amsGamms

```
#setwd(choose.dir())
```

```
require(tidyverse)
require(mgcv)
require(mgcViz)
require(itsadug)
```

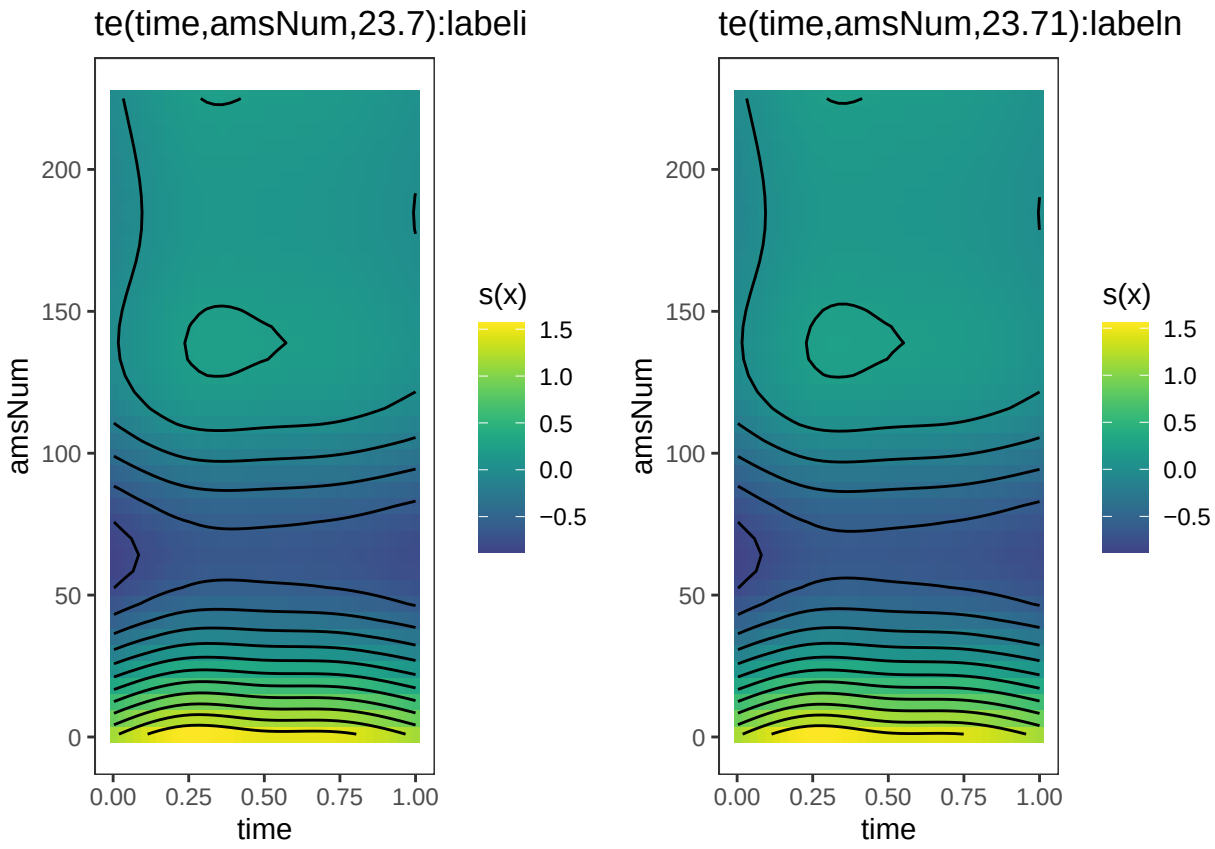
Load prepared ams data

```
amsData = read.csv("ams_ready_for_gamms.csv")
bams = filter(amsData, amsData$speaker=="b")
gams = filter(amsData, amsData$speaker=="g")
pams = filter(amsData, amsData$speaker=="p")
rams = filter(amsData, amsData$speaker=="r")
yams = filter(amsData, amsData$speaker=="y")

amsData$speaker = as.factor(amsData$speaker)
amsData$label = as.factor(amsData$label)

bams$speaker = as.factor(bams$speaker)
bams$label = as.factor(bams$label)
gams$speaker = as.factor(gams$speaker)
gams$label = as.factor(gams$label)
pams$speaker = as.factor(pams$speaker)
pams$label = as.factor(pams$label)
rams$speaker = as.factor(rams$speaker)
rams$label = as.factor(rams$label)
yams$speaker = as.factor(yams$speaker)
yams$label = as.factor(yams$label)
```

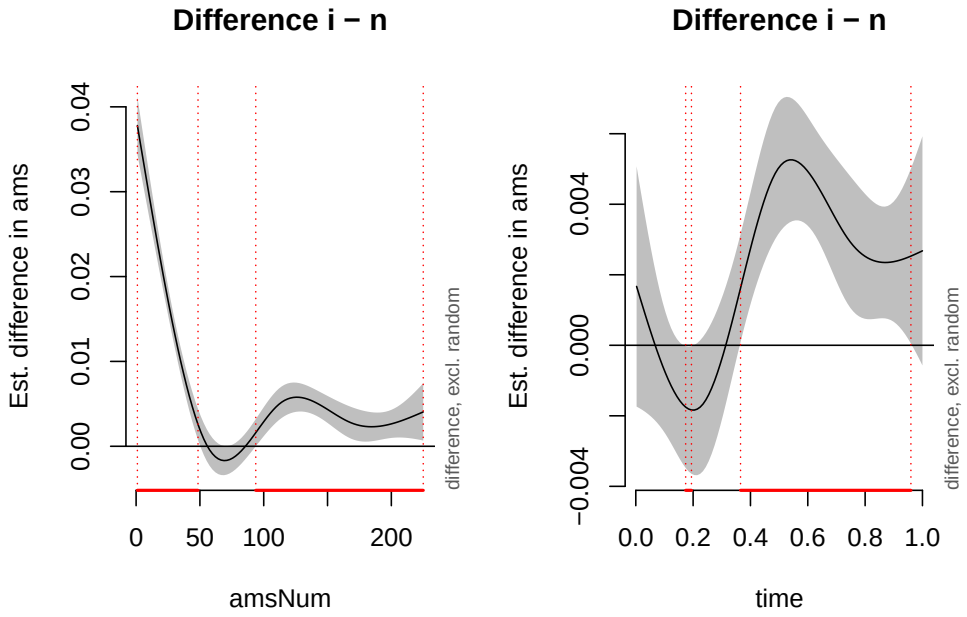
GAM with tensor product interaction for ams

```
m1ams=bam(ams ~ label + te(time, amsNum, by=label) + s(time, speaker, bs="fs", m=1)
          + s(amsNum, speaker, bs="fs", m=1), data=amsData)
m1amsViz = getViz(m1ams)
```

