amsGamms

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

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

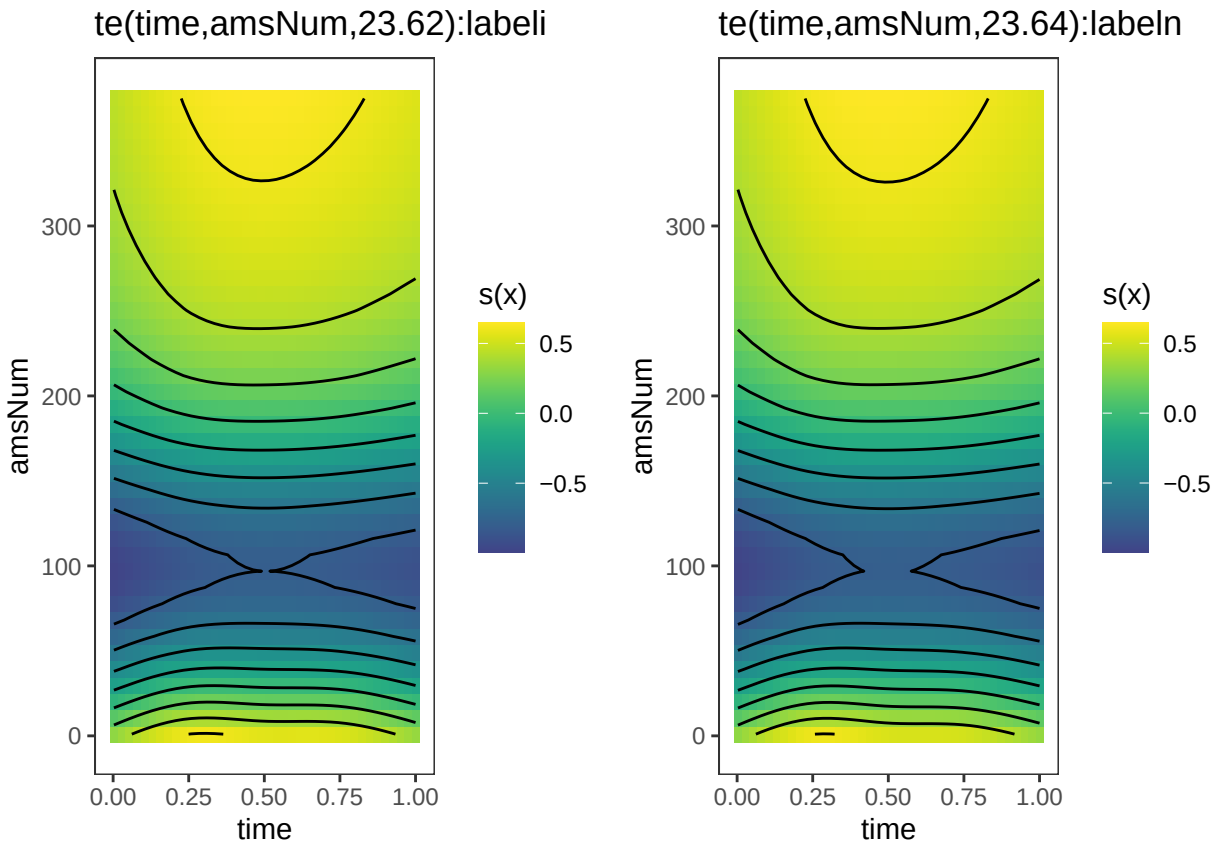
Load prepared ams data

```
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)
```

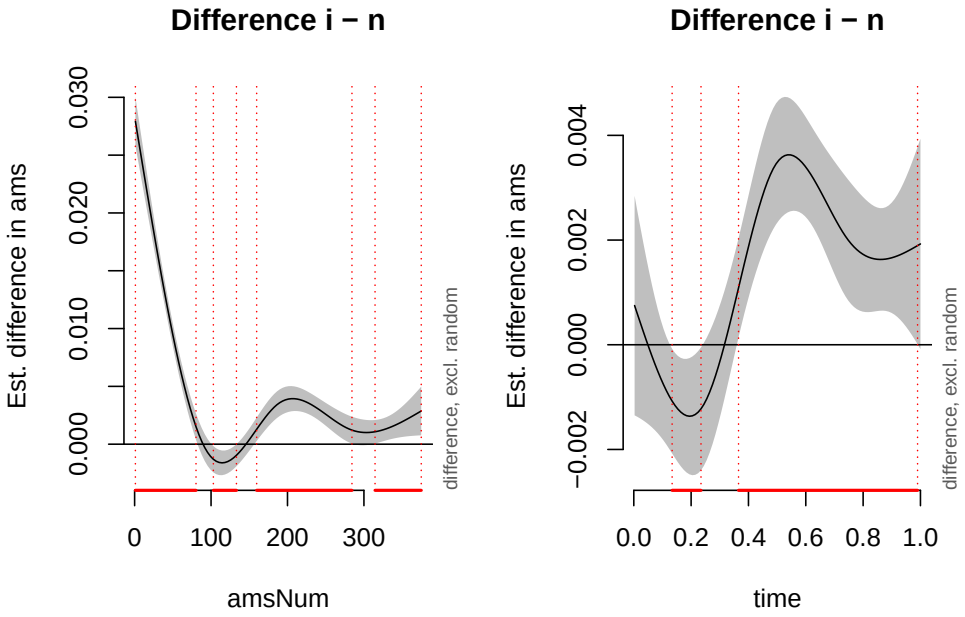
GAM with tensor product interaction for ams

```
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)
```

