In [1]:
```python
import mne
import numpy as np
from matplotlib import pyplot as plt
from stormdb.access import Query
from pickle import load
from scipy import stats
from mne.datasets import sample
from mne.stats import spatio_temporal_cluster_1samp_test
import os
import os.path as op
import pickle
from copy import deepcopy
from sys import argv
import warnings
warnings.filterwarnings("ignore", category=DeprecationWarning)
```

In [2]:
```python
os.environ['ETS_TOOLKIT'] = 'qt4'
os.environ['QT_API'] = 'pyqt5'

proj_name = 'MINDLAB2020_MEG-AuditoryPatternRecognition'
wdir = '/projects/' + proj_name + '/scratch/working_memory/'
data_dir = wdir + 'averages/data/'
subs_dir = '/projects/' + proj_name + '/scratch/fs_subjects_dir/'
sample_path = sample.data_path()
sample_subjects_dir = sample_path + '/subjects'
src_sample = mne.read_source_spaces(sample_subjects_dir +
                                    '/fsaverage/bem/fsaverage-vol-5-src.fif
')
stats_dir = wdir + 'results/stats/'
```

```
Reading a source space...
[done]
1 source spaces read
```

In [3]:
```python
#Get subjects:
qr = Query(proj_name)
subjects = qr.get_subjects()
subs = range(21,91) #, 27, 28, 29, 30, 31, 32, 33, 34, 35]
```

```python
In [4]: all_data = {}
for sidx,s in enumerate(subs):
    try:
        scode = subjects[s-1]
        morph = mne.read_source_morph(subs_dir + scode + '/bem/' + scod
e + '_vol-morph.h5')
        morph_mat = morph.vol_morph_mat
        dfname = data_dir + scode + '_patterns_imagined.p'
        print('loading file {}'.format(dfname))
        dfile = open(dfname,'rb')
        curdata = load(dfile)
        for cd in curdata:
            cdata = morph_mat.dot(curdata[cd].data)#deepcopy(cmorphed.d
ata) #morph_mat.dot(c.data)
            print('appending subject {} condition {}'.format(scode,cd))
            all_data.setdefault(cd, np.array([cdata]))
            #all_data[cd][cd2].append([cdata])
            if sidx > 0:
                all_data[cd] = np.vstack((all_data[cd],np.array([cdat
a])))
    except Exception as e:
        print(e)
        continue
```

```
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0021_LZW_patterns_imagined.p
appending subject 0021_LZW condition main_delay
appending subject 0021_LZW condition inv_delay
appending subject 0021_LZW condition main_fmel
appending subject 0021_LZW condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0022_BHR_patterns_imagined.p
appending subject 0022_BHR condition main_delay
appending subject 0022_BHR condition inv_delay
appending subject 0022_BHR condition main_fmel
appending subject 0022_BHR condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0023_ZPC_patterns_imagined.p
appending subject 0023_ZPC condition main_delay
appending subject 0023_ZPC condition inv_delay
appending subject 0023_ZPC condition main_fmel
appending subject 0023_ZPC condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0024_JSV_patterns_imagined.p
appending subject 0024_JSV condition main_delay
appending subject 0024_JSV condition inv_delay
appending subject 0024_JSV condition main_fmel
appending subject 0024_JSV condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0025_62P_patterns_imagined.p
appending subject 0025_62P condition main_delay
appending subject 0025_62P condition inv_delay
appending subject 0025_62P condition main_fmel
appending subject 0025_62P condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0026_S1H_patterns_imagined.p
appending subject 0026_S1H condition main_delay
appending subject 0026_S1H condition inv_delay