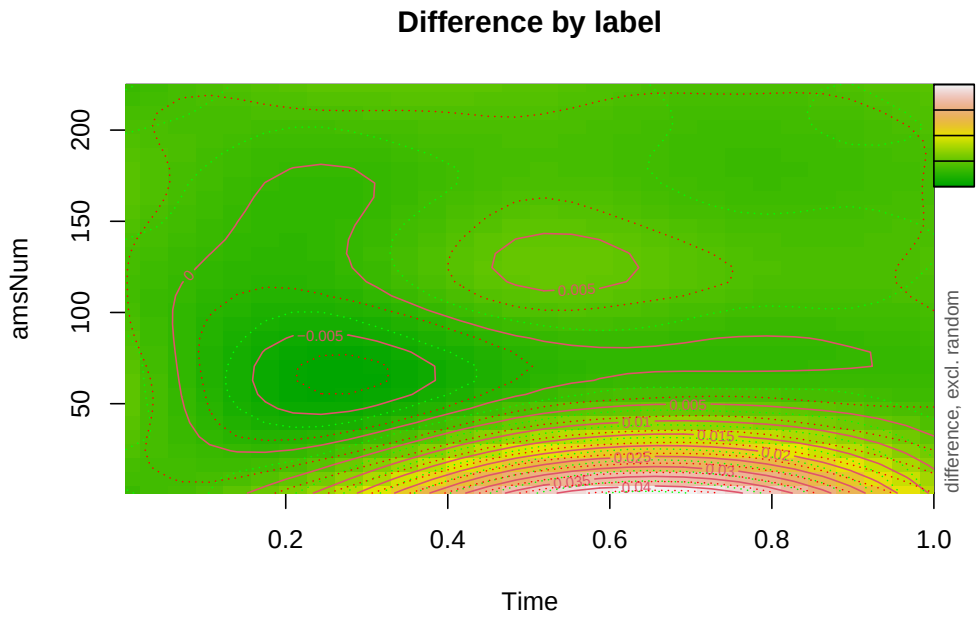
```
print(plot(m1amsViz, allTerms=T), pages=3)
```




```
par(mfrow=c(1, 2))
plot_diff(m1ams, view="amsNum", shade=TRUE, comp=list(label=c("i", "n")))
plot_diff(m1ams, view="time", shade=TRUE, comp=list(label=c("i", "n")))
```



```
par(mfrow=c(1, 1))
plot_diff2(m1ams, view=c('time', "amsNum"), comp=list(label=c("i", "n")),
           main="Difference by label", xlab="Time", ylab="amsNum")
```



summary

```
summary(m1ams)
```

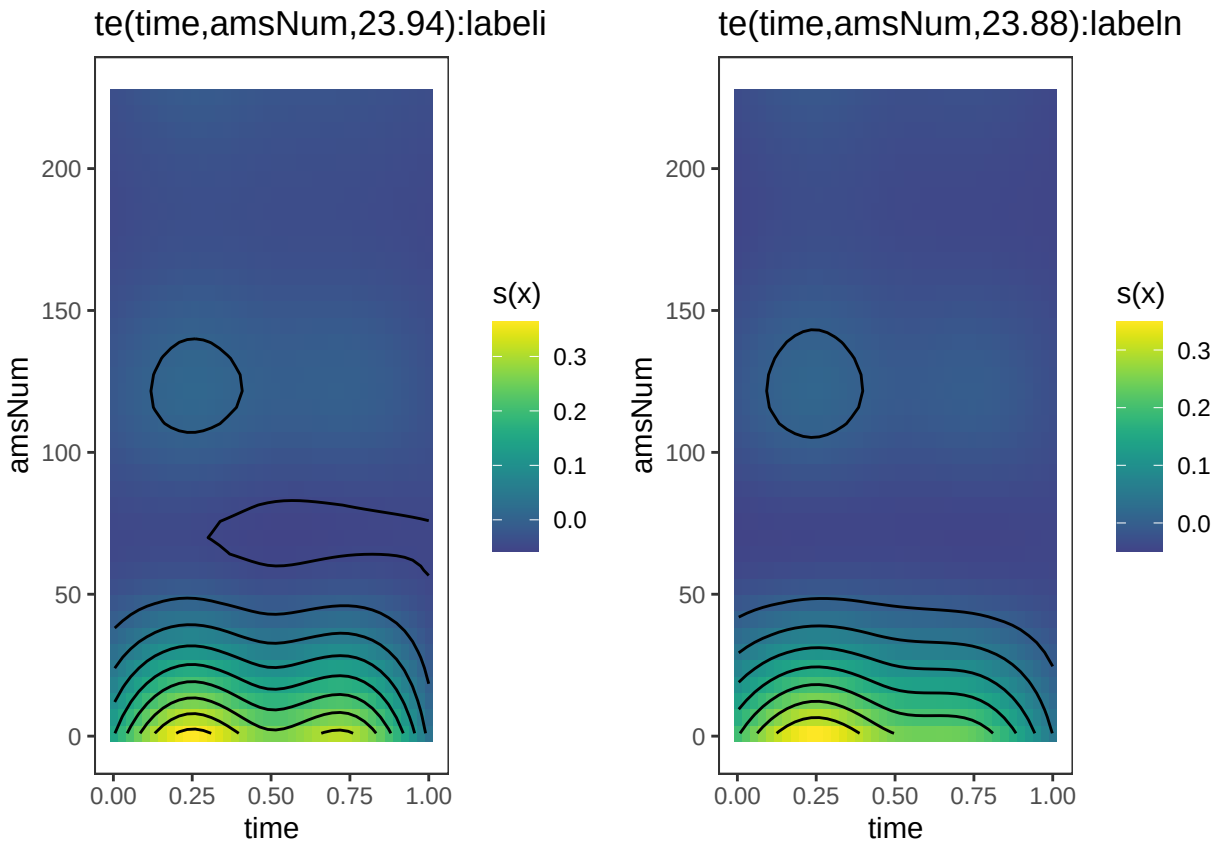
```
##
## Family: gaussian
## Link function: identity
##
## Formula:
## ams ~ label + te(time, amsNum, by = label) + s(time, speaker,
##     bs = "fs", m = 1) + s(amsNum, speaker, bs = "fs", m = 1)
##
## Parametric coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.3844367  0.0307186  -12.52   <2e-16 ***
## labeln      -0.0034559  0.0001985  -17.41   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Approximate significance of smooth terms:
##                            edf Ref.df      F p-value
## te(time,amsNum):labeli 23.70  23.75 6849.9  <2e-16 ***
## te(time,amsNum):labeln 23.71  23.76 6767.6  <2e-16 ***
## s(time,speaker)        40.54  44.00  173.5  <2e-16 ***
## s(amsNum,speaker)      41.35  44.00 4421.0  <2e-16 ***
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =  0.217   Deviance explained = 21.7%
## fREML = -1.0831e+06  Scale est. = 0.024868  n = 2531250
```