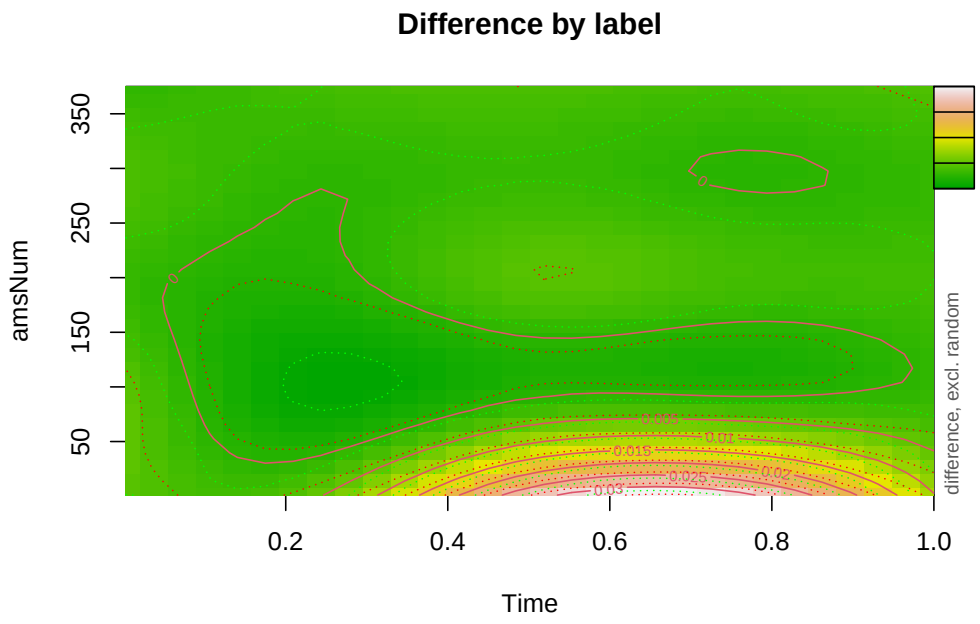
```
print(plot(m1amsViz, allTerms=T), pages=3)
```




```
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)
```

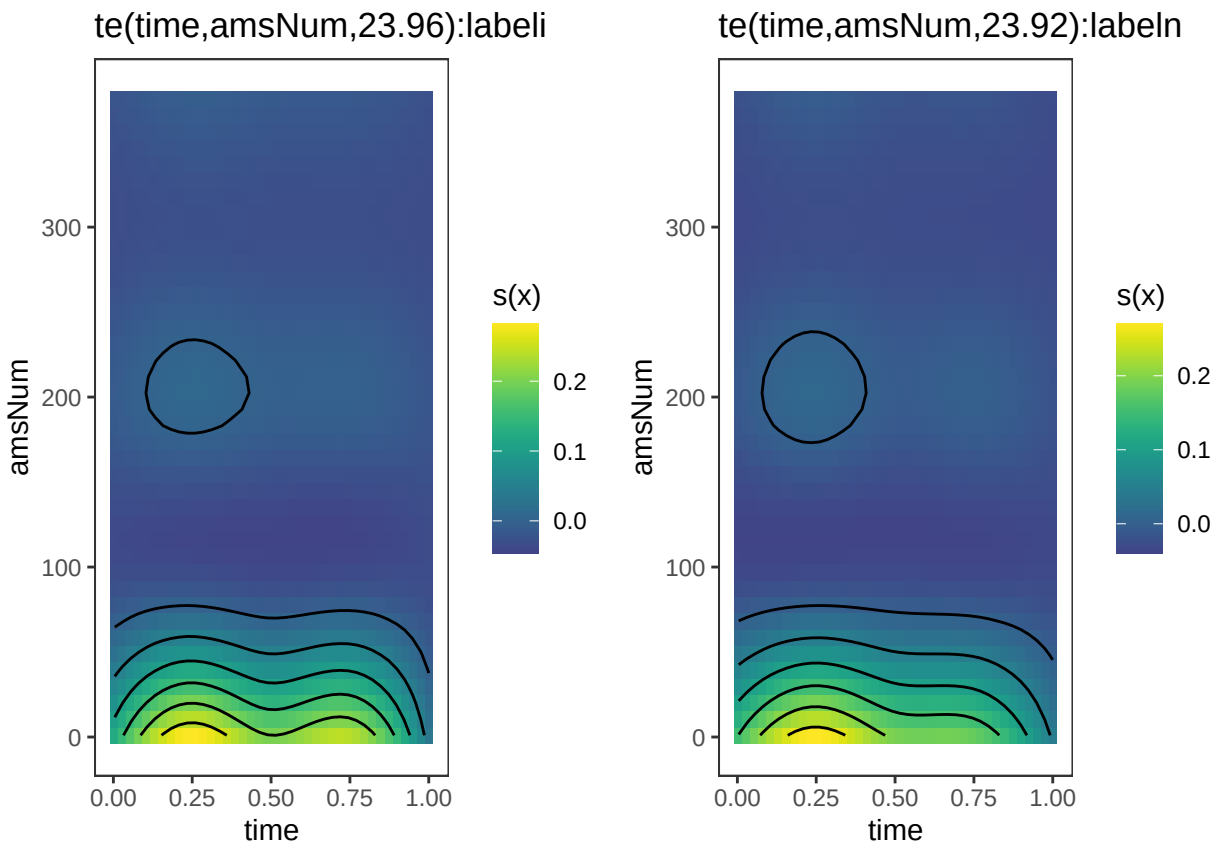
```
##
## Family: gaussian
## Link function: identity
##
## Formula:
## ams ~ label + te(time, amsNum, by = label) + s(time, speaker,
##     bs = "fs", m = 1) + s(amsNum, speaker, bs = "fs", m = 1)
##
## Parametric coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.2646037  0.0196843  -13.44   <2e-16 ***
## labeln      -0.0022427  0.0001228  -18.27   <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 23.62  23.67 8427.2  <2e-16 ***
## te(time,amsNum):labeln 23.64  23.69 8355.3  <2e-16 ***
## s(time,speaker)        40.69  44.00  191.9  <2e-16 ***
## s(amsNum,speaker)      41.50  44.00 5560.6  <2e-16 ***
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =   0.19   Deviance explained =   19%
## fREML = -2.7557e+06  Scale est. = 0.01585   n = 4218750
```

