fMRI解析の参考資料
(5) ROI解析前の準備

- WFU Pickatlasの準備
- Marsbarの準備

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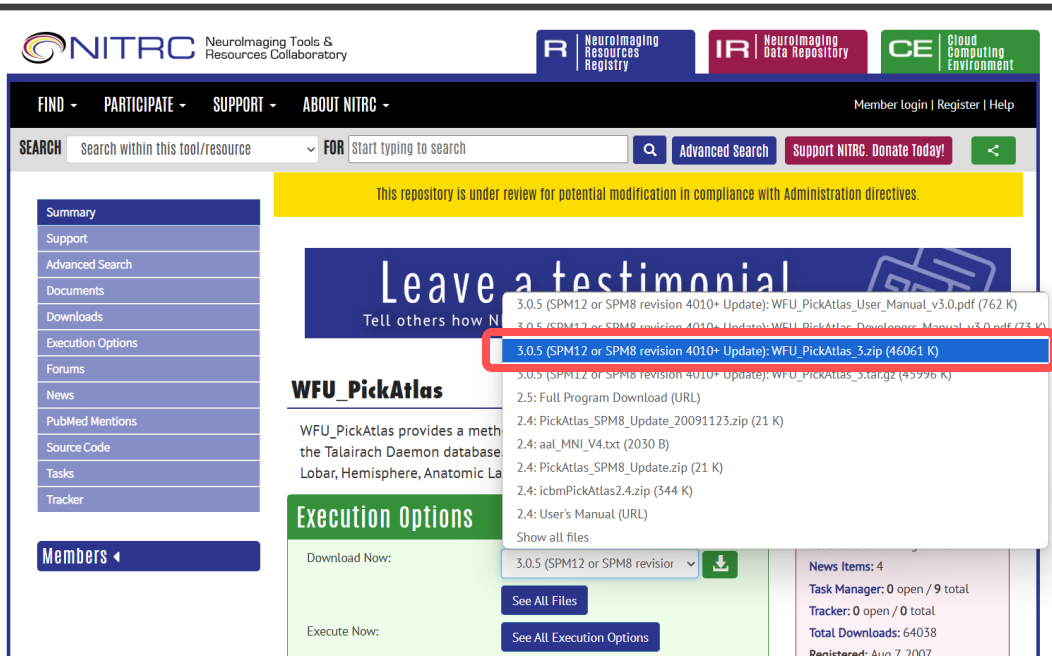
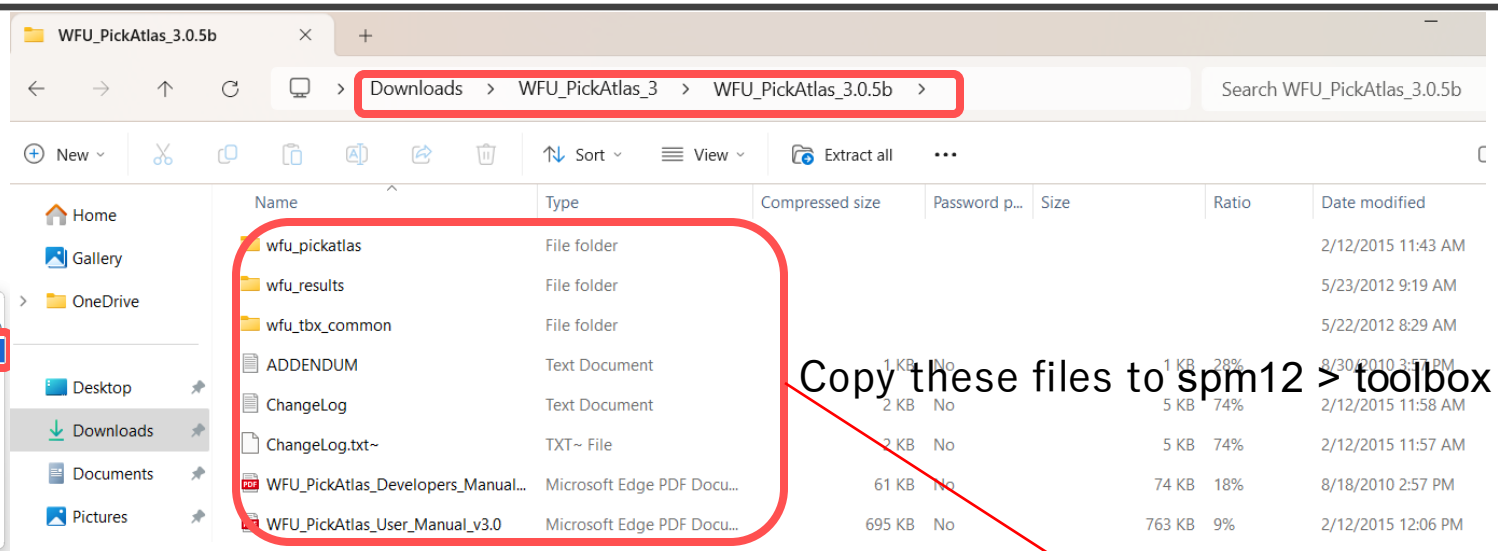
Download Link