appending subject 0026_S1H condition main_fmel
appending subject 0026_S1H condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0027_TLV_patterns_imagined.p
appending subject 0027_TLV condition main_delay
appending subject 0027_TLV condition inv_delay
appending subject 0027_TLV condition main_fmel
appending subject 0027_TLV condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0028_2NK_patterns_imagined.p
appending subject 0028_2NK condition main_delay
appending subject 0028_2NK condition inv_delay
appending subject 0028_2NK condition main_fmel
appending subject 0028_2NK condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0029_PAX_patterns_imagined.p
appending subject 0029_PAX condition main_delay
appending subject 0029_PAX condition inv_delay
appending subject 0029_PAX condition main_fmel
appending subject 0029_PAX condition inv_fmel
```

```
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0030_2MP_patterns_imagined.p
[Errno 2] No such file or directory: '/projects/MINDLAB2020_MEG-Audit
oryPatternRecognition/scratch/working_memory/averages/data/0030_2MP_p
atterns_imagined.p'
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0031_WZD_patterns_imagined.p
appending subject 0031_WZD condition main_delay
appending subject 0031_WZD condition inv_delay
appending subject 0031_WZD condition main_fmel
appending subject 0031_WZD condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0032_BLF_patterns_imagined.p
[Errno 2] No such file or directory: '/projects/MINDLAB2020_MEG-Audit
oryPatternRecognition/scratch/working_memory/averages/data/0032_BLF_p
atterns_imagined.p'
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0033_MXJ_patterns_imagined.p
[Errno 2] No such file or directory: '/projects/MINDLAB2020_MEG-Audit
oryPatternRecognition/scratch/working_memory/averages/data/0033_MXJ_p
atterns_imagined.p'
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0034_V8Q_patterns_imagined.p
appending subject 0034_V8Q condition main_delay
appending subject 0034_V8Q condition inv_delay
appending subject 0034_V8Q condition main_fmel
appending subject 0034_V8Q condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0035_FTI_patterns_imagined.p
appending subject 0035_FTI condition main_delay
appending subject 0035_FTI condition inv_delay
appending subject 0035_FTI condition main_fmel
appending subject 0035_FTI condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0036_9EA_patterns_imagined.p
appending subject 0036_9EA condition main_delay
appending subject 0036_9EA condition inv_delay
appending subject 0036_9EA condition main_fmel
appending subject 0036_9EA condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0037_KPS_patterns_imagined.p
appending subject 0037_KPS condition main_delay
appending subject 0037_KPS condition inv_delay
appending subject 0037_KPS condition main_fmel
appending subject 0037_KPS condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0038_J7W_patterns_imagined.p
appending subject 0038_J7W condition main_delay
appending subject 0038_J7W condition inv_delay
appending subject 0038_J7W condition main_fmel
appending subject 0038_J7W condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0039_MLI_patterns_imagined.p
appending subject 0039_MLI condition main_delay
```

```
appending subject 0039_MLI condition inv_delay
appending subject 0039_MLI condition main_fmel
appending subject 0039_MLI condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0040_LDN_patterns_imagined.p
appending subject 0040_LDN condition main_delay
appending subject 0040_LDN condition inv_delay
