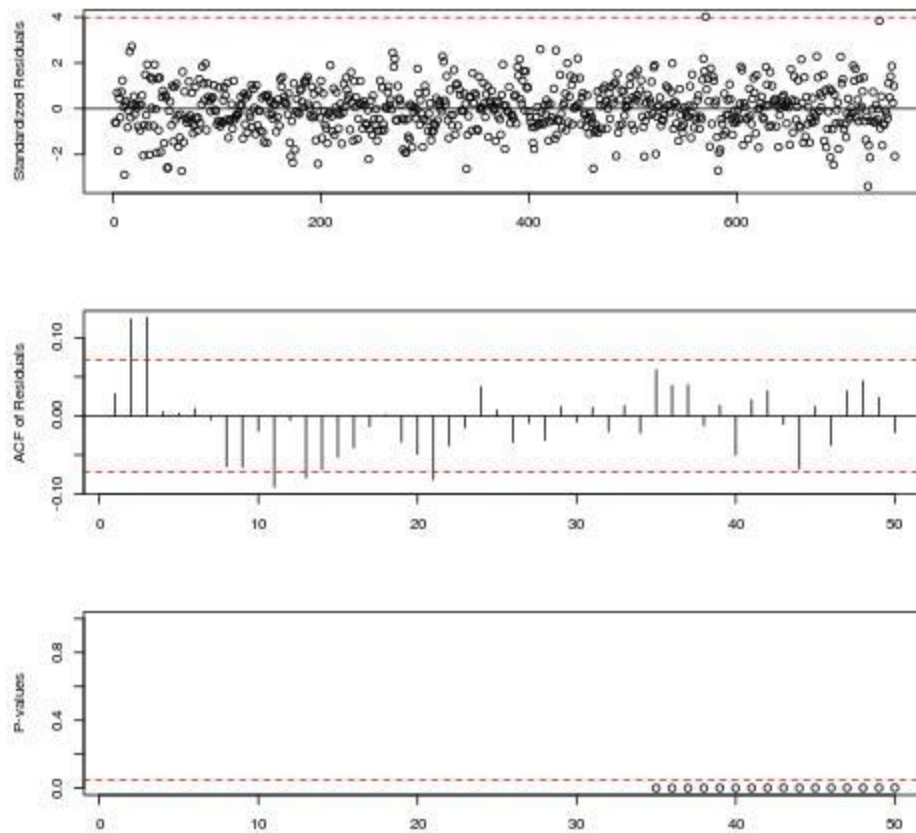


ARIMA(1,0,1) forecast

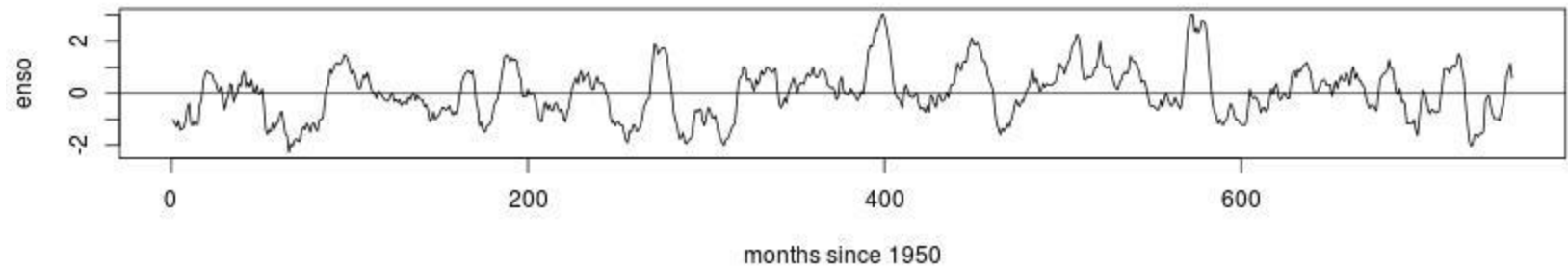


```
m1.enso<-arima(enso,order=c(1,0,1))  
plot.Arima((m1.enso, n.ahead=48,  
abline(h=0)
```