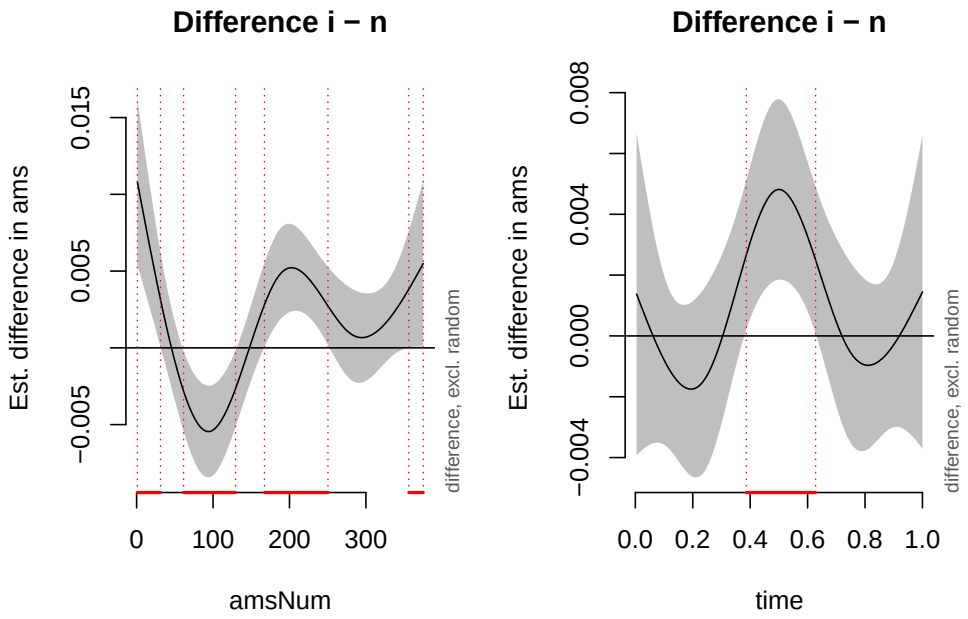
Individual Speaker Models Speaker B

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

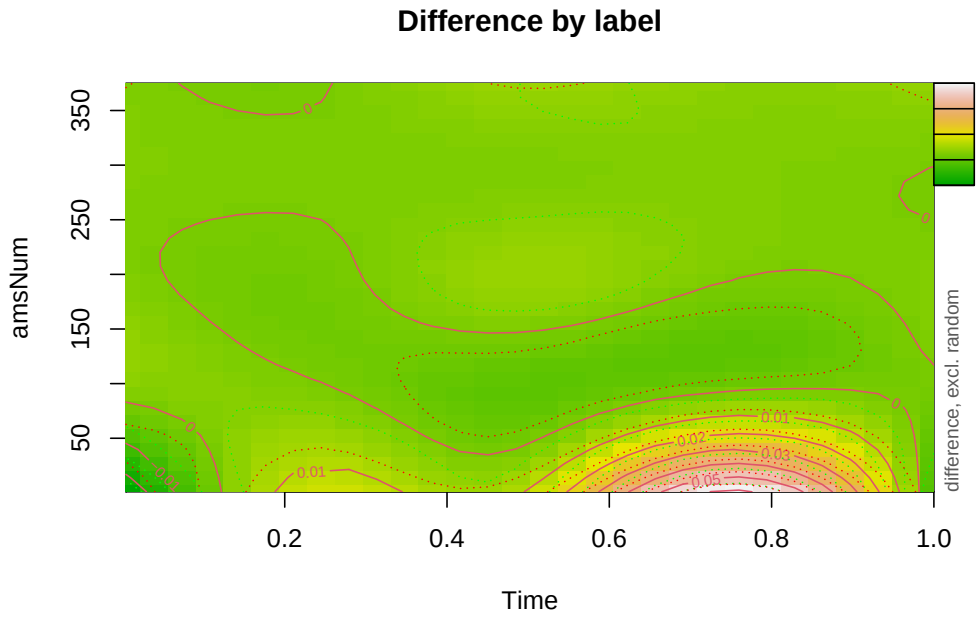
```
print(plot(mBamsViz, allTerms=T), pages=2)
```




```
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)
```

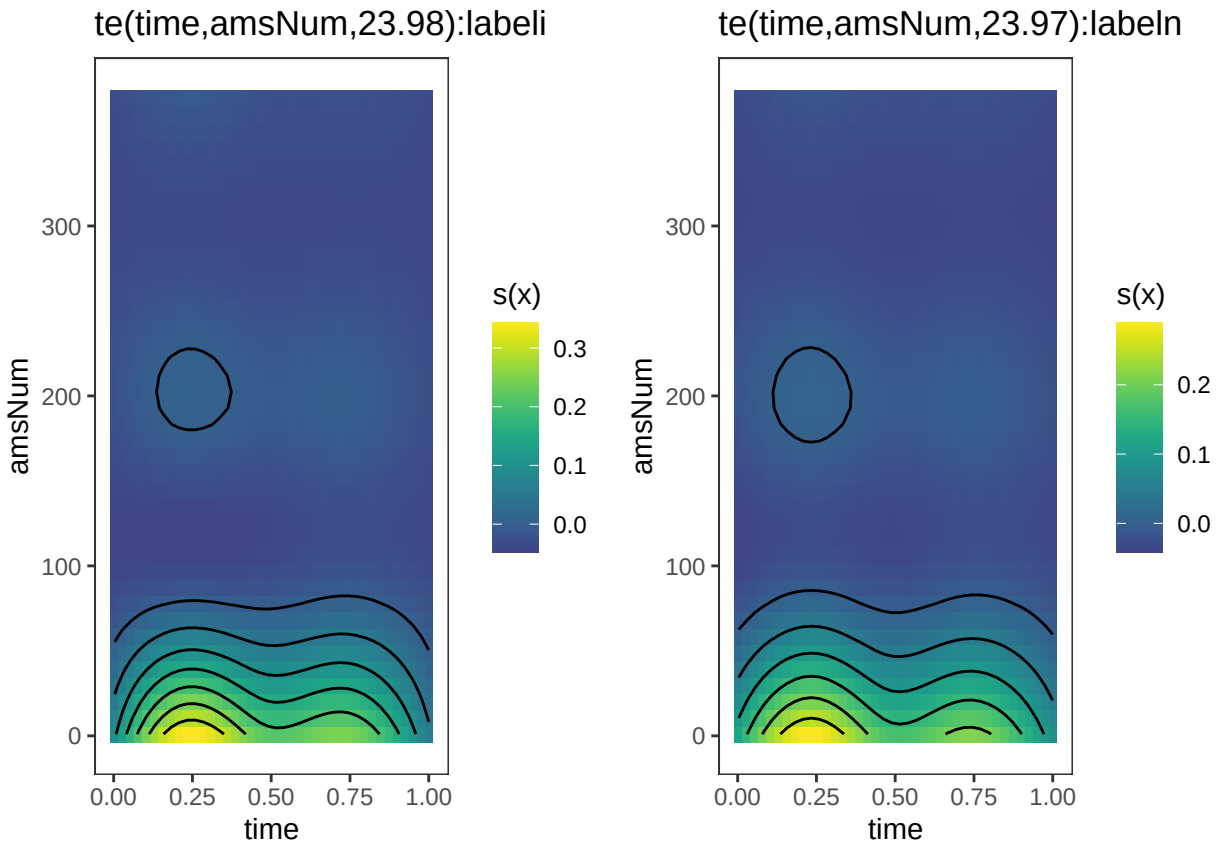
```
##
## Family: gaussian
```

```
## Link function: identity
##
## Formula:
## ams ~ label + te(time, amsNum, by = label)
##
## Parametric coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.0351111  0.0002232  157.28  < 2e-16 ***
## labeln      -0.0022257  0.0003157   -7.05 1.79e-12 ***
## ---
## 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 2727  <2e-16 ***
## te(time,amsNum):labeln 23.92     24 2311  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =  0.125   Deviance explained = 12.5%
## fREML = -4.3301e+05  Scale est. = 0.020969  n = 843750
```