appending subject 0040_LDN condition main_fmel
appending subject 0040_LDN condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0041_RSP_patterns_imagined.p
appending subject 0041_RSP condition main_delay
appending subject 0041_RSP condition inv_delay
appending subject 0041_RSP condition main_fmel
appending subject 0041_RSP condition inv_fmel
file "/projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scratch/fs
_subjects_dir/0042_WOB/bem/0042_WOB_vol-morph.h5" not found
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0043_XKK_patterns_imagined.p
appending subject 0043_XKK condition main_delay
appending subject 0043_XKK condition inv_delay
appending subject 0043_XKK condition main_fmel
appending subject 0043_XKK condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0044_4QT_patterns_imagined.p
appending subject 0044_4QT condition main_delay
appending subject 0044_4QT condition inv_delay
appending subject 0044_4QT condition main_fmel
appending subject 0044_4QT condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0045_GVP_patterns_imagined.p
appending subject 0045_GVP condition main_delay
appending subject 0045_GVP condition inv_delay
appending subject 0045_GVP condition main_fmel
appending subject 0045_GVP condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0046_QXA_patterns_imagined.p
appending subject 0046_QXA condition main_delay
appending subject 0046_QXA condition inv_delay
appending subject 0046_QXA condition main_fmel
appending subject 0046_QXA condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0047_KXX_patterns_imagined.p
appending subject 0047_KXX condition main_delay
appending subject 0047_KXX condition inv_delay
appending subject 0047_KXX condition main_fmel
appending subject 0047_KXX condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0048_7BH_patterns_imagined.p
appending subject 0048_7BH condition main_delay
appending subject 0048_7BH condtion inv_delay
appending subject 0048_7BH condition main_fmel
appending subject 0048_7BH condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
```

```
atch/working_memory/averages/data/0049_KFD_patterns_imagined.p
appending subject 0049_KFD condition main_delay
appending subject 0049_KFD condition inv_delay
appending subject 0049_KFD condition main_fmel
appending subject 0049_KFD condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0050_BBQ_patterns_imagined.p
appending subject 0050_BBQ condition main_delay
appending subject 0050_BBQ condition inv_delay
appending subject 0050_BBQ condition main_fmel
appending subject 0050_BBQ condition inv_fmel
file "/projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scratch/fs
_subjects_dir/0051_NUI/bem/0051_NUI_vol-morph.h5" not found
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0052_GWV_patterns_imagined.p
appending subject 0052_GWV condition main_delay
appending subject 0052_GWV condition inv_delay
appending subject 0052_GWV condition main_fmel
appending subject 0052_GWV condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0053_BUS_patterns_imagined.p
appending subject 0053_BUS condition main_delay
appending subject 0053_BUS condition inv_delay
appending subject 0053_BUS condition main_fmel
appending subject 0053_BUS condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0054_TPU_patterns_imagined.p
appending subject 0054_TPU condition main_delay
appending subject 0054_TPU condition inv_delay
appending subject 0054_TPU condition main_fmel
appending subject 0054_TPU condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0055_PGC_patterns_imagined.p