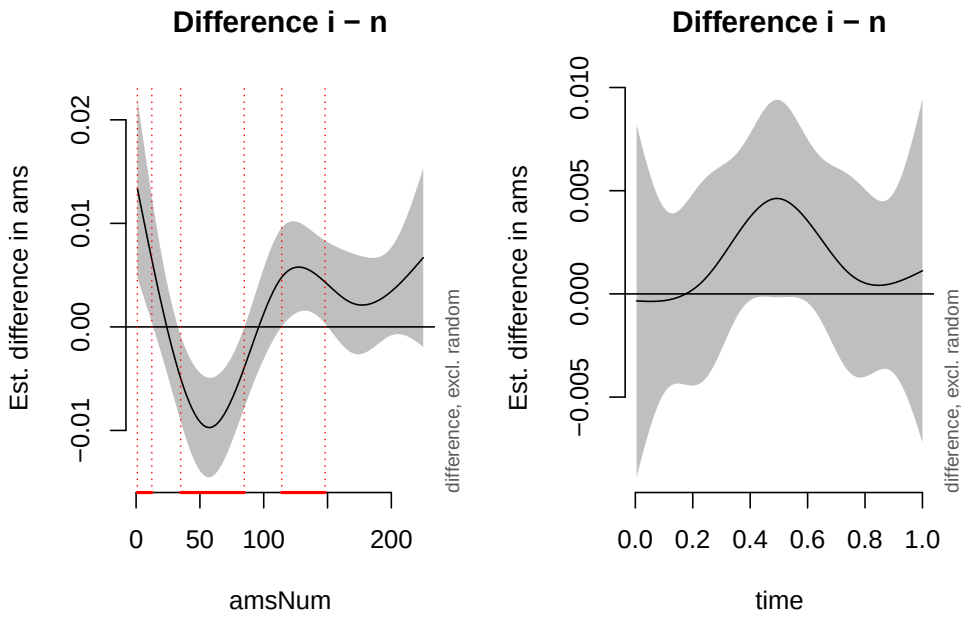
Individual Speaker Models Speaker B

```
mBams=bam(ams ~ label + te(time, amsNum, by=label), data=bams)
mBamsViz = getViz(mBams)
```

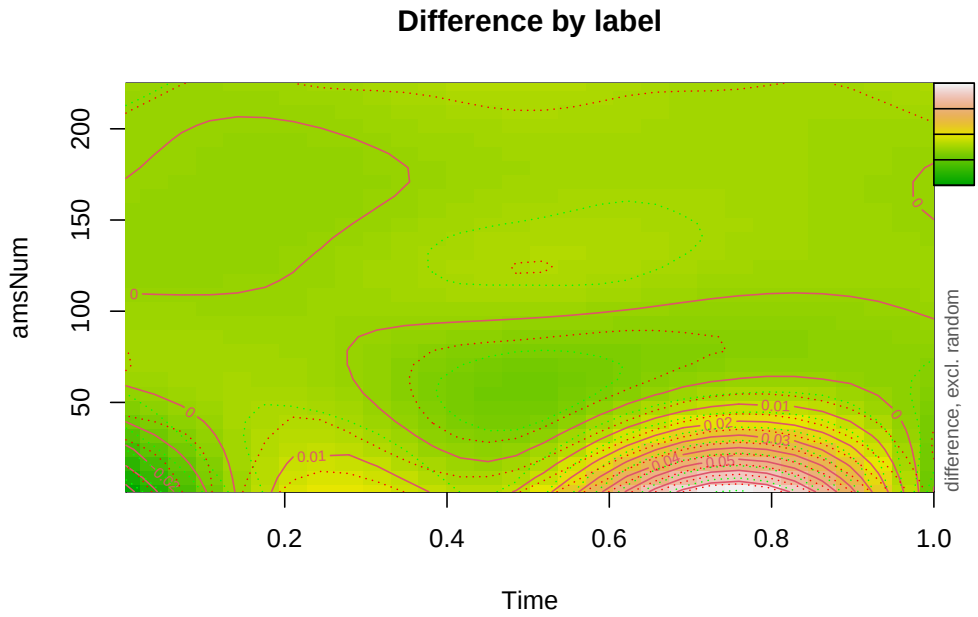
```
print(plot(mBamsViz, allTerms=T), pages=2)
```




```
par(mfrow=c(1, 2))
plot_diff(mBams, view="amsNum", shade=TRUE, comp=list(label=c("i", "n")))
plot_diff(mBams, view="time", shade=TRUE, comp=list(label=c("i", "n")))
```




```
par(mfrow=c(1, 1))
plot_diff2(mBams, view=c('time', "amsNum"), comp=list(label=c("i", "n")),
           main="Difference by label", xlab="Time", ylab="amsNum")
```




```
summary(mBams)
```