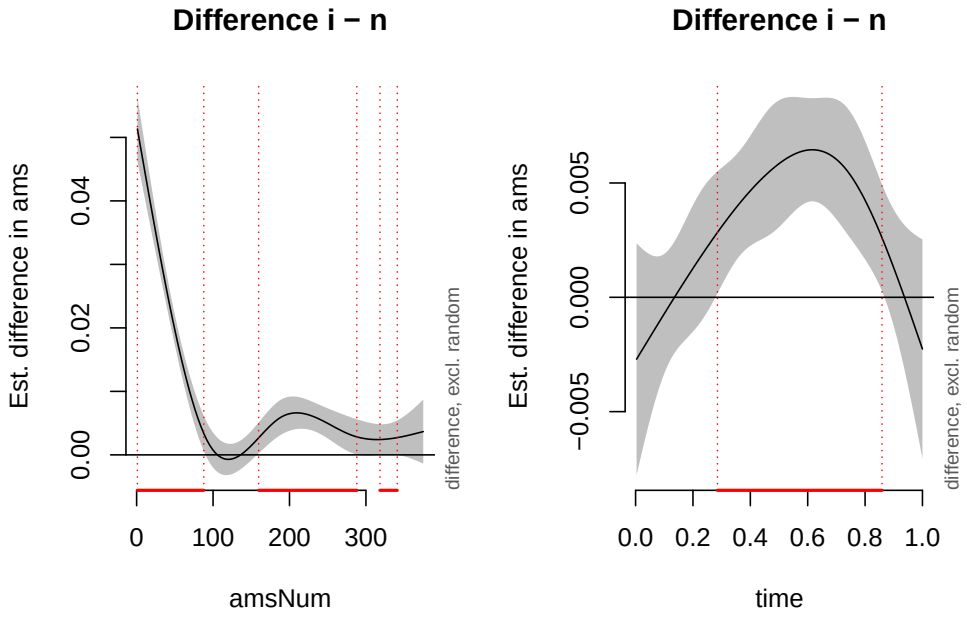
Speaker G

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

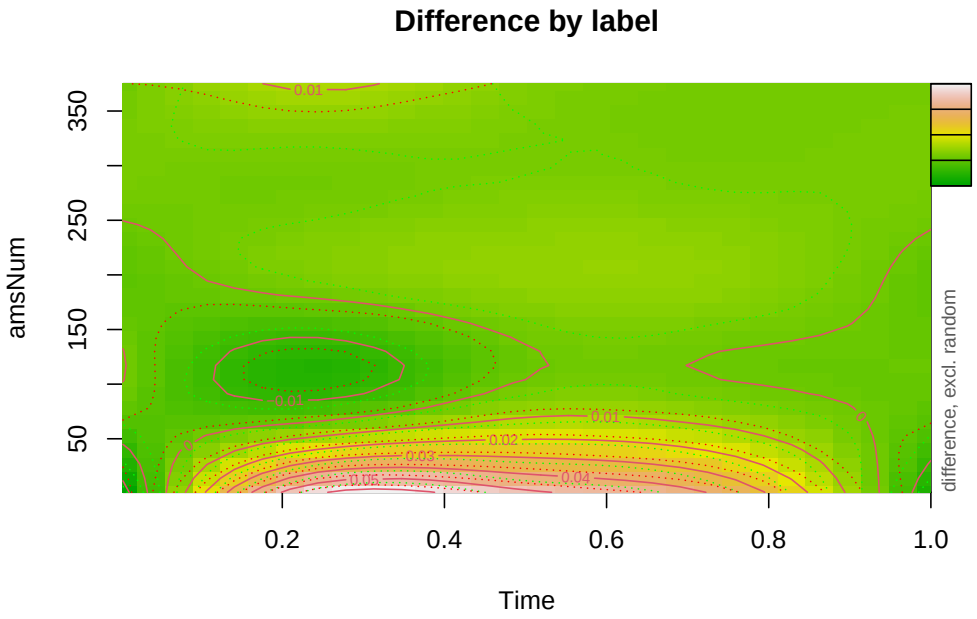
```
print(plot(mGamsViz, allTerms=T), pages=2)
```




```
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")
```