appending subject 0055_PGC condition main_delay
appending subject 0055_PGC condition inv_delay
appending subject 0055_PGC condition main_fmel
appending subject 0055_PGC condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0056_QLB_patterns_imagined.p
appending subject 0056_QLB condition main_delay
appending subject 0056_QLB condition inv_delay
appending subject 0056_QLB condition main_fmel
appending subject 0056_QLB condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0057_LOR_patterns_imagined.p
appending subject 0057_LOR condition main_delay
appending subject 0057_LOR condition inv_delay
appending subject 0057_LOR condition main_fmel
appending subject 0057_LOR condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0058_L3X_patterns_imagined.p
appending subject 0058_L3X condition main_delay
appending subject 0058_L3X condition inv_delay
appending subject 0058_L3X condition main_fmel
```

```
appending subject 0058_L3X condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0059_CYC_patterns_imagined.p
appending subject 0059_CYC condition main_delay
appending subject 0059_CYC condition inv_delay
appending subject 0059_CYC condition main_fmel
appending subject 0059_CYC condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0060_KDJ_patterns_imagined.p
appending subject 0060_KDJ condition main_delay
appending subject 0060_KDJ condition inv_delay
appending subject 0060_KDJ condition main_fmel
appending subject 0060_KDJ condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0061_NMF_patterns_imagined.p
appending subject 0061_NMF condition main_delay
appending subject 0061_NMF condition inv_delay
appending subject 0061_NMF condition main_fmel
appending subject 0061_NMF condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0062_WKJ_patterns_imagined.p
appending subject 0062_WKJ condition main_delay
appending subject 0062_WKJ condition inv_delay
appending subject 0062_WKJ condition main_fmel
appending subject 0062_WKJ condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0063_NNY_patterns_imagined.p
appending subject 0063_NNY condition main_delay
appending subject 0063_NNY condition inv_delay
appending subject 0063_NNY condition main_fmel
appending subject 0063_NNY condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0064_GMS_patterns_imagined.p
appending subject 0064_GMS condition main_delay
appending subject 0064_GMS condition inv_delay
appending subject 0064_GMS condition main_fmel
appending subject 0064_GMS condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0065_DEH_patterns_imagined.p
appending subject 0065_DEH condition main_delay
appending subject 0065_DEH condition inv_delay
appending subject 0065_DEH condition main_fmel
appending subject 0065_DEH condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0066_T0O_patterns_imagined.p
appending subject 0066_T0O condition main_delay
appending subject 0066_T0O condition inv_delay
appending subject 0066_T0O condition main_fmel
appending subject 0066_T0O condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0067_PQF_patterns_imagined.p
appending subject 0067_PQF condition main_delay
appending subject 0067_PQF condition inv_delay
appending subject 0067_PQF condition main_fmel
```

```
appending subject 0067_PQF condition inv_fmel
file "/projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scratch/fs
_subjects_dir/0068_Q6G/bem/0068_Q6G_vol-morph.h5" not found
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0069_ECC_patterns_imagined.p
appending subject 0069_ECC condition main_delay