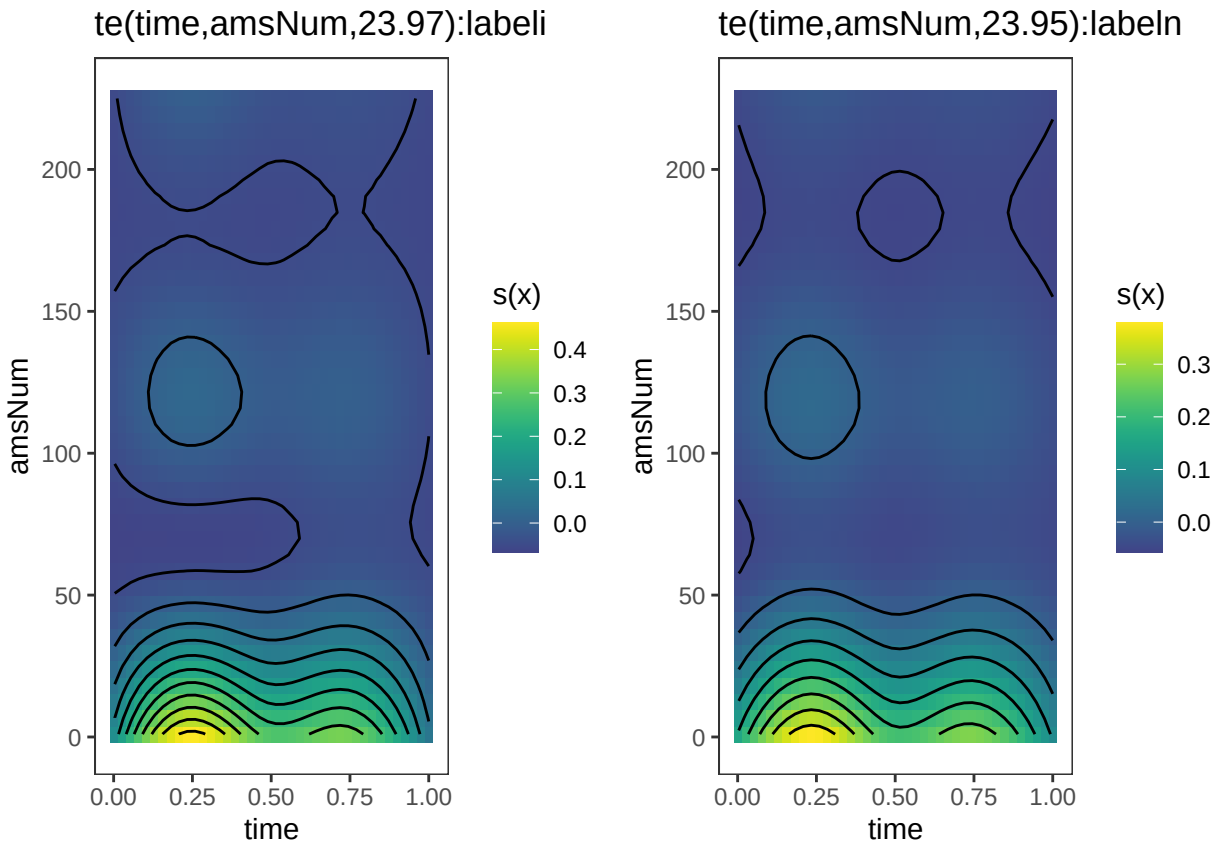
```
##
## Family: gaussian
```

```
## Link function: identity
##
## Formula:
## ams ~ label + te(time, amsNum, by = label)
##
## Parametric coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.0518407  0.0003598 144.086  < 2e-16 ***
## labeln      -0.0031147  0.0005088  -6.122 9.27e-10 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Approximate significance of smooth terms:
##                           edf Ref.df    F p-value
## te(time,amsNum):labeli 23.94     24 1787  <2e-16 ***
## te(time,amsNum):labeln 23.88     24 1533  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =  0.136   Deviance explained = 13.6%
## fREML = -1.4742e+05  Scale est. = 0.032681  n = 506250
```

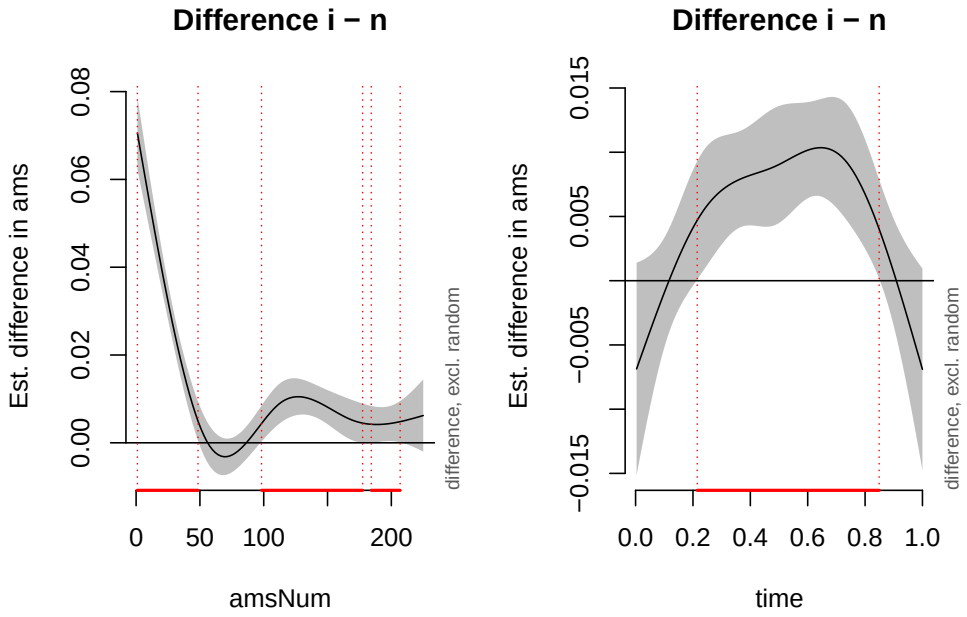
Speaker G

```
mGams=bam(ams ~ label + te(time, amsNum, by=label), data=gams)
mGamsViz = getViz(mGams)
```

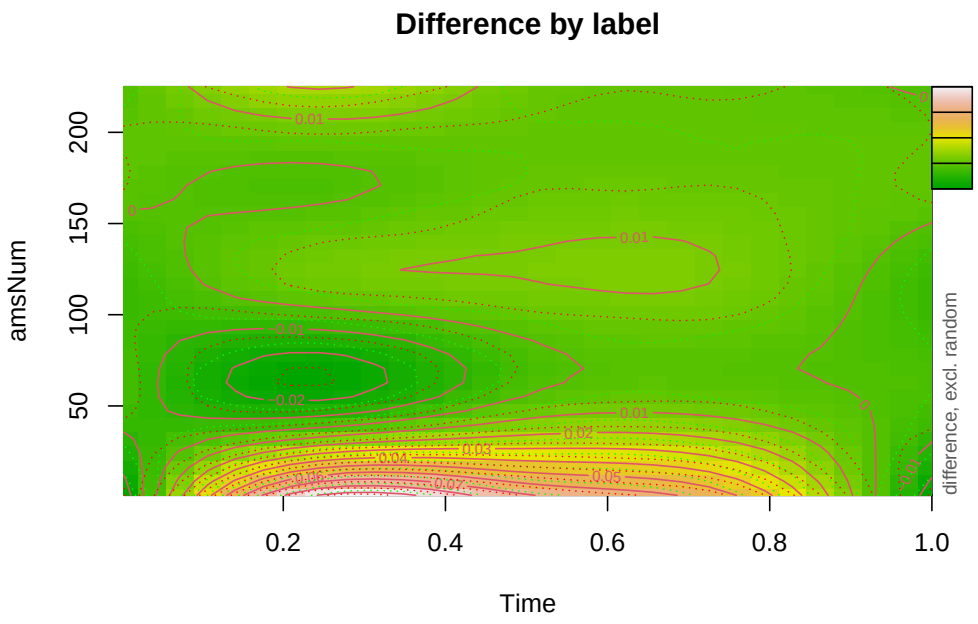
```
print(plot(mGamsViz, allTerms=T), pages=2)
```




```
par(mfrow=c(1, 2))
plot_diff(mGams, view="amsNum", shade=TRUE, comp=list(label=c("i", "n")))
plot_diff(mGams, view="time", shade=TRUE, comp=list(label=c("i", "n")))
```



```
par(mfrow=c(1, 1))
plot_diff2(mGams, view=c('time', "amsNum"), comp=list(label=c("i", "n")),
           main="Difference by label", xlab="Time", ylab="amsNum")
```