- **WFU Pickatlas**
  - https://www.nitrc.org/projects/wfu_pickatlas/

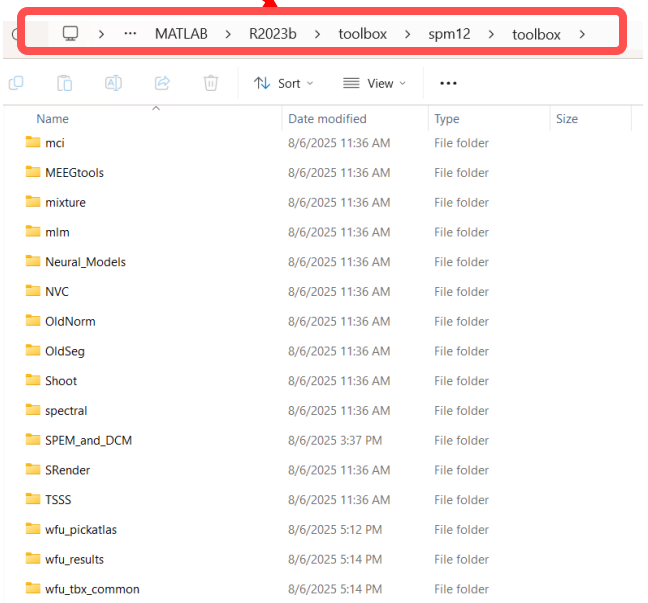
- **Marsbar**
  - https://sourceforge.net/projects/marsbar/files/