appending subject 0069_ECC condition inv_delay
appending subject 0069_ECC condition main_fmel
appending subject 0069_ECC condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0070_EWA_patterns_imagined.p
appending subject 0070_EWA condition main_delay
appending subject 0070_EWA condition inv_delay
appending subject 0070_EWA condition main_fmel
appending subject 0070_EWA condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0071_WGY_patterns_imagined.p
appending subject 0071_WGY condition main_delay
appending subject 0071_WGY condition inv_delay
appending subject 0071_WGY condition main_fmel
appending subject 0071_WGY condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0072_ZHI_patterns_imagined.p
appending subject 0072_ZHI condition main_delay
appending subject 0072_ZHI condition inv_delay
appending subject 0072_ZHI condition main_fmel
appending subject 0072_ZHI condition inv_fmel
file "/projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scratch/fs
_subjects_dir/0073_0RQ/bem/0073_0RQ_vol-morph.h5" not found
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0074_CQ7_patterns_imagined.p
appending subject 0074_CQ7 condition main_delay
appending subject 0074_CQ7 condition inv_delay
appending subject 0074_CQ7 condition main_fmel
appending subject 0074_CQ7 condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0075_CIE_patterns_imagined.p
appending subject 0075_CIE condition main_delay
appending subject 0075_CIE condition inv_delay
appending subject 0075_CIE condition main_fmel
appending subject 0075_CIE condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0076_E8Z_patterns_imagined.p
appending subject 0076_E8Z condition main_delay
appending subject 0076_E8Z condition inv_delay
appending subject 0076_E8Z condition main_fmel
appending subject 0076_E8Z condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0077_YXW_patterns_imagined.p
appending subject 0077_YXW condition main_delay
appending subject 0077_YXW conchtion inv_delay
appending subject 0077_YXW condition main_fmel
appending subject 0077_YXW condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
```

```
                    atch/working_memory/averages/data/0078_PAK_patterns_imagined.p
                    appending subject 0078_PAK condition main_delay
                    appending subject 0078_PAK condition inv_delay
                    appending subject 0078_PAK condition main_fmel
                    appending subject 0078_PAK condition inv_fmel
                    loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
                    atch/working_memory/averages/data/0079_DFV_patterns_imagined.p
                    [Errno 2] No such file or directory: '/projects/MINDLAB2020_MEG-Audit
                    oryPatternRecognition/scratch/working_memory/averages/data/0079_DFV_p
                    atterns_imagined.p'
                    loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
                    atch/working_memory/averages/data/0080_G9V_patterns_imagined.p
                    appending subject 0080_G9V condition main_delay
                    appending subject 0080_G9V condition inv_delay
                    appending subject 0080_G9V condition main_fmel
                    appending subject 0080_G9V condition inv_fmel
                    loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
                    atch/working_memory/averages/data/0081_V1D_patterns_imagined.p
                    appending subject 0081_V1D condition main_delay
                    appending subject 0081_V1D condition inv_delay