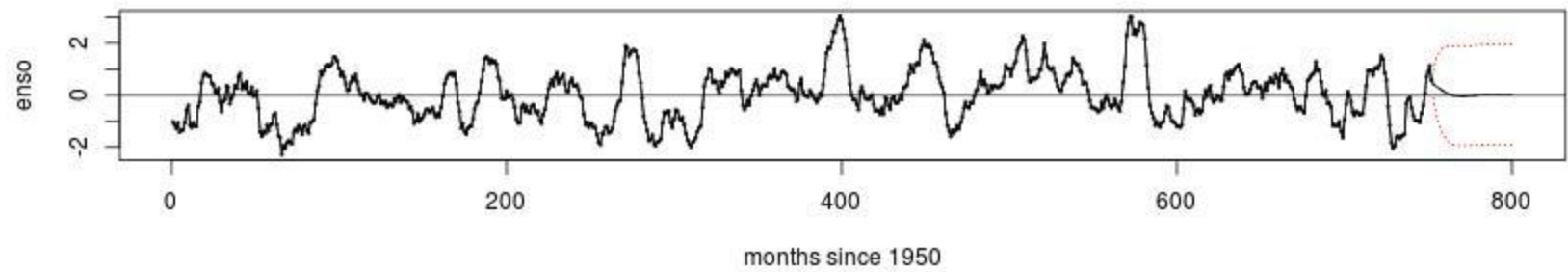
ARMA(1,0,1)