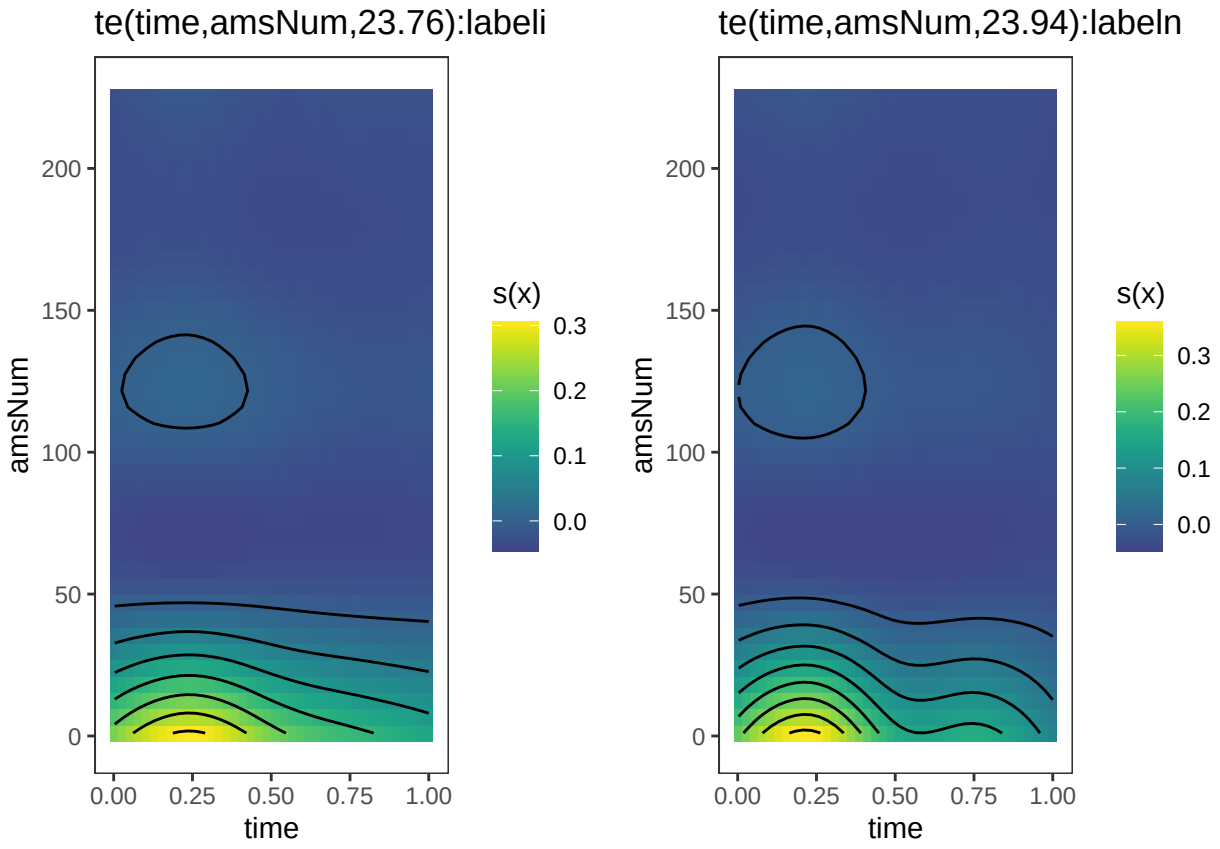

```
summary(mGams)
```

```
##
## Family: gaussian
## Link function: identity
##
## Formula:
## ams ~ label + te(time, amsNum, by = label)
##
## Parametric coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.0680792  0.0003427  198.64   <2e-16 ***
## labeln      -0.0060461  0.0004847  -12.47   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Approximate significance of smooth terms:
##                            edf Ref.df    F p-value
## te(time,amsNum):labeli 23.97     24 2661  <2e-16 ***
## te(time,amsNum):labeln 23.95     24 1949  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =   0.18   Deviance explained =   18%
## fREML = -1.7198e+05  Scale est. = 0.029657  n = 506250
```

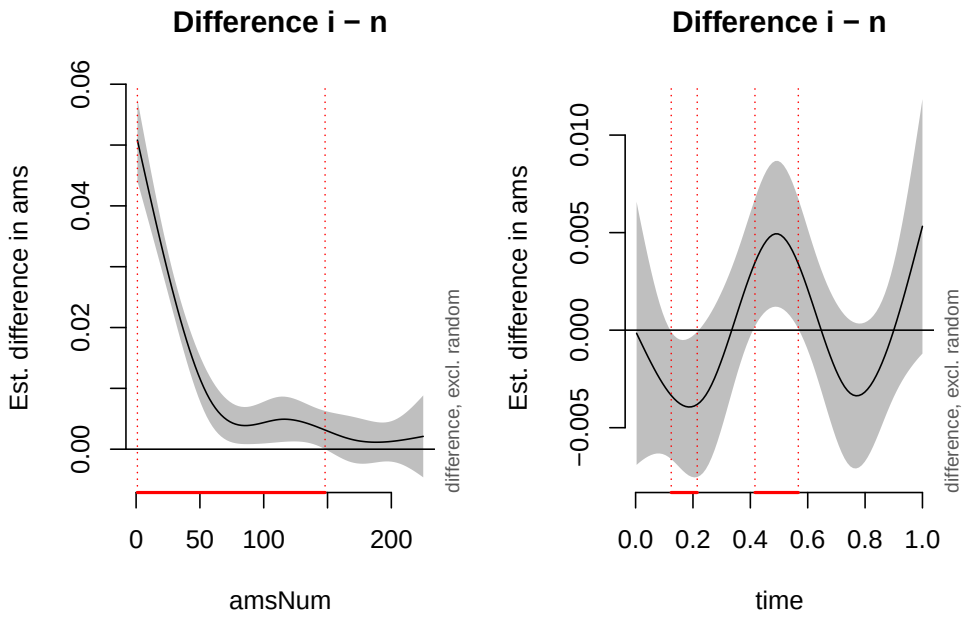
Speaker P

```
mPams=bam(ams ~ label + te(time, amsNum, by=label), data=pams)
mPamsViz = getViz(mPams)
```