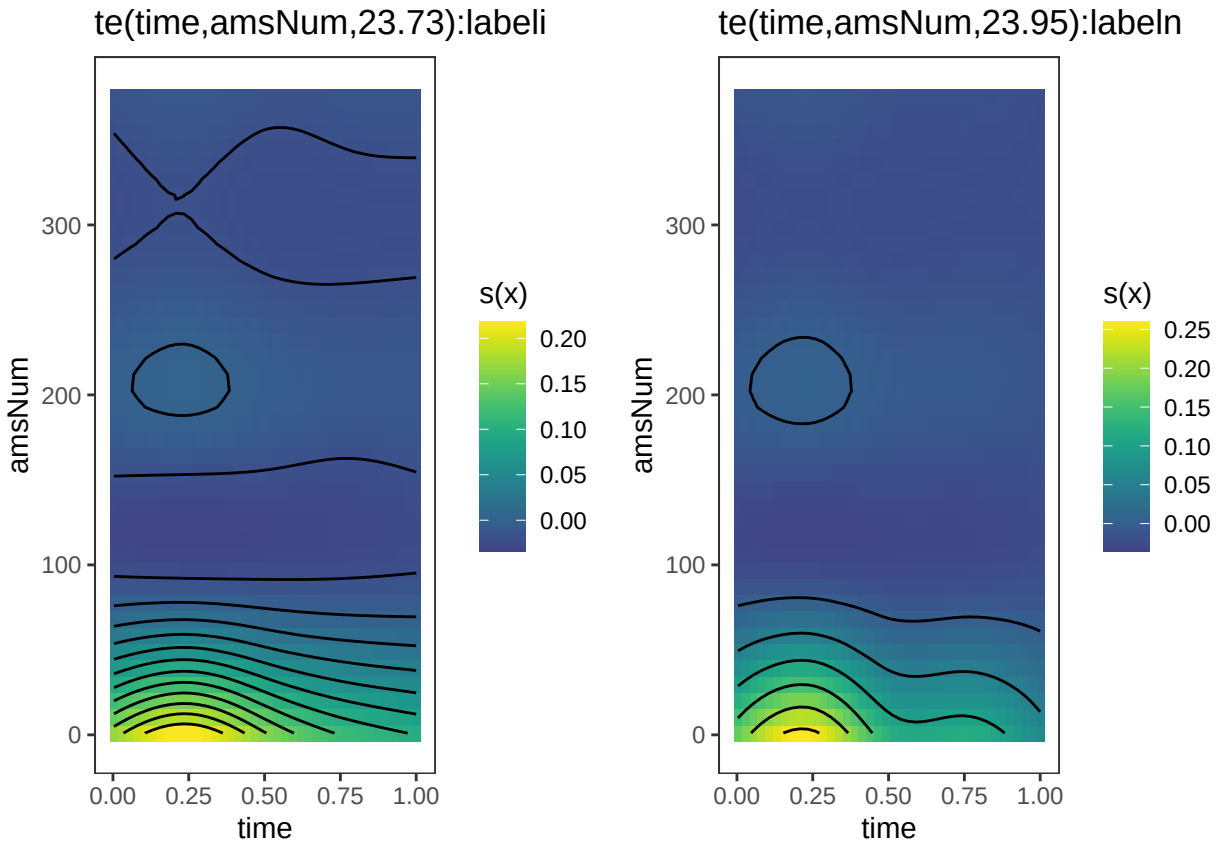

```
summary(mGams)
```

```
##
## Family: gaussian
## Link function: identity
##
## Formula:
## ams ~ label + te(time, amsNum, by = label)
##
## Parametric coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.0433964  0.0002096  207.05   <2e-16 ***
## labeln      -0.0041857  0.0002964  -14.12   <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 23.98     24 3985  <2e-16 ***
## te(time,amsNum):labeln 23.97     24 3006  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =  0.166   Deviance explained = 16.6%
## fREML = -4.8614e+05  Scale est. = 0.018487  n = 843750
```