                    appending subject 0081_V1D condition main_fmel
                    appending subject 0081_V1D condition inv_fmel
                    loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
                    atch/working_memory/averages/data/0082_PV2_patterns_imagined.p
                    appending subject 0082_PV2 condition main_delay
                    appending subject 0082_PV2 condition inv_delay
                    appending subject 0082_PV2 condition main_fmel
                    appending subject 0082_PV2 condition inv_fmel
                    loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
                    atch/working_memory/averages/data/0083_B62_patterns_imagined.p
                    appending subject 0083_B62 condition main_delay
                    appending subject 0083_B62 condition inv_delay
                    appending subject 0083_B62 condition main_fmel
                    appending subject 0083_B62 condition inv_fmel
                    loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
                    atch/working_memory/averages/data/0084_DZM_patterns_imagined.p
                    appending subject 0084_DZM condition main_delay
                    appending subject 0084_DZM condition inv_delay
                    appending subject 0084_DZM condition main_fmel
                    appending subject 0084_DZM condition inv_fmel
                    loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
                    atch/working_memory/averages/data/0085_EDC_patterns_imagined.p
                    appending subject 0085_EDC condition main_delay
                    appending subject 0085_EDC condition inv_delay
                    appending subject 0085_EDC condition main_fmel
                    appending subject 0085_EDC condition inv_fmel
                    loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
                    atch/working_memory/averages/data/0086_HBD_patterns_imagined.p
                    appending subject 0086_HBD condition main_delay
                    appending subject 0086_HBD condition inv_delay
                    appending subject 0086_HBD condition main_fmel
                    appending subject 0086_HBD condition inv_fmel
                    loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
                    atch/working_memory/averages/data/0087_MM7_patterns_imagined.p
```

```
appending subject 0087_MM7 condition main_delay
appending subject 0087_MM7 condition inv_delay
appending subject 0087_MM7 condition main_fmel
appending subject 0087_MM7 condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0088_AVP_patterns_imagined.p
appending subject 0088_AVP condition main_delay
appending subject 0088_AVP condition inv_delay
appending subject 0088_AVP condition main_fmel
appending subject 0088_AVP condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
atch/working_memory/averages/data/0089_FHG_patterns_imagined.p
appending subject 0089_FHG condition main_delay
appending subject 0089_FHG condition inv_delay
appending subject 0089_FHG condition main_fmel
appending subject 0089_FHG condition inv_fmel
loading file /projects/MINDLAB2020_MEG-AuditoryPatternRecognition/scr
```

In [5]:
```python
print(all_data[cd].shape)
```

```
(62, 14629, 126)
```

In [6]:
```python
grand_avg = {}
for cd in all_data:
    grand_avg[cd] = deepcopy(morph.apply(curdata['main_delay']))
    #grand_avg[b][cd].subject = 'sample'
    grand_avg[cd].data = np.mean(all_data[cd],0)