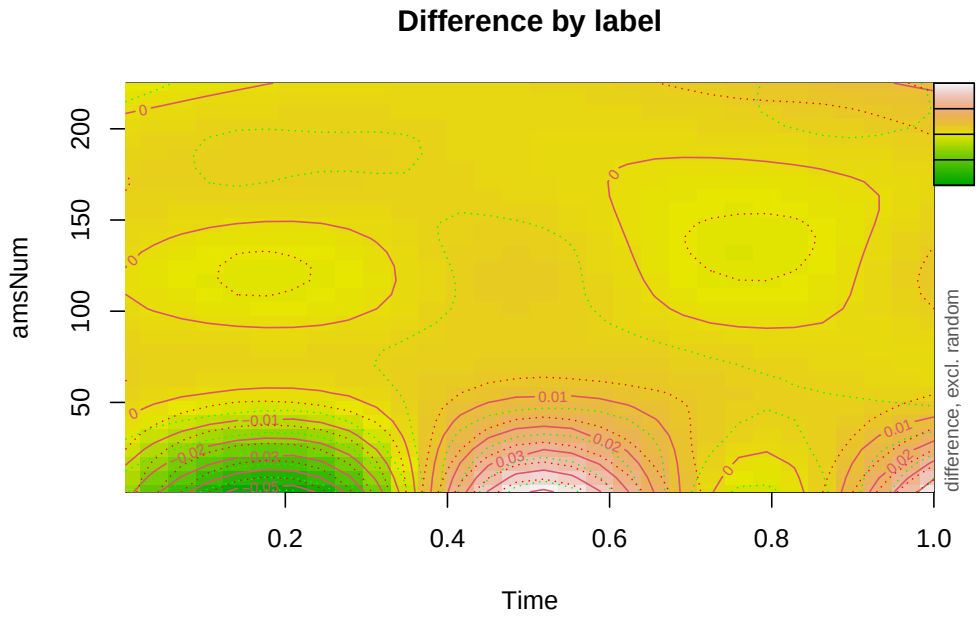
```
print(plot(mPamsViz, allTerms=T), pages=2)
```




```
par(mfrow=c(1, 2))
plot_diff(mPams, view="amsNum", shade=TRUE, comp=list(label=c("i", "n")))
plot_diff(mPams, view="time", shade=TRUE, comp=list(label=c("i", "n")))
```




```
par(mfrow=c(1, 1))
plot_diff2(mPams, view=c('time', "amsNum"), comp=list(label=c("i", "n")),
           main="Difference by label", xlab="Time", ylab="amsNum")
```




```
summary(mPams)
```

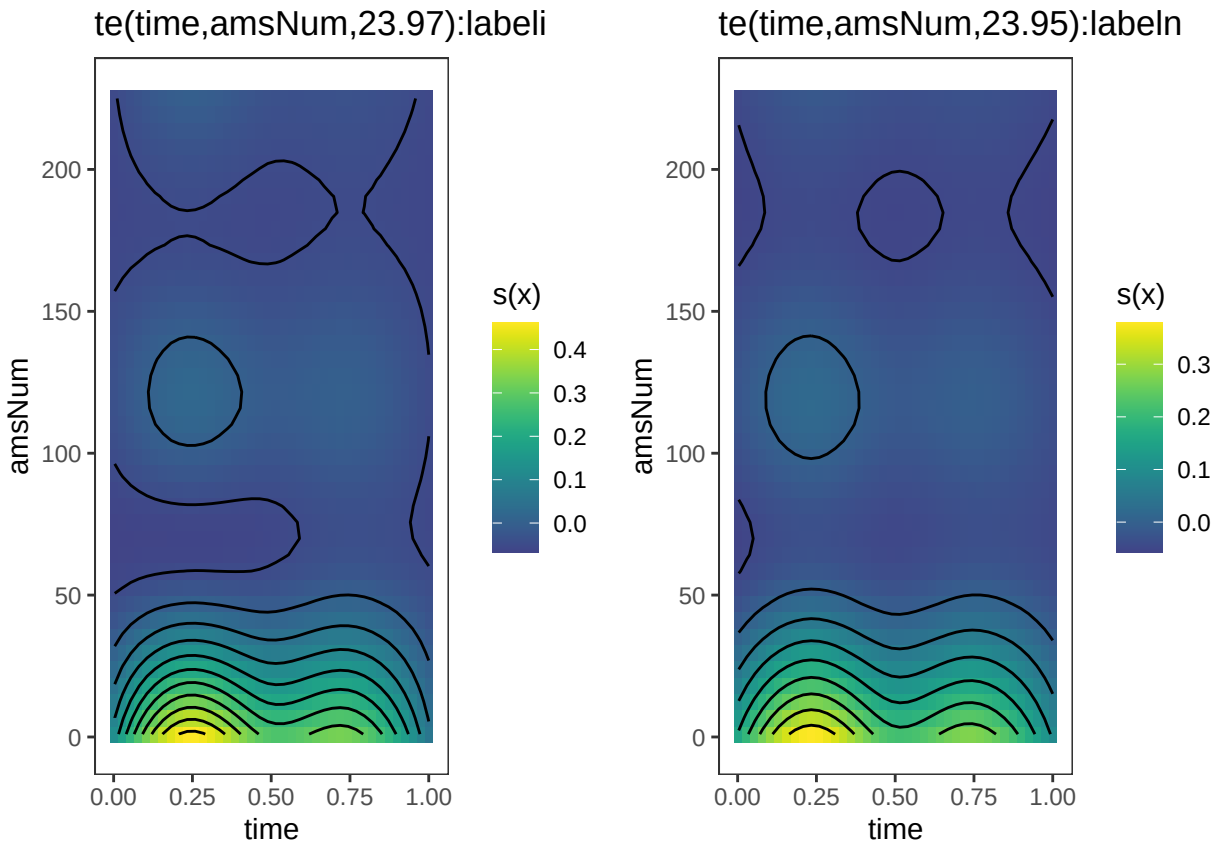
```
##
## Family: gaussian
```

```
## Link function: identity
##
## Formula:
## ams ~ label + te(time, amsNum, by = label)
##
## Parametric coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.0416249  0.0002817 147.749  < 2e-16 ***
## labeln      -0.0017321  0.0003984  -4.347 1.38e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Approximate significance of smooth terms:
##                           edf Ref.df    F p-value
## te(time,amsNum):labeli 23.76  23.99 1916  <2e-16 ***
## te(time,amsNum):labeln 23.94  24.00 2063  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =  0.159   Deviance explained = 15.9%
## fREML = -2.7122e+05  Scale est. = 0.020039  n = 506250
```