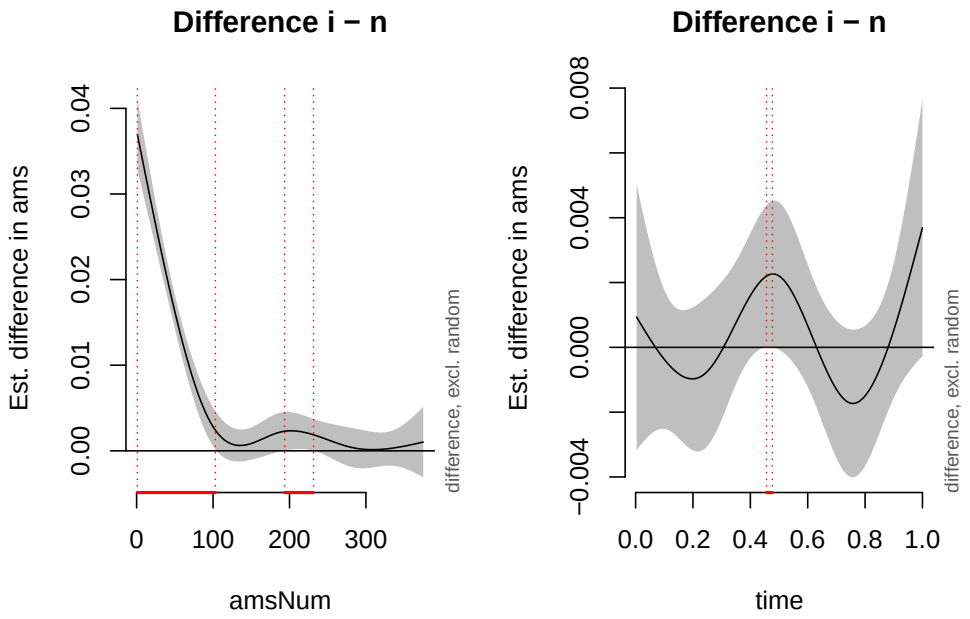
Speaker P

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

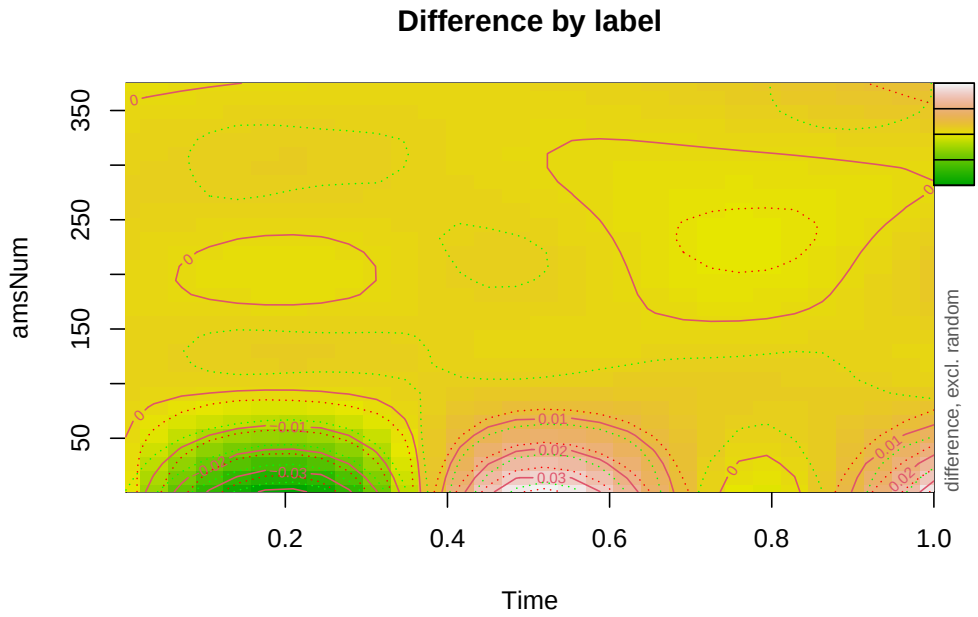
```
print(plot(mPamsViz, allTerms=T), pages=2)
```




```
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)
```

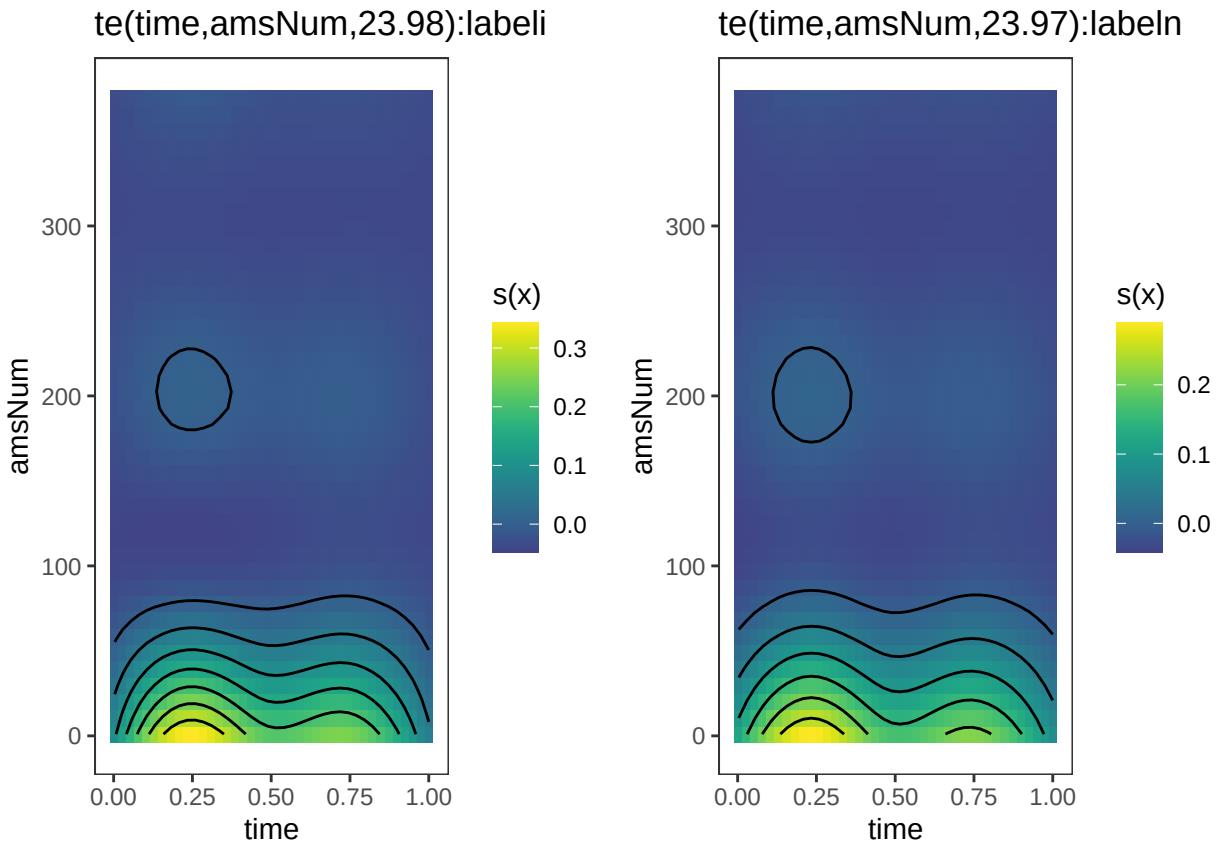
```
##
## Family: gaussian
```

```
## Link function: identity
##
## Formula:
## ams ~ label + te(time, amsNum, by = label)
##
## Parametric coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.0262617  0.0001716 153.079  < 2e-16 ***
## labeln      -0.0010438  0.0002426  -4.302 1.69e-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 23.73  23.99 2728  <2e-16 ***
## te(time,amsNum):labeln 23.95  24.00 2917  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =  0.138   Deviance explained = 13.8%
## fREML = -6.5514e+05  Scale est. = 0.012386  n = 843750
```