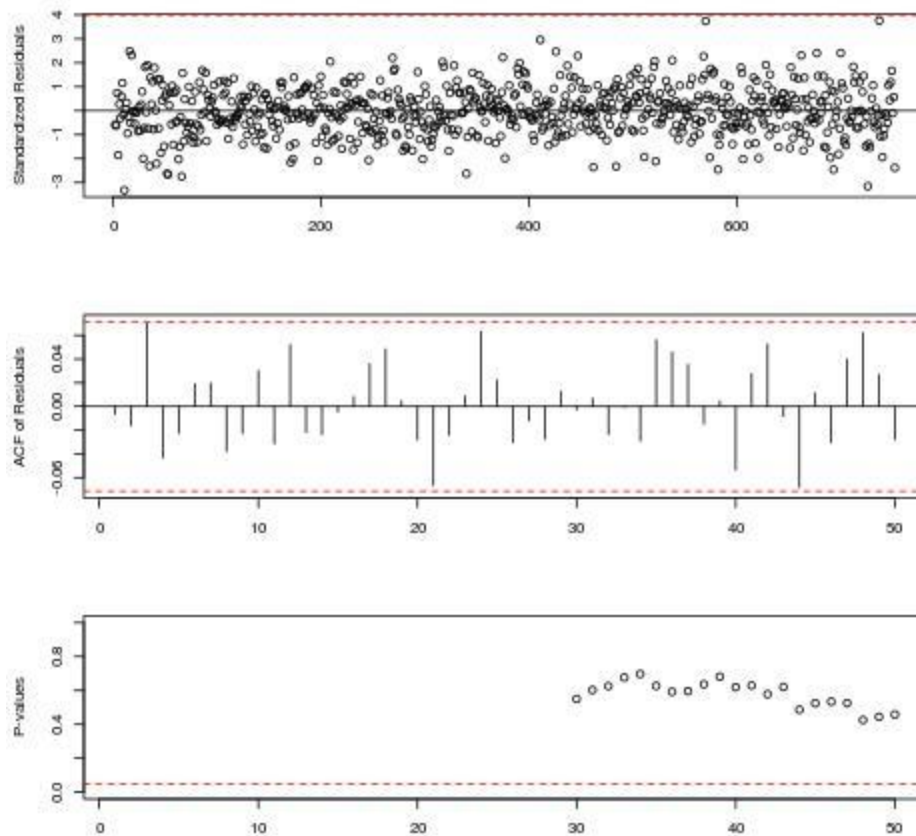
Multivariate ENSO



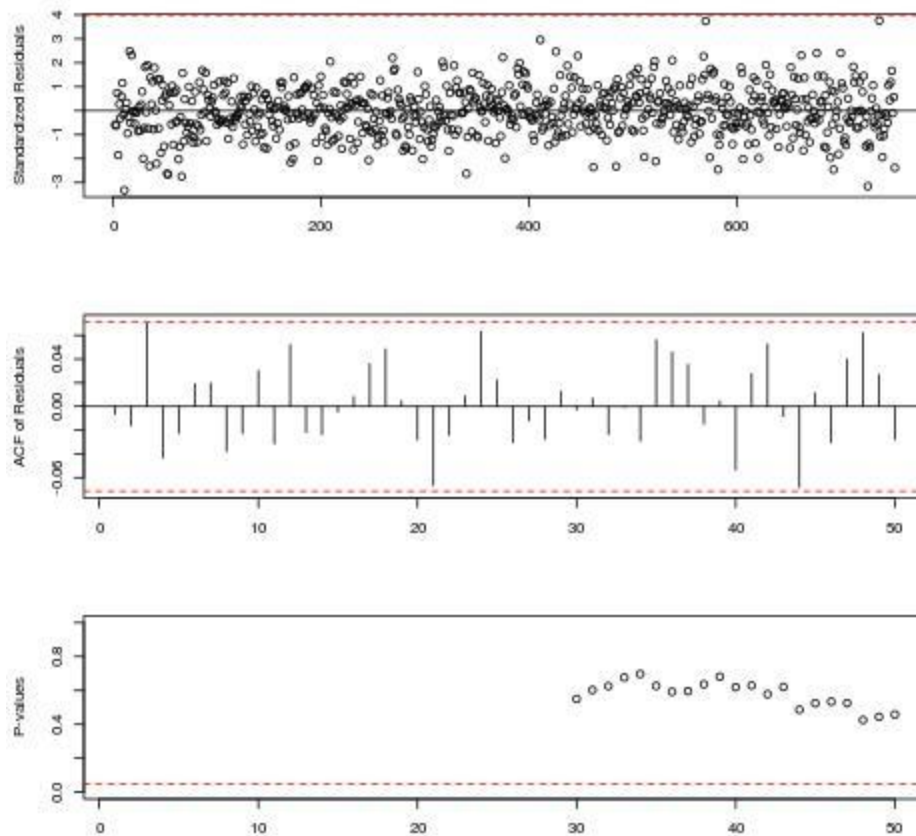
ARIMA(2,0,2) forecast



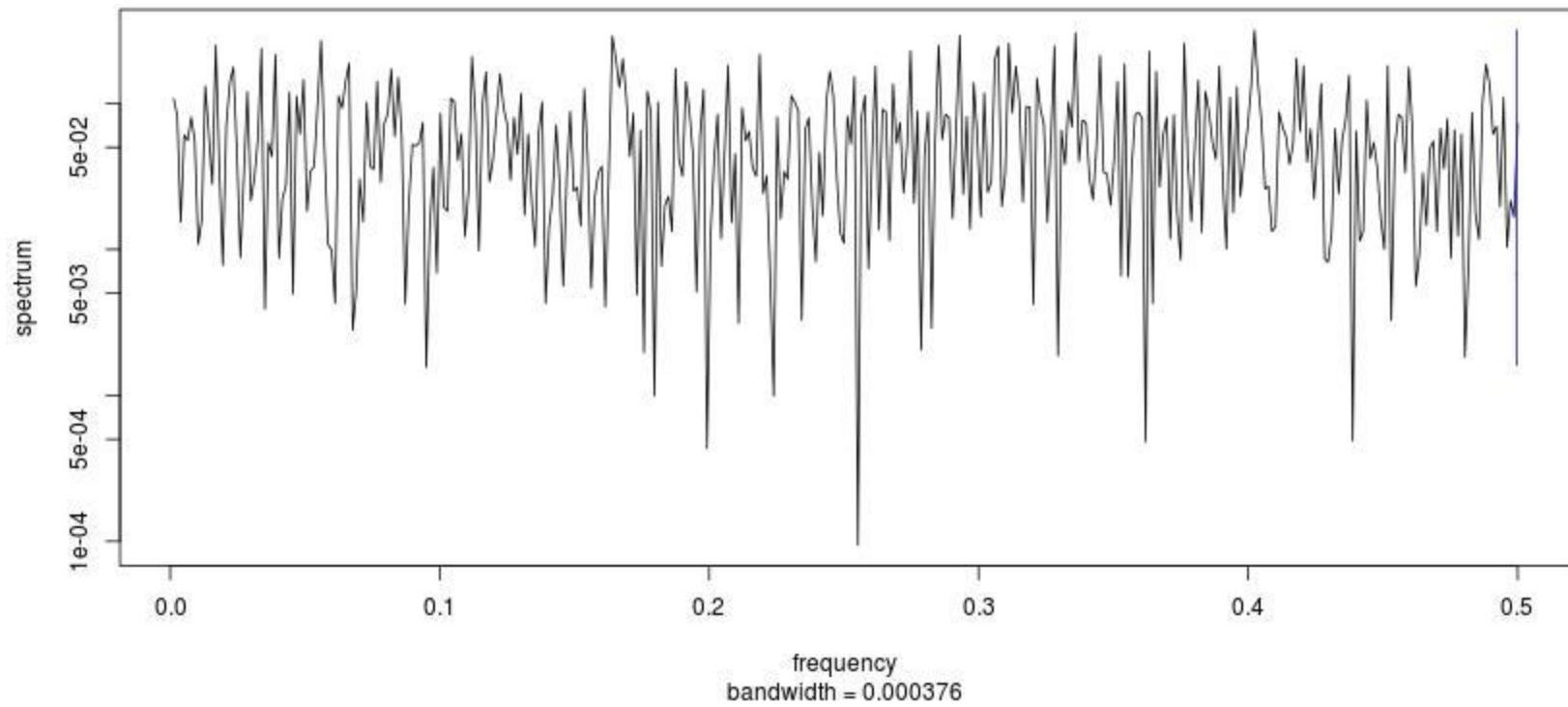
ARMA(2,0,2)



ARMA(2,0,2)



Periodogram of residuals



`spectrum(m2.enso$residuals`