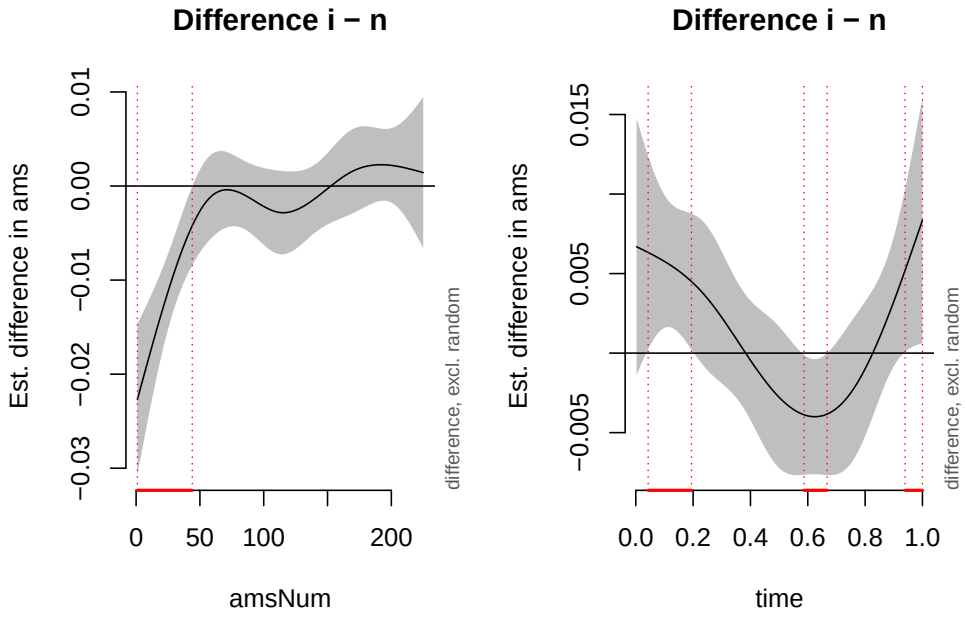
Speaker R

```
mRams=bam(ams ~ label + te(time, amsNum, by=label), data=rams)
mRamsViz = getViz(mGams)
```

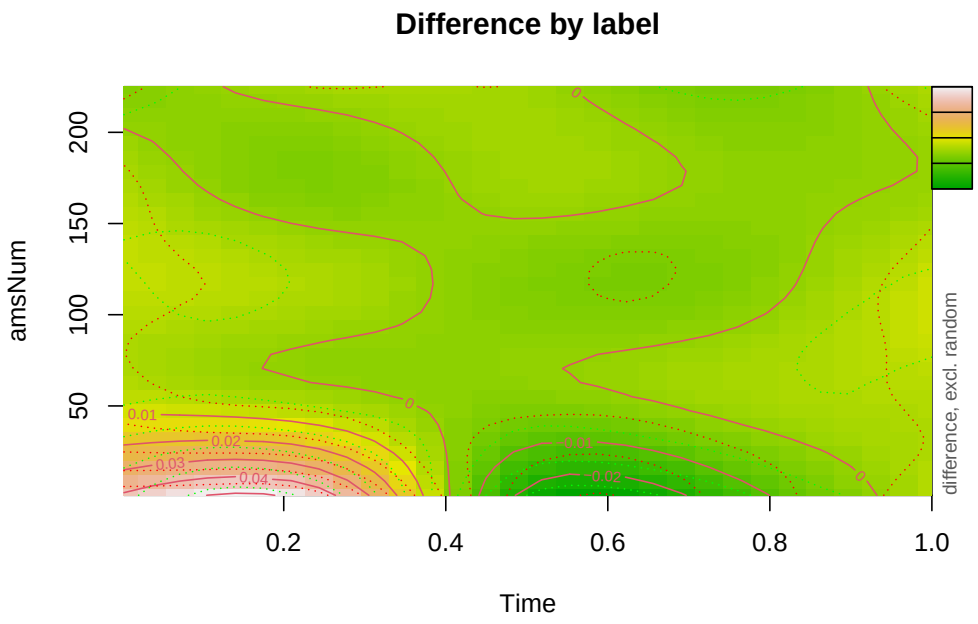
```
print(plot(mRamsViz, allTerms=T), pages=2)
```




```
par(mfrow=c(1, 2))
plot_diff(mRams, view="amsNum", shade=TRUE, comp=list(label=c("i", "n")))
plot_diff(mRams, view="time", shade=TRUE, comp=list(label=c("i", "n")))
```



```
par(mfrow=c(1, 1))
plot_diff2(mRams, view=c('time', "amsNum"), comp=list(label=c("i", "n")),
           main="Difference by label", xlab="Time", ylab="amsNum")
```



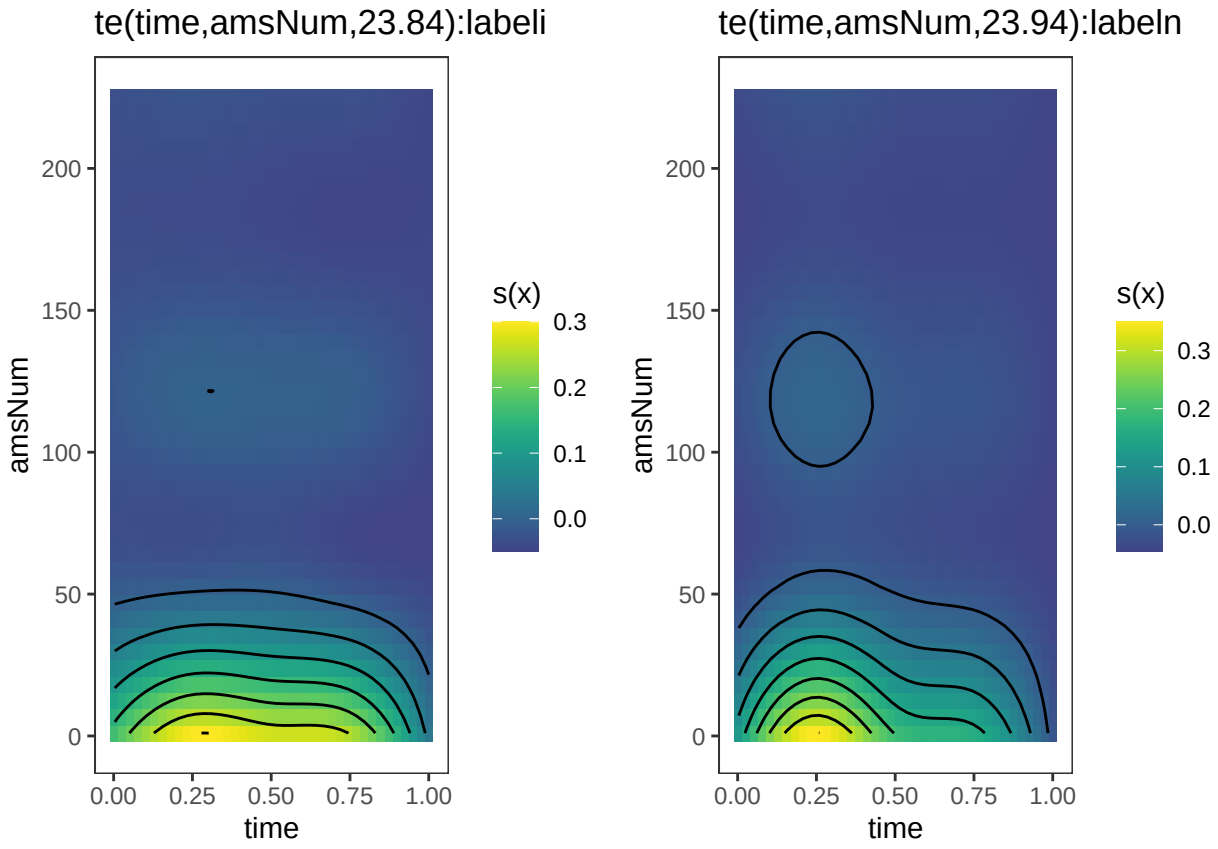

```
summary(mRams)
```

```
##
## Family: gaussian
## Link function: identity
##
## Formula:
## ams ~ label + te(time, amsNum, by = label)
##
## Parametric coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.0491716  0.0003345 147.000  < 2e-16 ***
## labeln      -0.0014677  0.0004731  -3.103  0.00192 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Approximate significance of smooth terms:
##                            edf Ref.df    F p-value
## te(time,amsNum):labeli 23.96     24 2016  <2e-16 ***
## te(time,amsNum):labeln 23.95     24 1865  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =  0.155   Deviance explained = 15.5%
## fREML = -1.843e+05  Scale est. = 0.028249  n = 506250
```