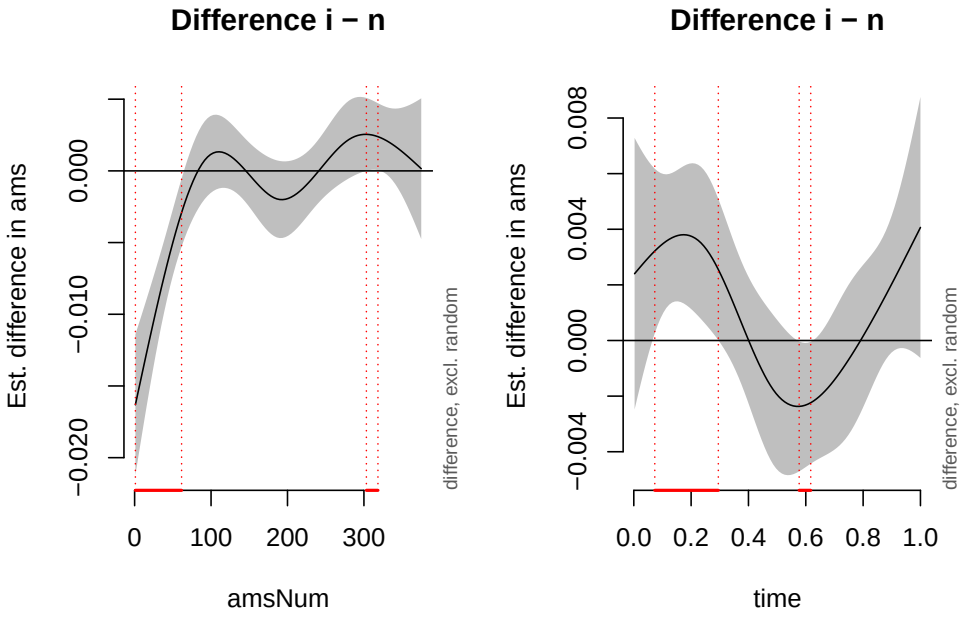
Speaker R

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

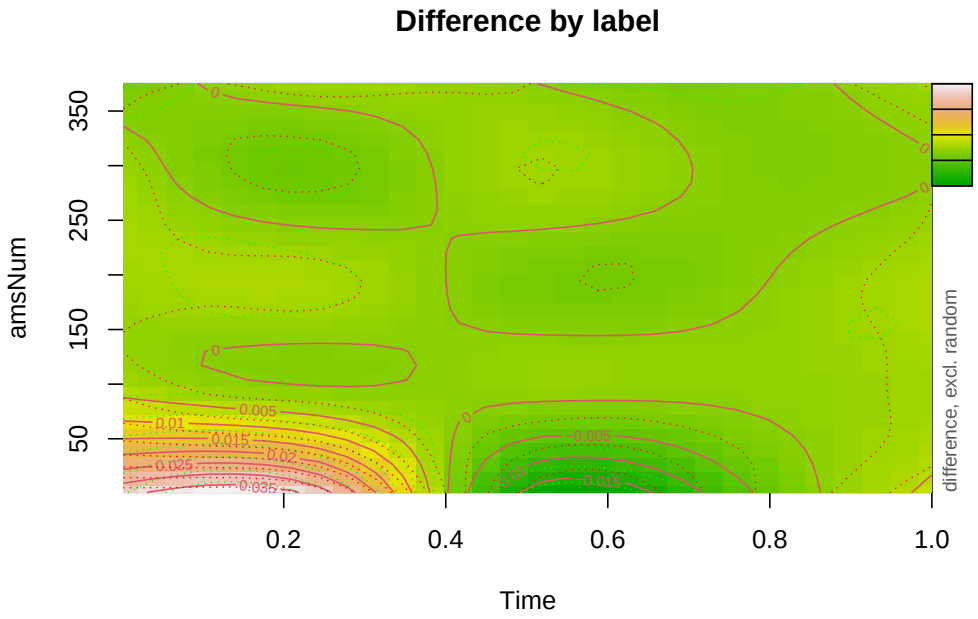
```
print(plot(mRamsViz, allTerms=T), pages=2)
```




```
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")
```



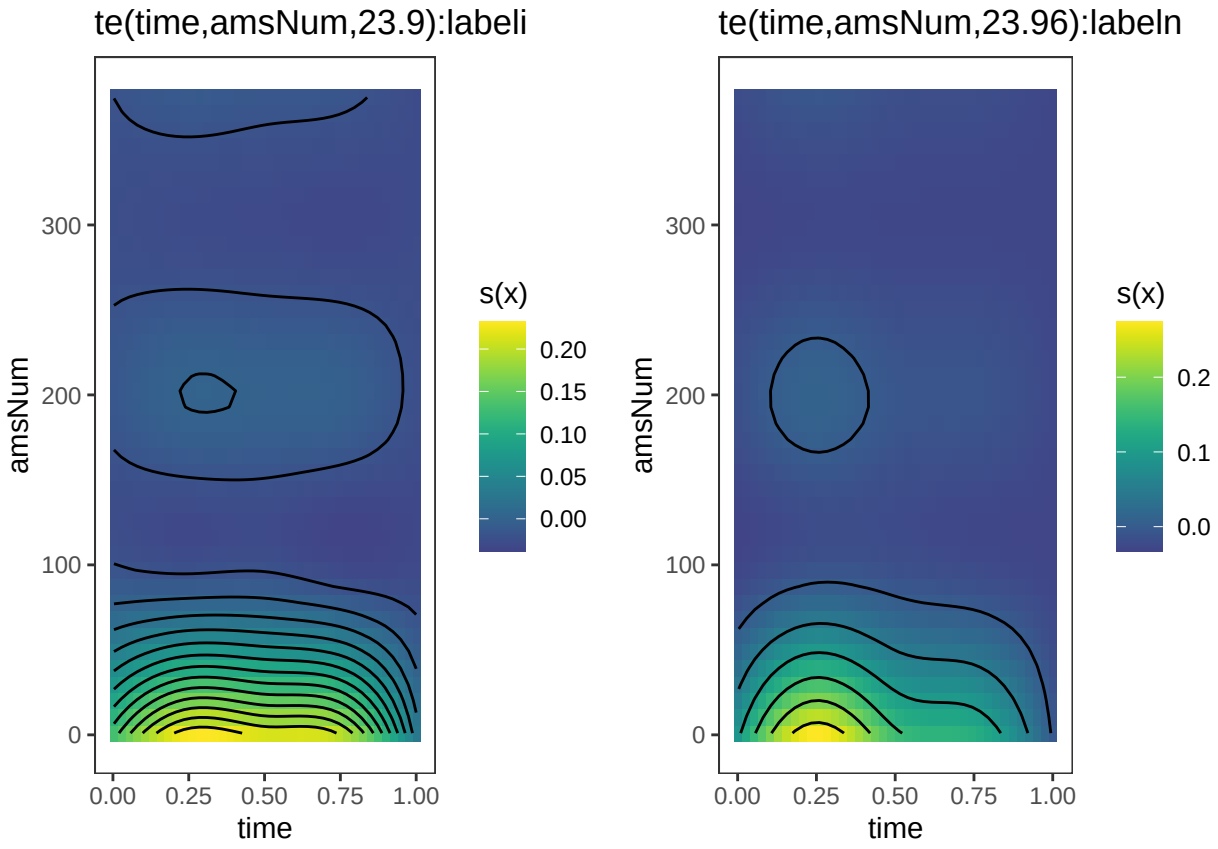

```
summary(mRams)
```

```
##
## Family: gaussian
## Link function: identity
##
## Formula:
## ams ~ label + te(time, amsNum, by = label)
##
## Parametric coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.0308639  0.0002026 152.341  < 2e-16 ***
## labeln      -0.0012231  0.0002865  -4.269 1.97e-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 23.97     24 3050  <2e-16 ***
## te(time,amsNum):labeln 23.97     24 2803  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =  0.143   Deviance explained = 14.3%
## fREML = -5.1484e+05  Scale est. = 0.017271  n = 843750
```