    grand_avg[cd].tmin = -0.5
    grand_avg[cd].tstep = 0.02
    print(grand_avg[cd].data.shape)
```

```
(14629, 126)
(14629, 126)
(14629, 126)
(14629, 126)
```

```
In [7]: crop_times = np.arange(-0.5,2.5,0.5)
        for p in grand_avg:
            print(grand_avg[p].tmin)
            for tidx, t in enumerate(crop_times):
                if tidx < (len(crop_times) - 1):
                    t2 = crop_times[tidx + 1]
                    print('{} ({} {}):'.format(p, t, t2) )
                    grand_avg[p].copy().crop(t,t2).mean().plot(src = src_sampl
        e, subjects_dir = subs_dir, mode = 'stat_map',#'glass_brain',#'glass_br
        ain',#initial_time = 1.75,
                                        initial_pos = None)#[.007,.05,.023])
```

```
-0.5
main_delay (-0.5 0.0):
Showing: t = -0.240 s, (30.0, -20.0, 25.0) mm, [22, 19, 20] vox, 2638
9 vertex
Using control points [0.10928788 0.11891835 0.163832  ]
```
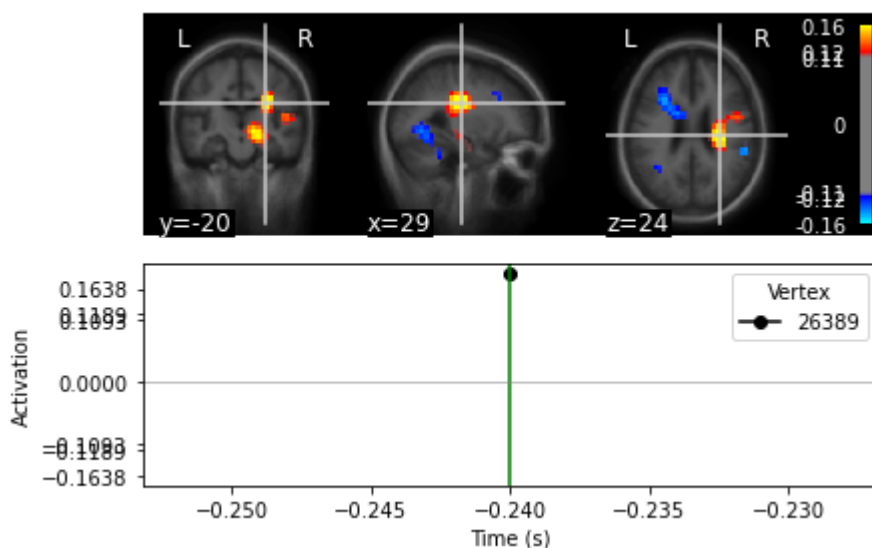


```
main_delay (0.0 0.5):
Showing: t = 0.260 s, (5.0, -10.0, -0.0) mm, [17, 21, 15] vox, 20015
vertex
Using control points [0.22216022 0.25507471 0.37888781]
```
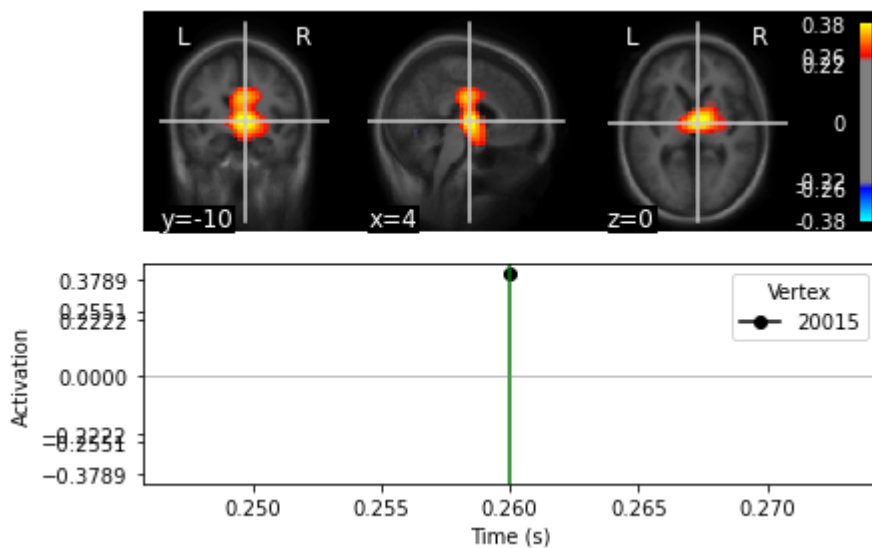


```
main_delay (0.5 1.0):
Showing: t = 0.760 s, (5.0, -10.0, -0.0) mm, [17, 21, 15] vox, 20015
vertex
Using control points [0.26525619 0.30547113 0.50287837]
```
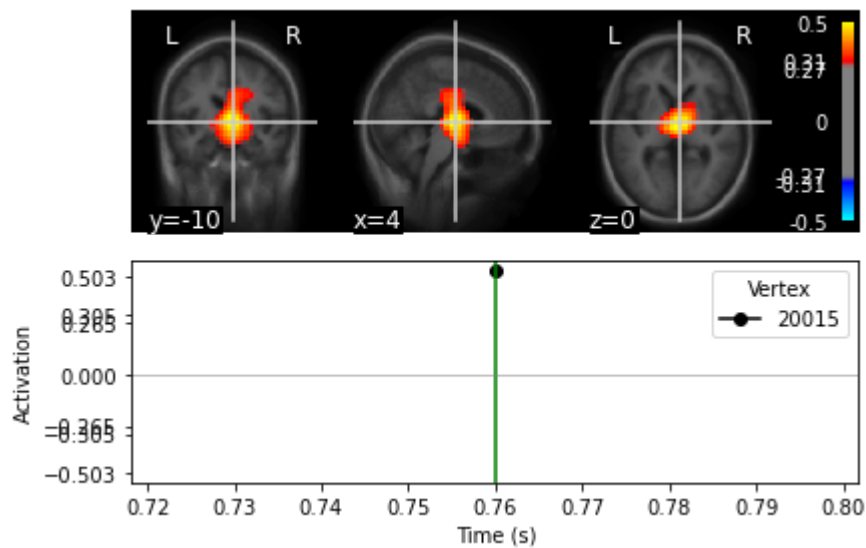
```
main_delay (1.0 1.5):
Showing: t = 1.260 s, (5.0, -10.0, 5.0) mm, [17, 21, 16] vox, 21302 v
ertex
Using control points [0.20638392 0.23327097 0.38858631]
```
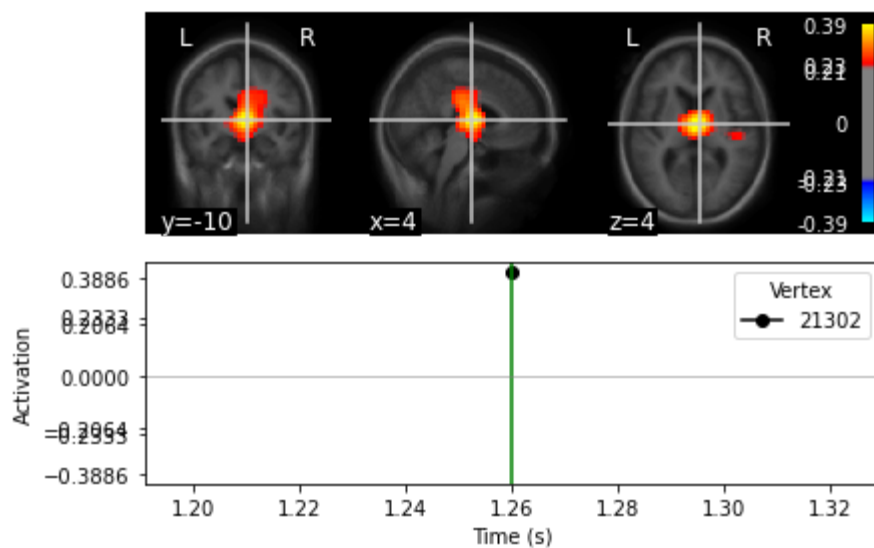


```
main_delay (1.5 2.0):
Showing: t = 1.760 s, (10.0, -20.0, 35.0) mm, [18, 19, 22] vox, 28959
vertex
Using control points [0.17464414 0.20877201 0.33794604]
```
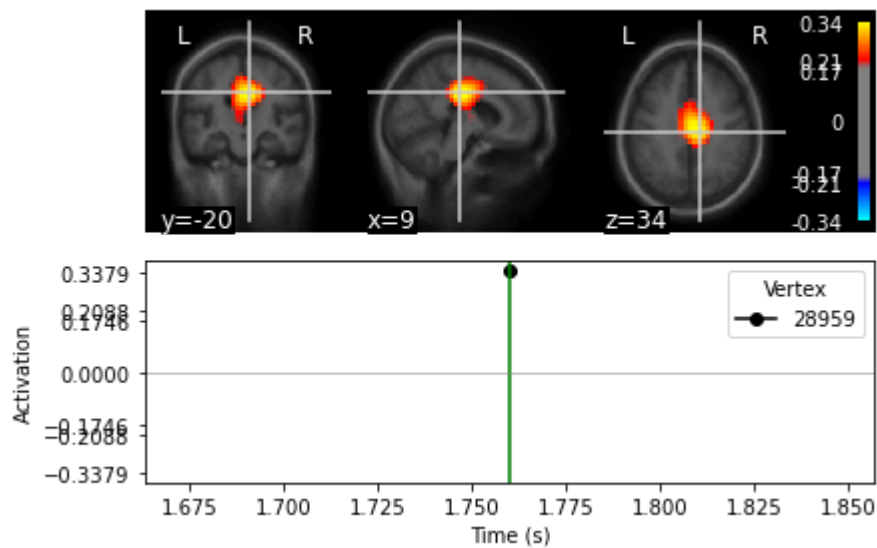
```
-0.5
inv_delay (-0.5 0.0):
Showing: t = -0.240 s, (40.0, -30.0, 10.0) mm, [24, 17, 17] vox, 2246
4 vertex
Using control points [0.16789841 0.19035399 0.3021752 ]
```
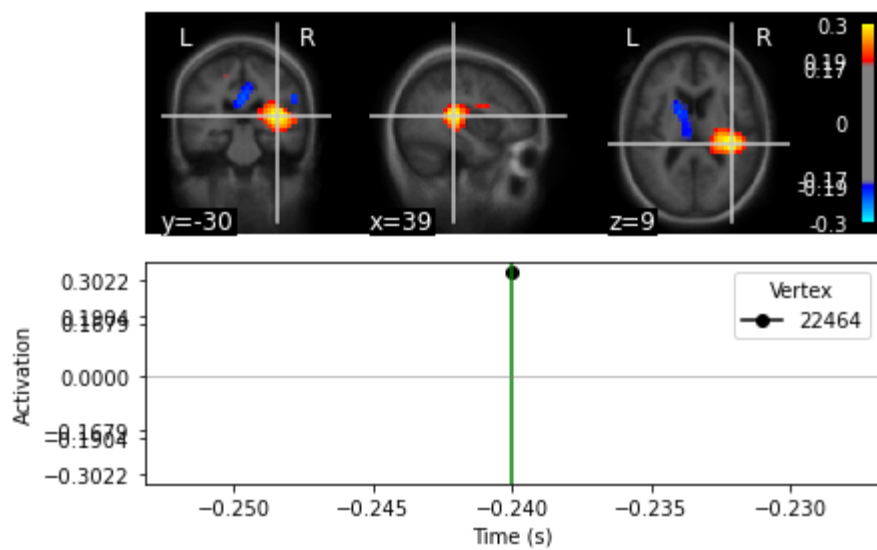


```
inv_delay (0.0 0.5):
Showing: t = 0.260 s, (15.0, -5.0, 5.0) mm, [19, 22, 16] vox, 21337 v
ertex
Using control points [0.20108357 0.22712035 0.33624338]
```
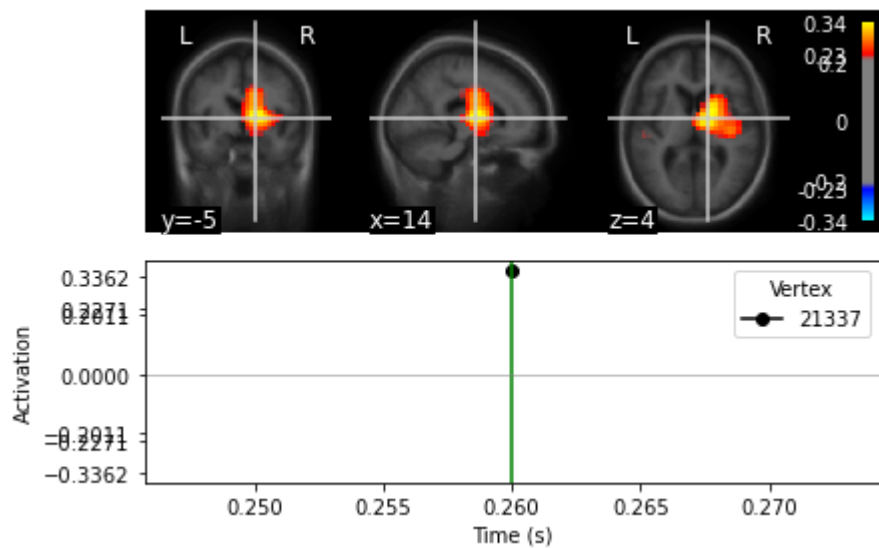
```
inv_delay (0.5 1.0):
Showing: t = 0.760 s, (10.0, -5.0, -0.0) mm, [18, 22, 15] vox, 20049
vertex
Using control points [0.27294828 0.31063749 0.47614453]
```
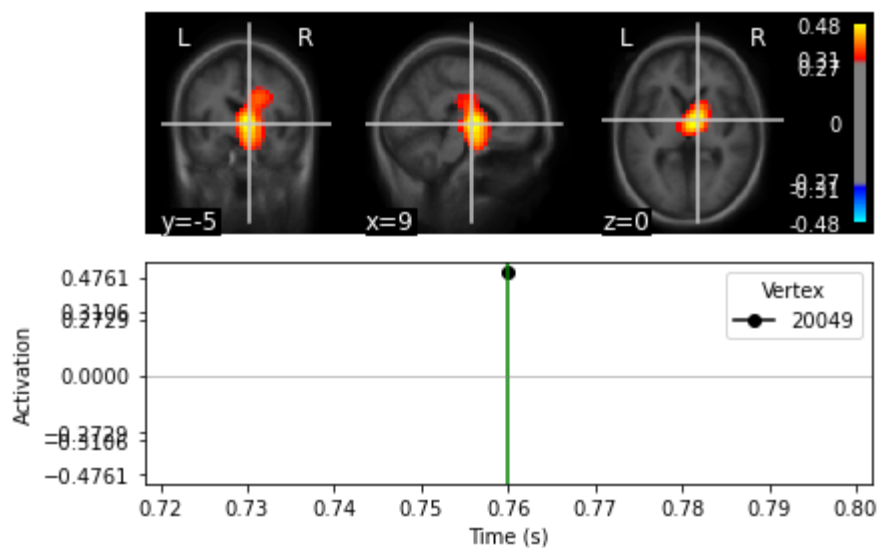


```
inv_delay (1.0 1.5):
Showing: t = 1.260 s, (5.0, -10.0, -0.0) mm, [17, 21, 15] vox, 20015
vertex
Using control points [0.22868501 0.26078498 0.38021427]
```
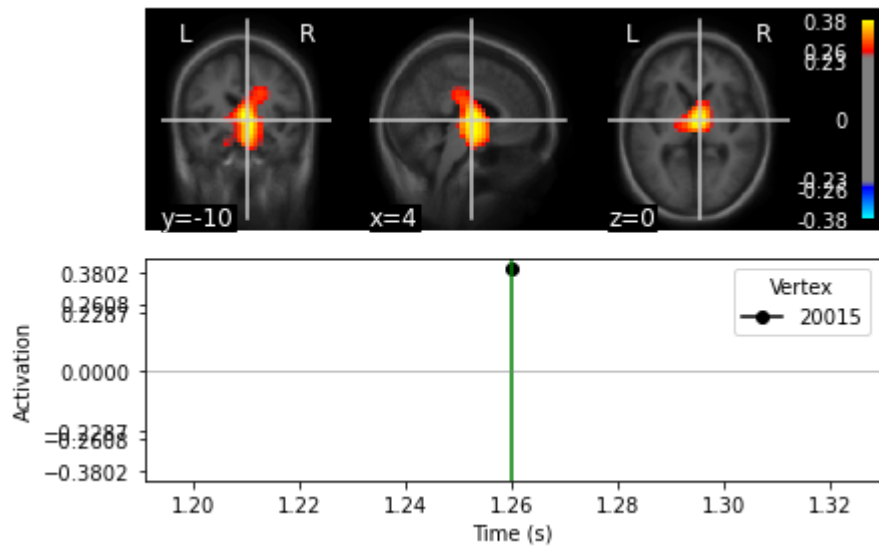
inv_delay (1.5 2.0):
Showing: t = 1.760 s, (10.0, -20.0, 25.0) mm, [18, 19, 20] vox, 26385
vertex
Using control points [0.15880787 0.18196126 0.24394497]
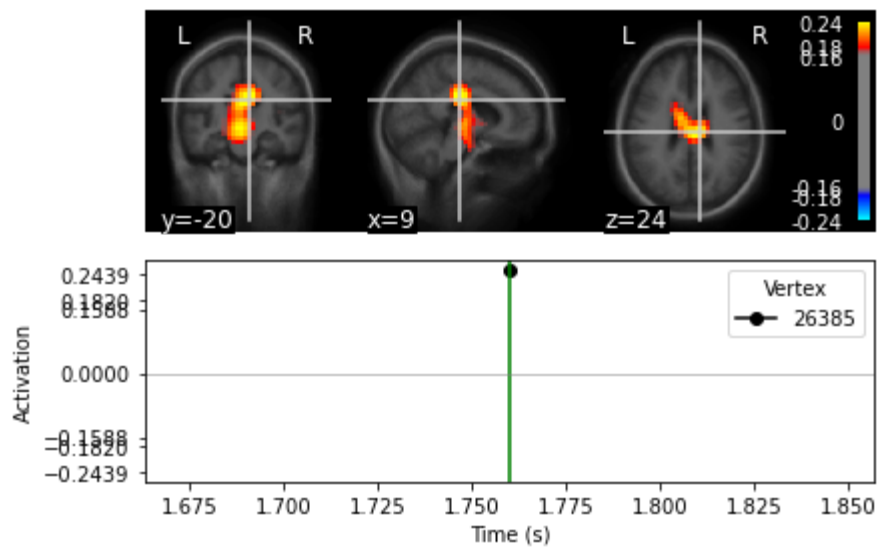
-0.5
main_fmel (-0.5 0.0):
Showing: t = -0.240 s, (0.0, -15.0, 35.0) mm, [16, 20, 22] vox, 28990
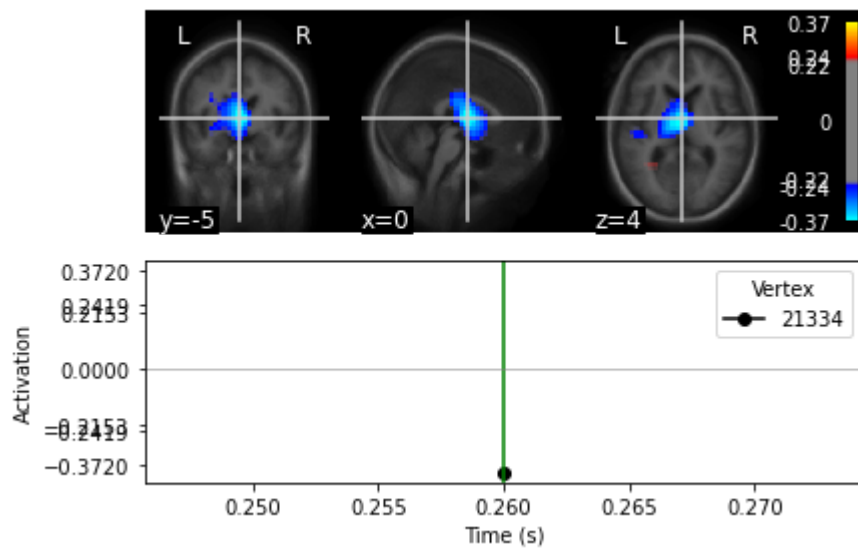vertex
Using control points [0.17071334 0.19303749 0.27369601]
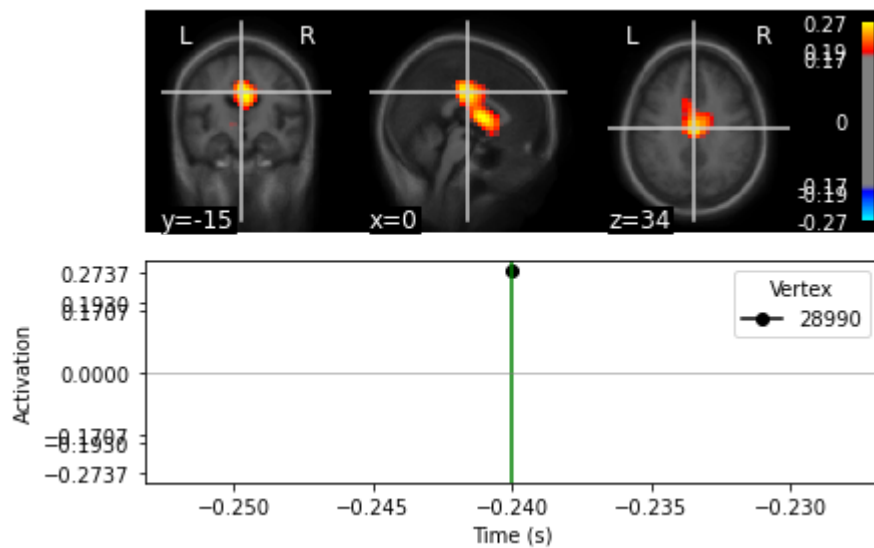
```
main_fmel (0.0 0.5):
Showing: t = 0.260 s, (0.0, -5.0, 5.0) mm, [16, 22, 16] vox, 21334 ve
rtex
Using control points [0.23028081 0.25329265 0.36245082]
```
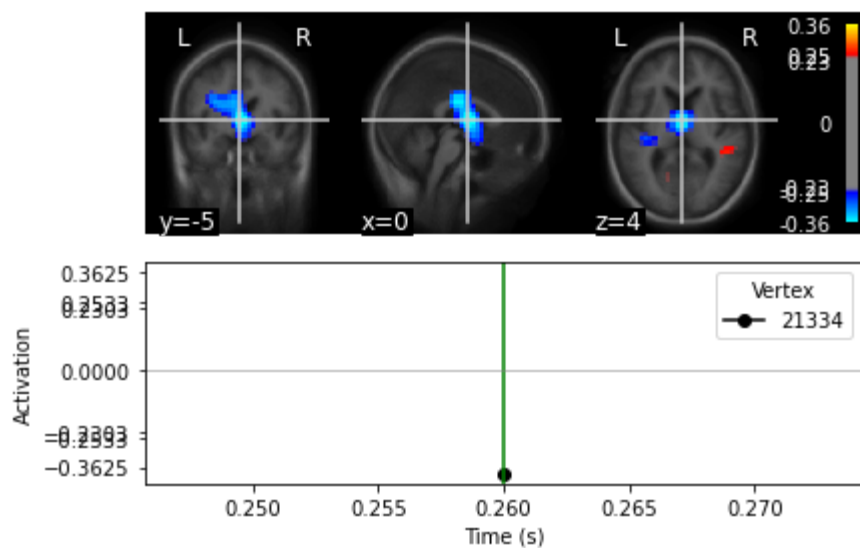


```
main_fmel (0.5 1.0):
Showing: t = 0.760 s, (0.0, -15.0, 30.0) mm, [16, 20, 21] vox, 27703
vertex
Using control points [0.48797244 0.59358726 1.00703291]
```
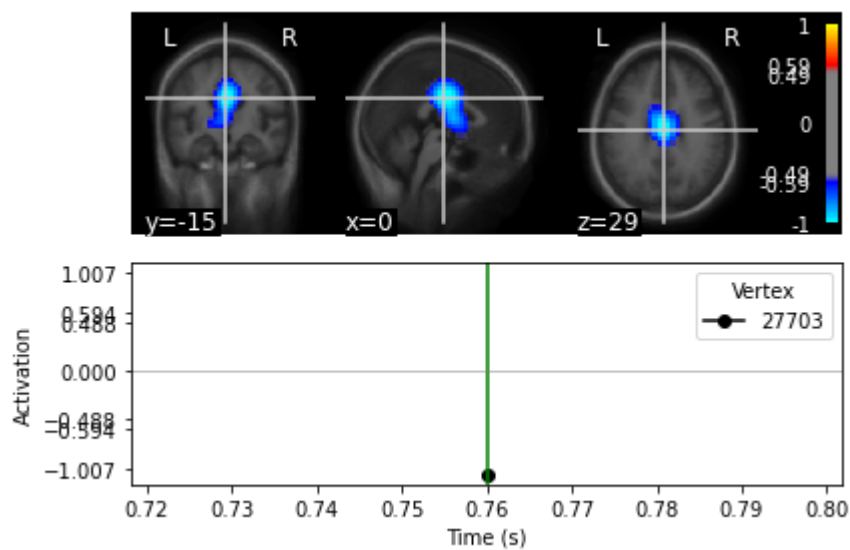
main_fmel (1.0 1.5):
Showing: t = 1.260 s, (0.0, -15.0, 30.0) mm, [16, 20, 21] vox, 27703
vertex