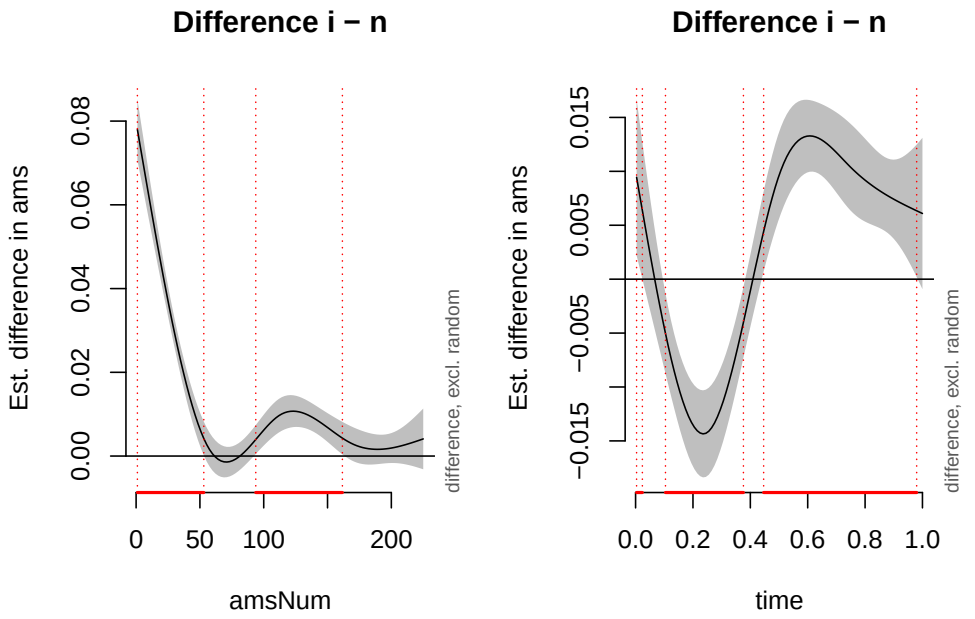
Speaker Y

```
mYams=bam(ams ~ label + te(time, amsNum, by=label), data=yams)
mYamsViz = getViz(mYams)
```

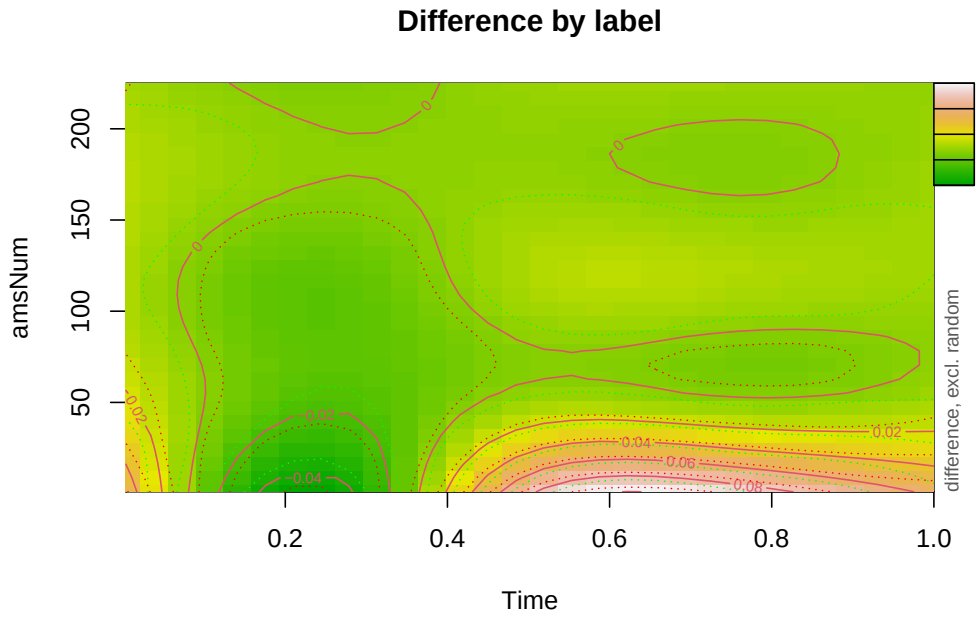
```
print(plot(mYamsViz, allTerms=T), pages=2)
```




```
par(mfrow=c(1, 2))
plot_diff(mYams, view="amsNum", shade=TRUE, comp=list(label=c("i", "n")))
plot_diff(mYams, view="time", shade=TRUE, comp=list(label=c("i", "n")))
```




```
par(mfrow=c(1, 1))
plot_diff2(mYams, view=c('time', "amsNum"), comp=list(label=c("i", "n")),
           main="Difference by label", xlab="Time", ylab="amsNum")
```




```
summary(mYams)
```

```
##
## Family: gaussian
```

```
## Link function: identity
##
## Formula:
## ams ~ label + te(time, amsNum, by = label)
##
## Parametric coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.0501192  0.0003019  166.01   <2e-16 ***
## labeln      -0.0046815  0.0004270  -10.96   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Approximate significance of smooth terms:
##                           edf Ref.df    F p-value
## te(time,amsNum):labeli 23.84     24 2112  <2e-16 ***
## te(time,amsNum):labeln 23.94     24 1811  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =  0.157   Deviance explained = 15.7%
## fREML = -2.362e+05  Scale est. = 0.023013  n = 506250
```