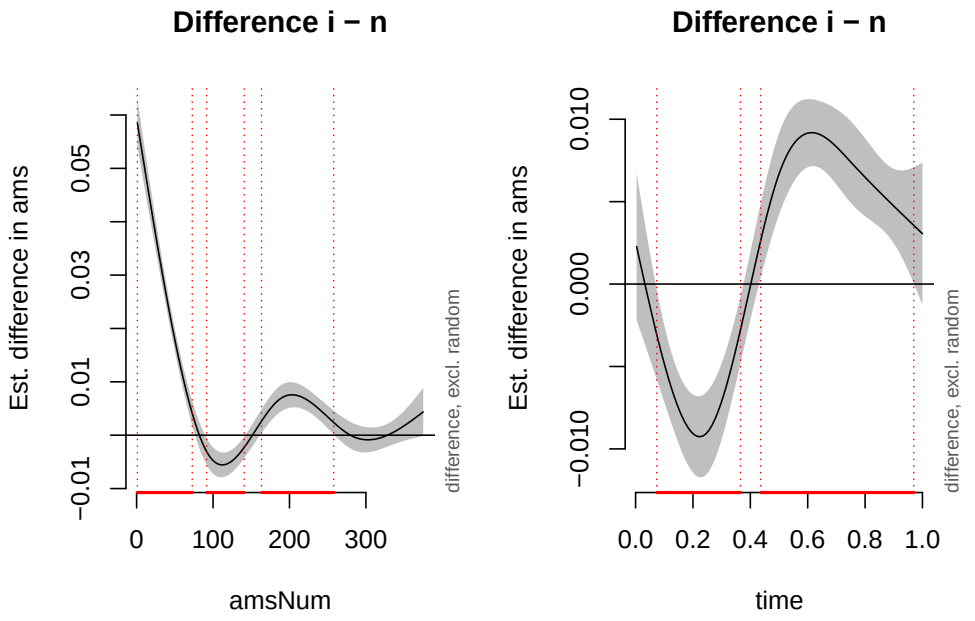
Speaker Y

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

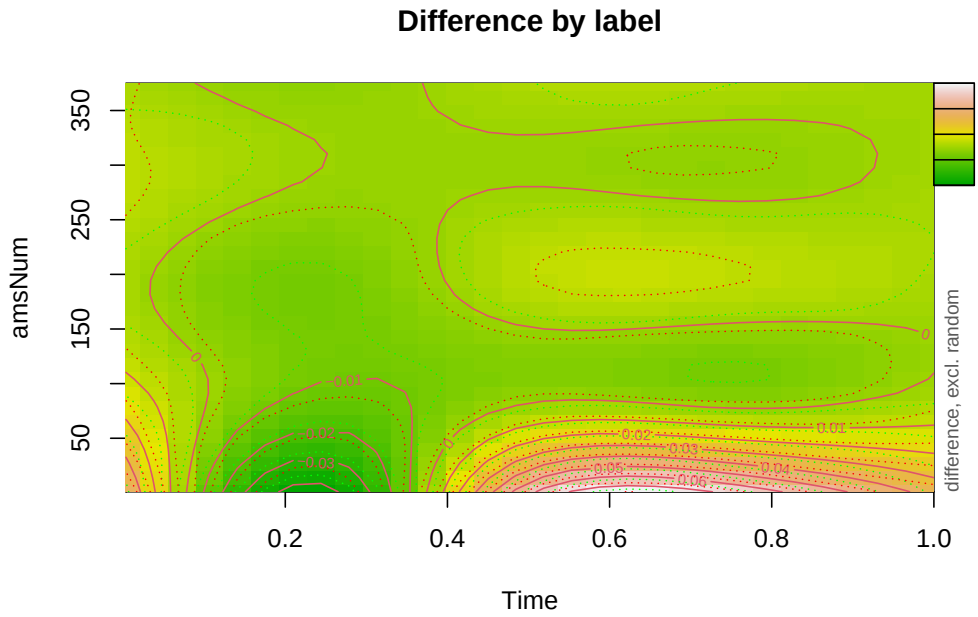
```
print(plot(mYamsViz, allTerms=T), pages=2)
```




```
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)  0.0320888  0.0001858 172.721  < 2e-16 ***
## labeln      -0.0019483  0.0002627  -7.415 1.21e-13 ***
## ---
## 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 23.90     24 3239  <2e-16 ***
## te(time,amsNum):labeln 23.96     24 2794  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =  0.147   Deviance explained = 14.7%
## fREML = -5.8792e+05  Scale est. = 0.014525  n = 843750
```