Using control points [0.40141342 0.46108718 0.73083753]
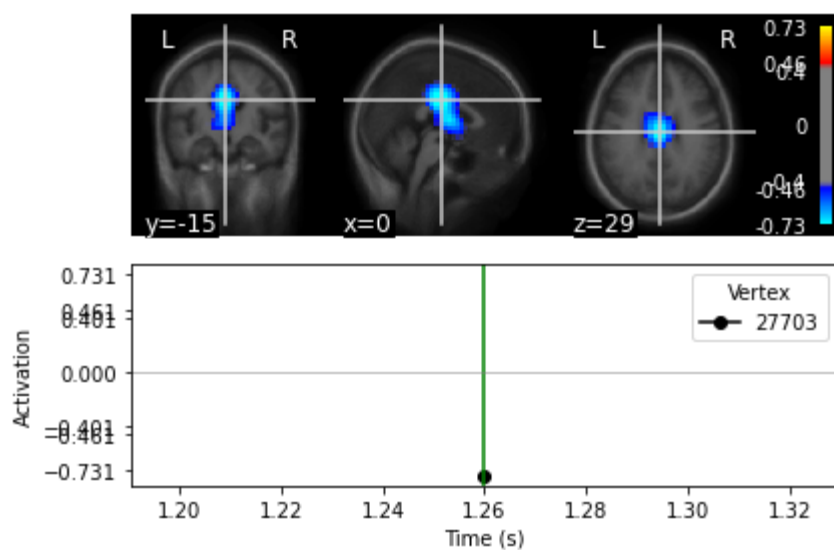
main_fmel (1.5 2.0):
Showing: t = 1.760 s, (30.0, -20.0, 25.0) mm, [22, 19, 20] vox, 26389
vertex
Using control points [0.10928788 0.11891835 0.163832]
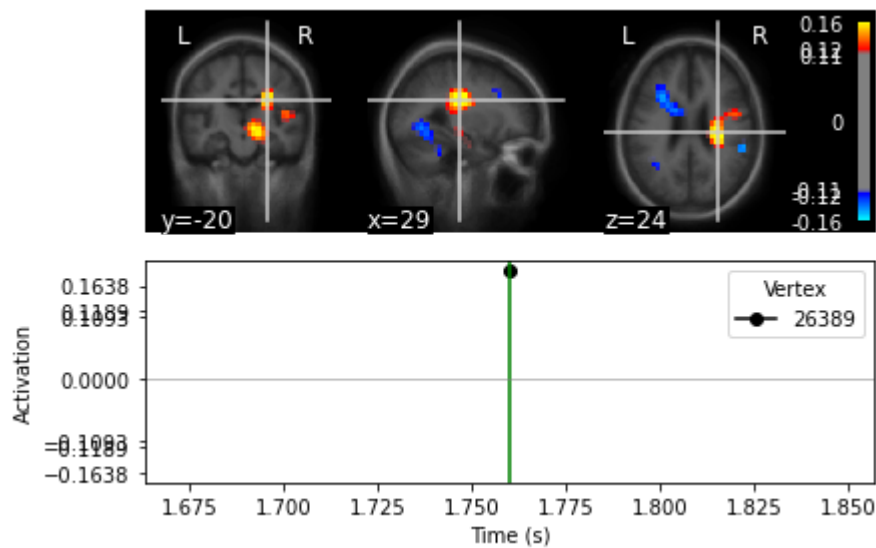
```
-0.5
inv_fmel (-0.5 0.0):
Showing: t = -0.240 s, (0.0, -15.0, 30.0) mm, [16, 20, 21] vox, 27703
vertex
Using control points [0.20736466 0.22924204 0.36444839]
```
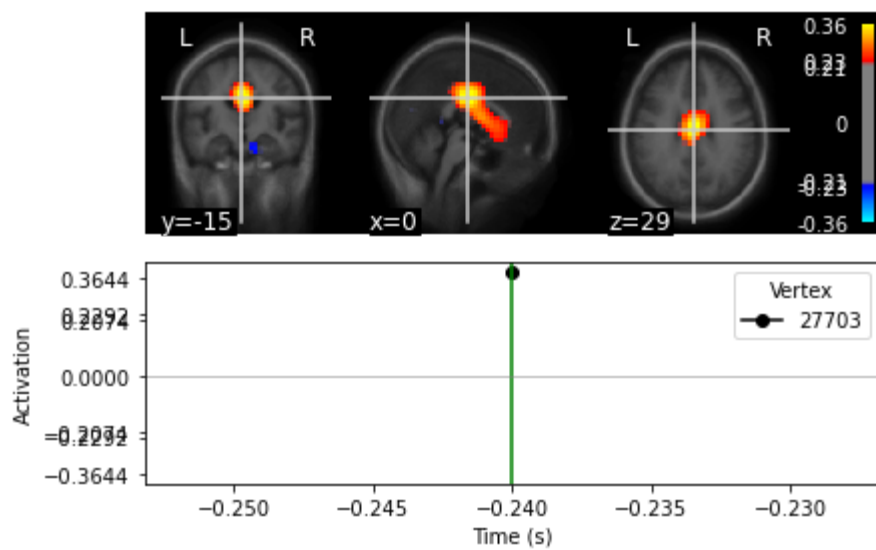


```
inv_fmel (0.0 0.5):
Showing: t = 0.260 s, (0.0, -5.0, 5.0) mm, [16, 22, 16] vox, 21334 ve
rtex
Using control points [0.21534114 0.24188997 0.3720353 ]
```

```
inv_fmel (0.5 1.0):
Showing: t = 0.760 s, (0.0, -15.0, 30.0) mm, [16, 20, 21] vox, 27703
vertex
Using control points [0.41187656 0.49166643 0.79471969]
```
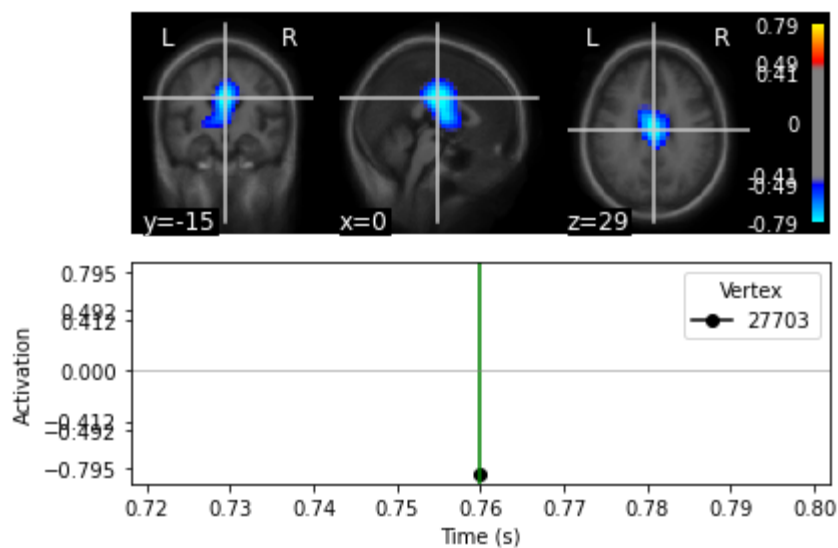


```
inv_fmel (1.0 1.5):
Showing: t = 1.260 s, (0.0, -20.0, 30.0) mm, [16, 19, 21] vox, 27670
vertex
Using control points [0.34297142 0.39350433 0.67014243]
```
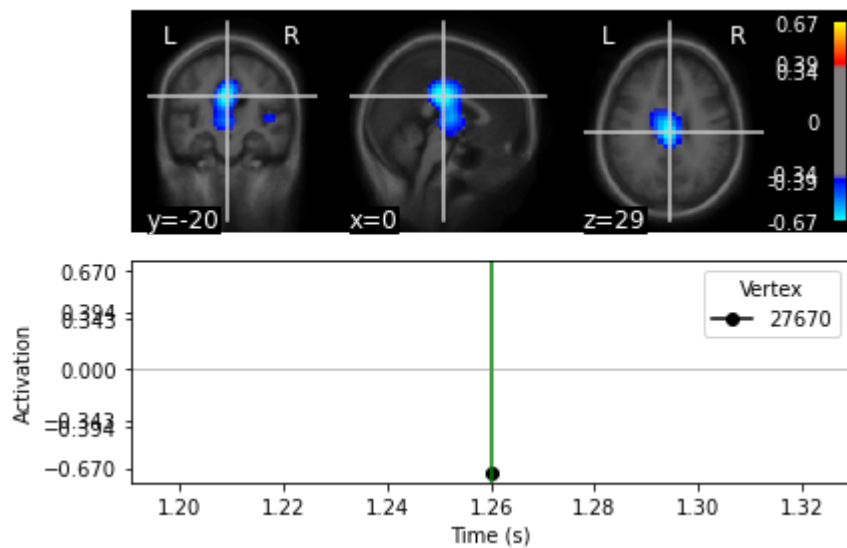
inv_fmel (1.5 2.0):
Showing: t = 1.760 s, (40.0, -30.0, 10.0) mm, [24, 17, 17] vox, 22464
vertex
Using control points [0.1678983 0.19035399 0.3021752]
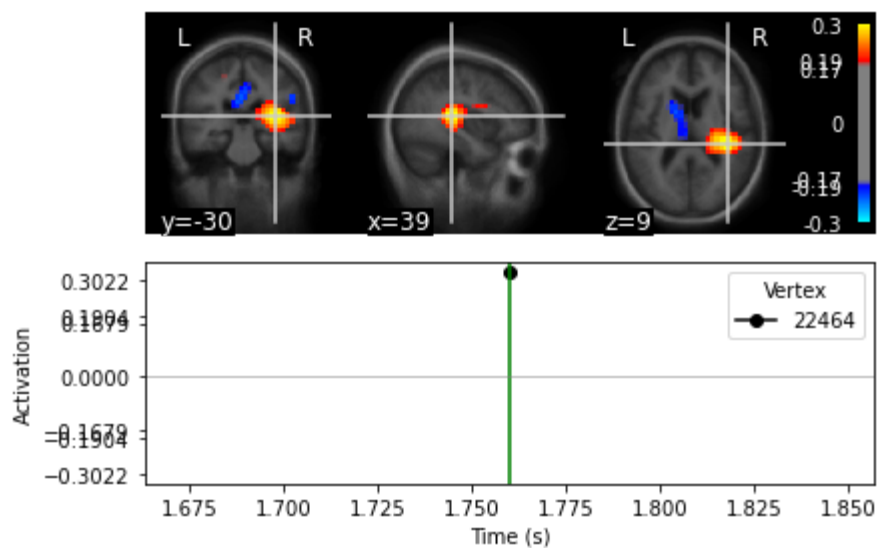
```
In [10]: for p in grand_avg:
             print(p)
             grand_avg[p].mean().plot(src = src_sample, subjects_dir = subs_dir,
         mode = 'glass_brain')#'glass_brain')#[.007,.05,.023])
```

```
main_delay
Showing: t = 0.760 s, (5.0, -10.0, -0.0) mm, [17, 21, 15] vox, 20015
vertex
Using control points [0.16677806 0.19453716 0.30652781]
```
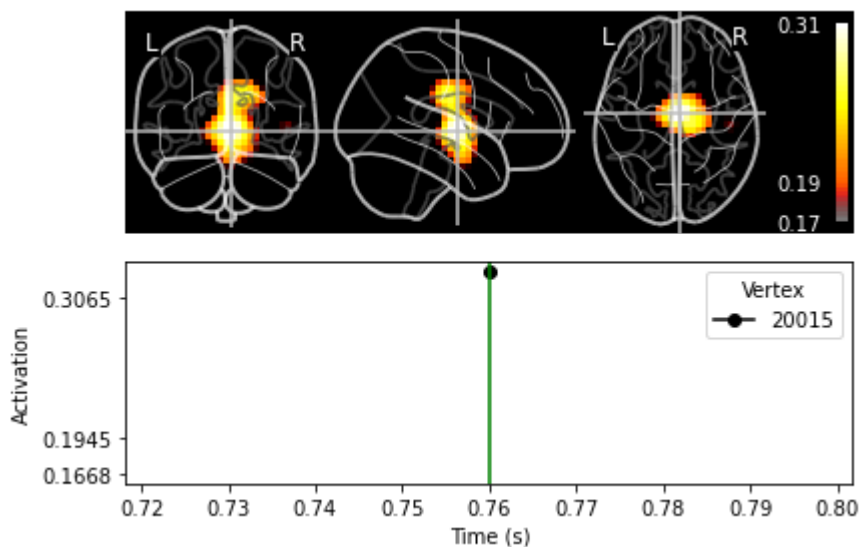


```
inv_delay
Showing: t = 0.760 s, (10.0, -5.0, 5.0) mm, [18, 22, 16] vox, 21336 v
ertex
Using control points [0.16063736 0.17997267 0.2603455 ]
```
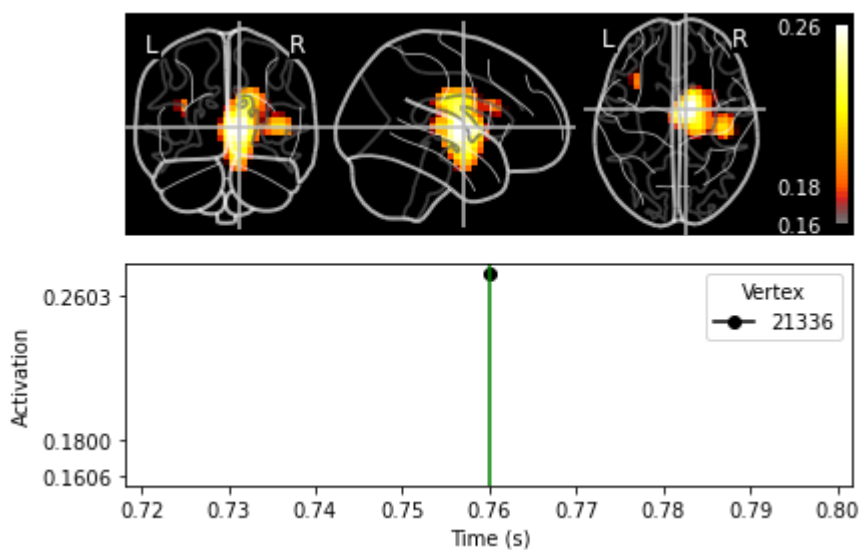


```
main_fmel
Showing: t = 0.760 s, (0.0, -15.0, 30.0) mm, [16, 20, 21] vox, 27703
vertex
Using control points [0.08348548 0.09752173 0.14142464]
```
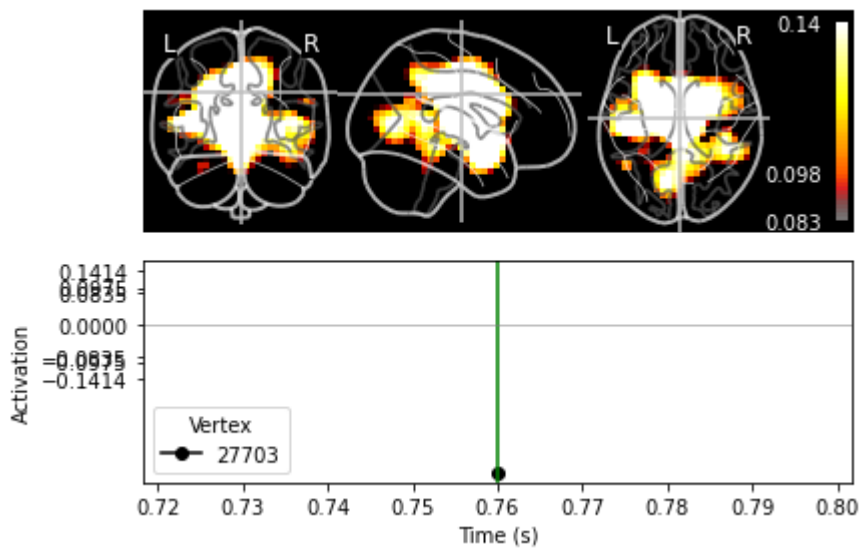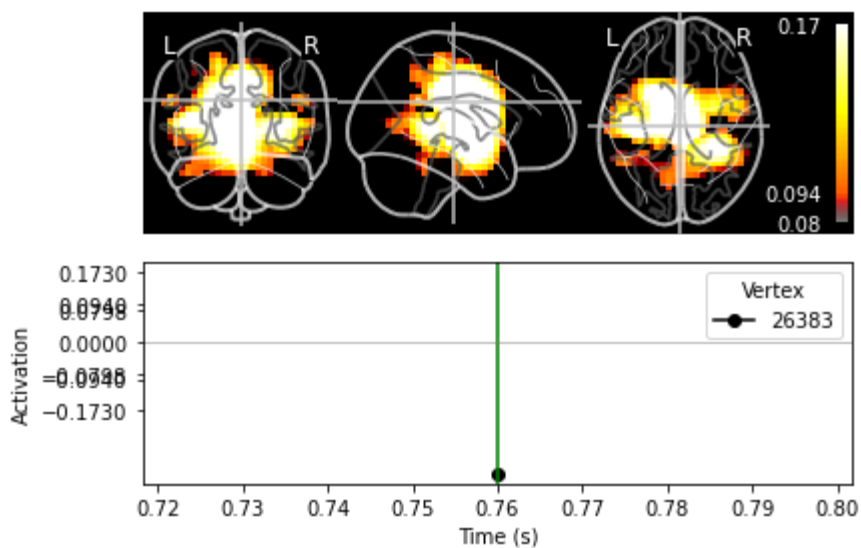
inv_fmel
Showing: t = 0.760 s, (0.0, -20.0, 25.0) mm, [16, 19, 20] vox, 26383
vertex
Using control points [0.07976457 0.09397606 0.17297018]

```python
In [11]: ts = [0.12]
         for p in grand_avg:
             for t in ts:
                 print(grand_avg[p].tmin)
                 print('{} ({}):'.format(p, t) )
                 grand_avg[p].mean().plot(src = src_sample, subjects_dir = subs_
         dir, mode = 'stat_map',#'glass_brain',#'glass_brain',#initial_time = 1.
         75,
                                                 initial_time = t)#[.007,.05,.023])
```
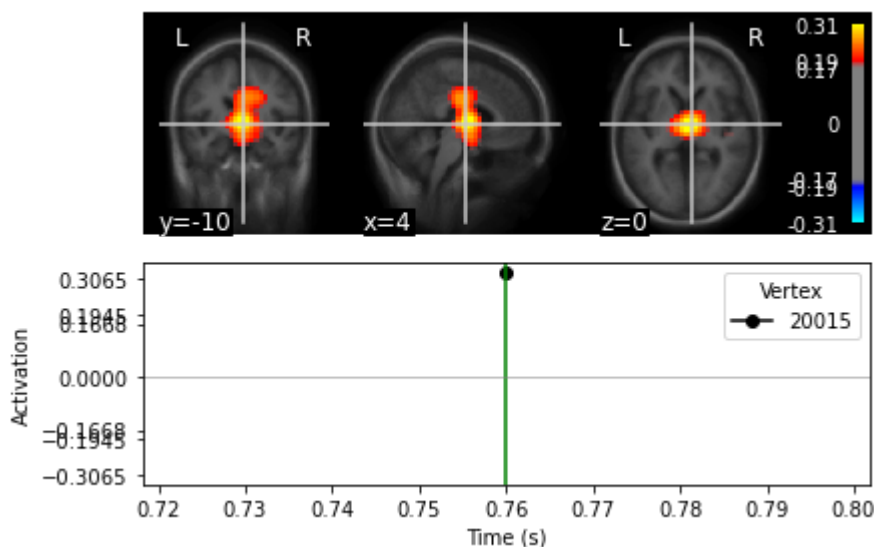
```
-0.5
main_delay (0.12):
Fixing initial time: 0.12 sec
Showing: t = 0.760 s, (5.0, -10.0, -0.0) mm, [17, 21, 15] vox, 20015
vertex
Using control points [0.16677806 0.19453716 0.30652781]
```
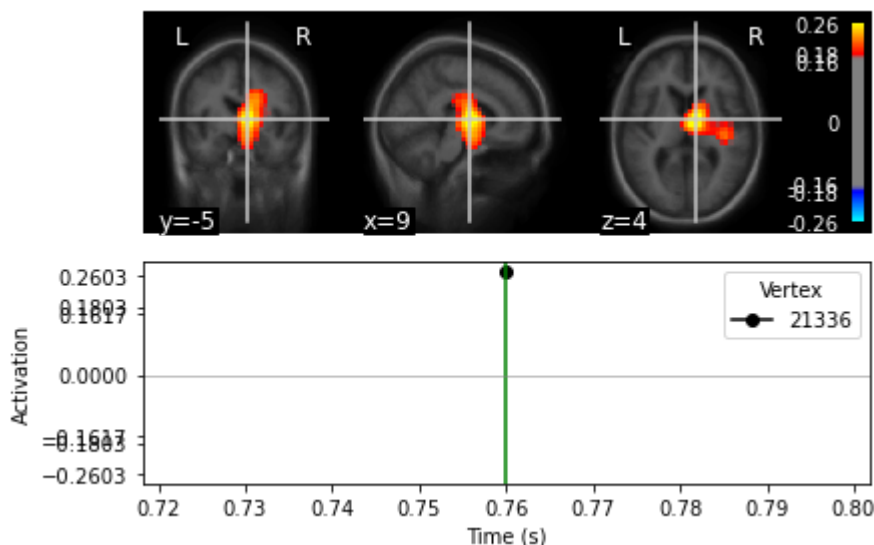


```
-0.5
inv_delay (0.12):
Fixing initial time: 0.12 sec
Showing: t = 0.760 s, (10.0, -5.0, 5.0) mm, [18, 22, 16] vox, 21336 v
ertex
Using control points [0.16174667 0.1802646  0.2603455 ]
```
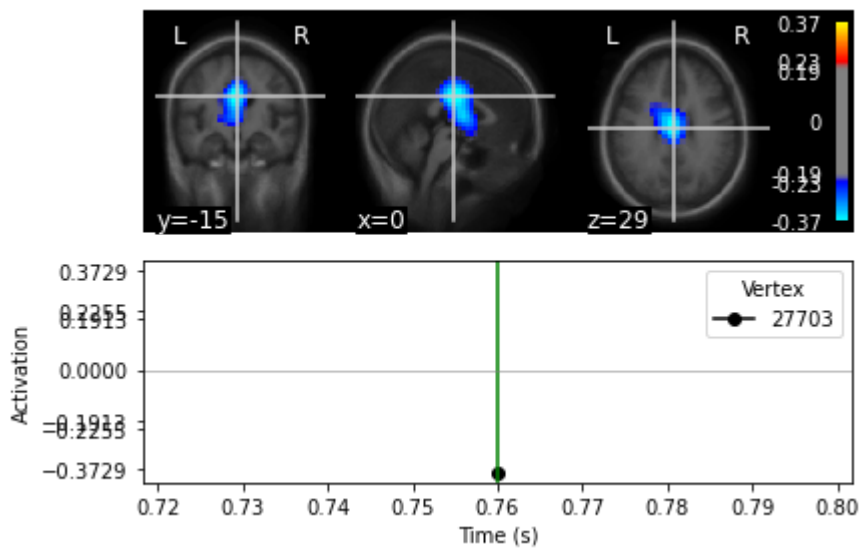


```
-0.5
main_fmel (0.12):
Fixing initial time: 0.12 sec
Showing: t = 0.760 s, (0.0, -15.0, 30.0) mm, [16, 20, 21] vox, 27703
vertex
Using control points [0.19130187 0.22549063 0.37292721]
```

```
-0.5
inv_fmel (0.12):
Fixing initial time: 0.12 sec
Showing: t = 0.760 s, (0.0, -20.0, 25.0) mm, [16, 19, 20] vox, 26383
vertex
Using control points [0.18019938 0.21145908 0.32143562]
```