WFU Pickatlasの準備



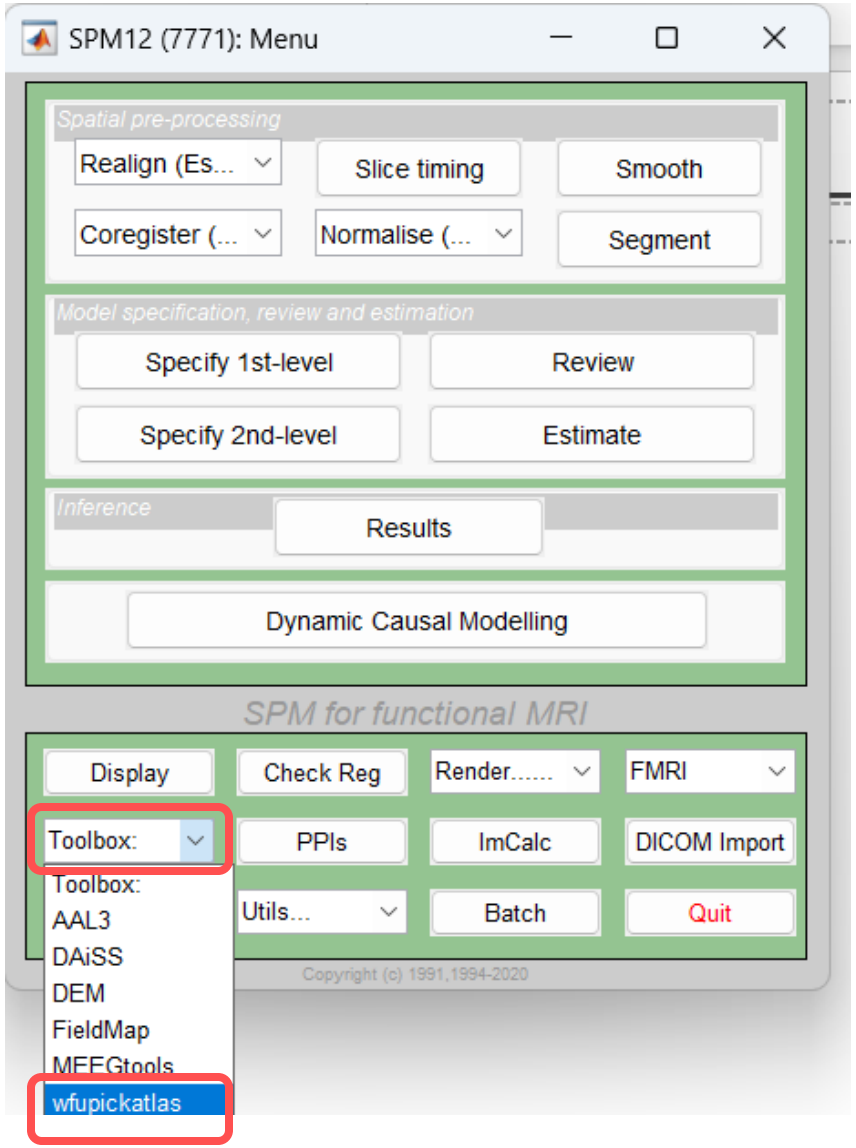


Copy these files to spm12 > toolbox

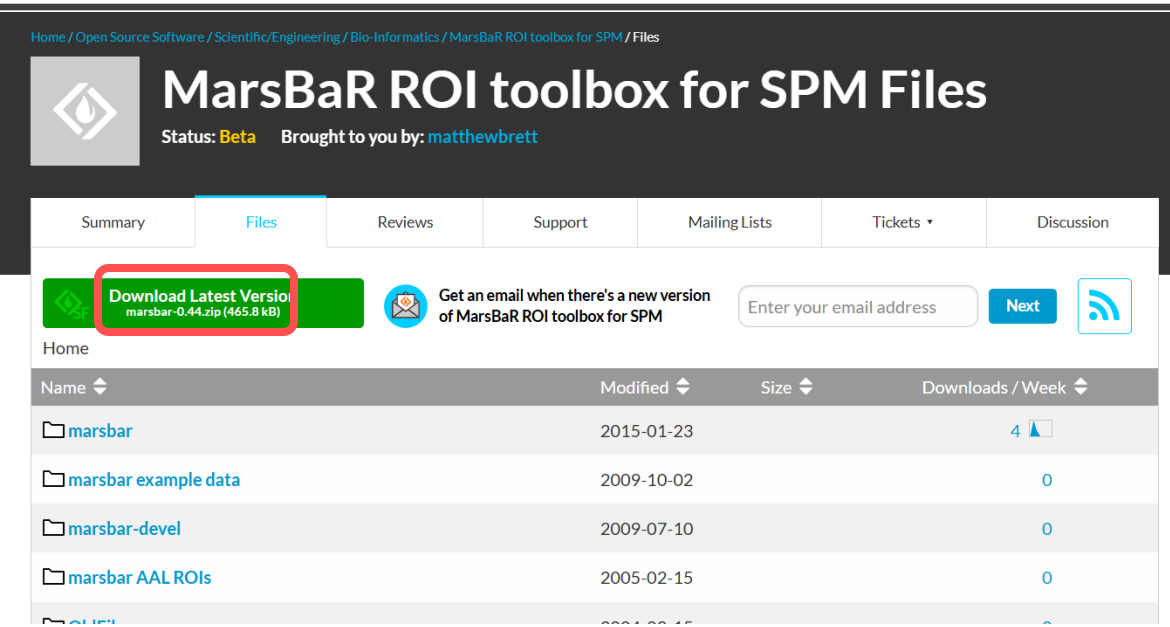


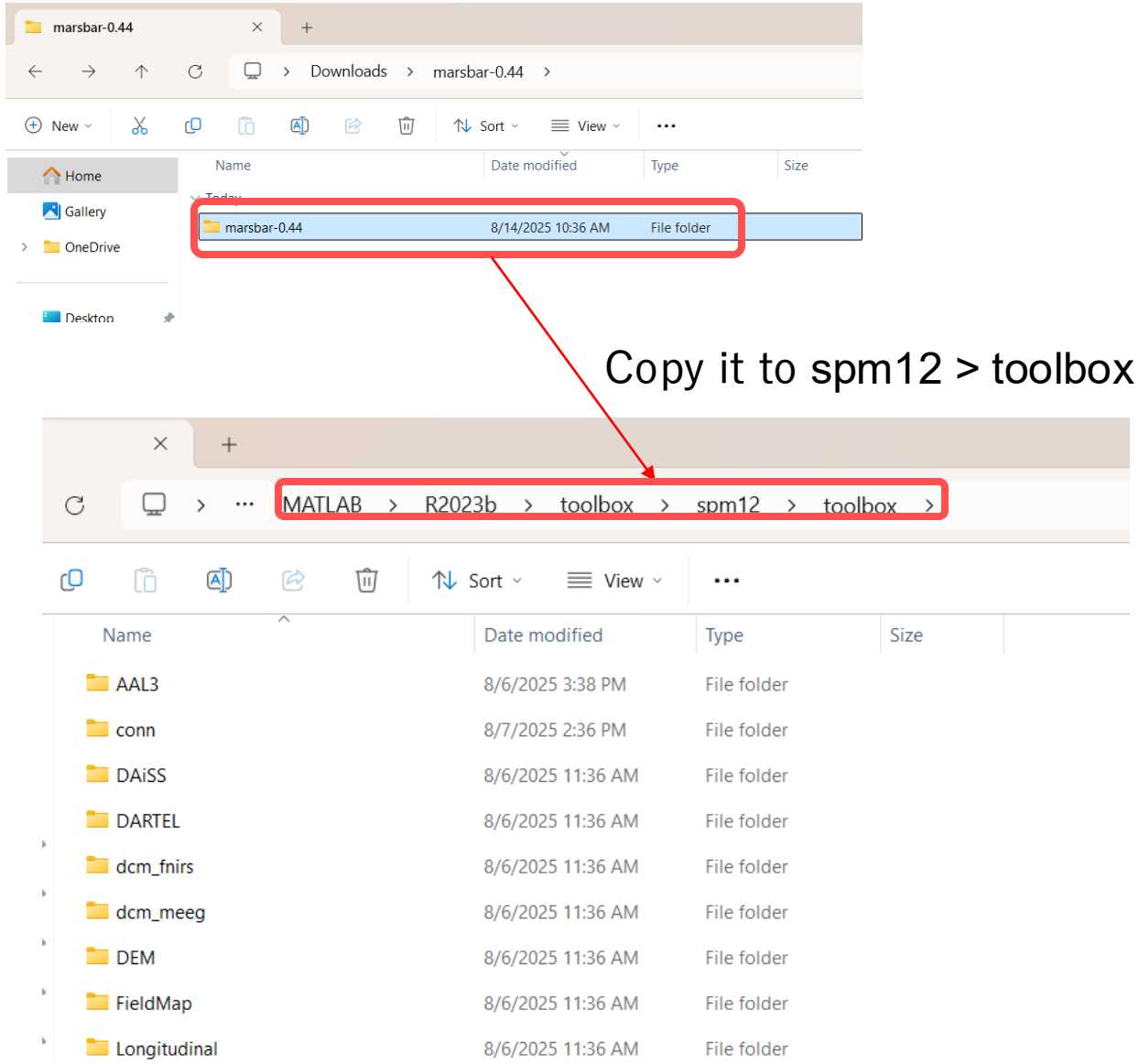
- Download the zip.file （Register and Log in if you don't have an account）
- Unzip 'WFU_PickAtlas_3' and you will get '**WFU_PickAtlas_3.0.5.b**'
- Copy all files in 'WFU_PickAtlas_3.0.5b' to '**spm12 > toolbox**'

- Then it can be accessed from SPM GUI ->Toolbox ->wfupickatlas



Marsbarの準備

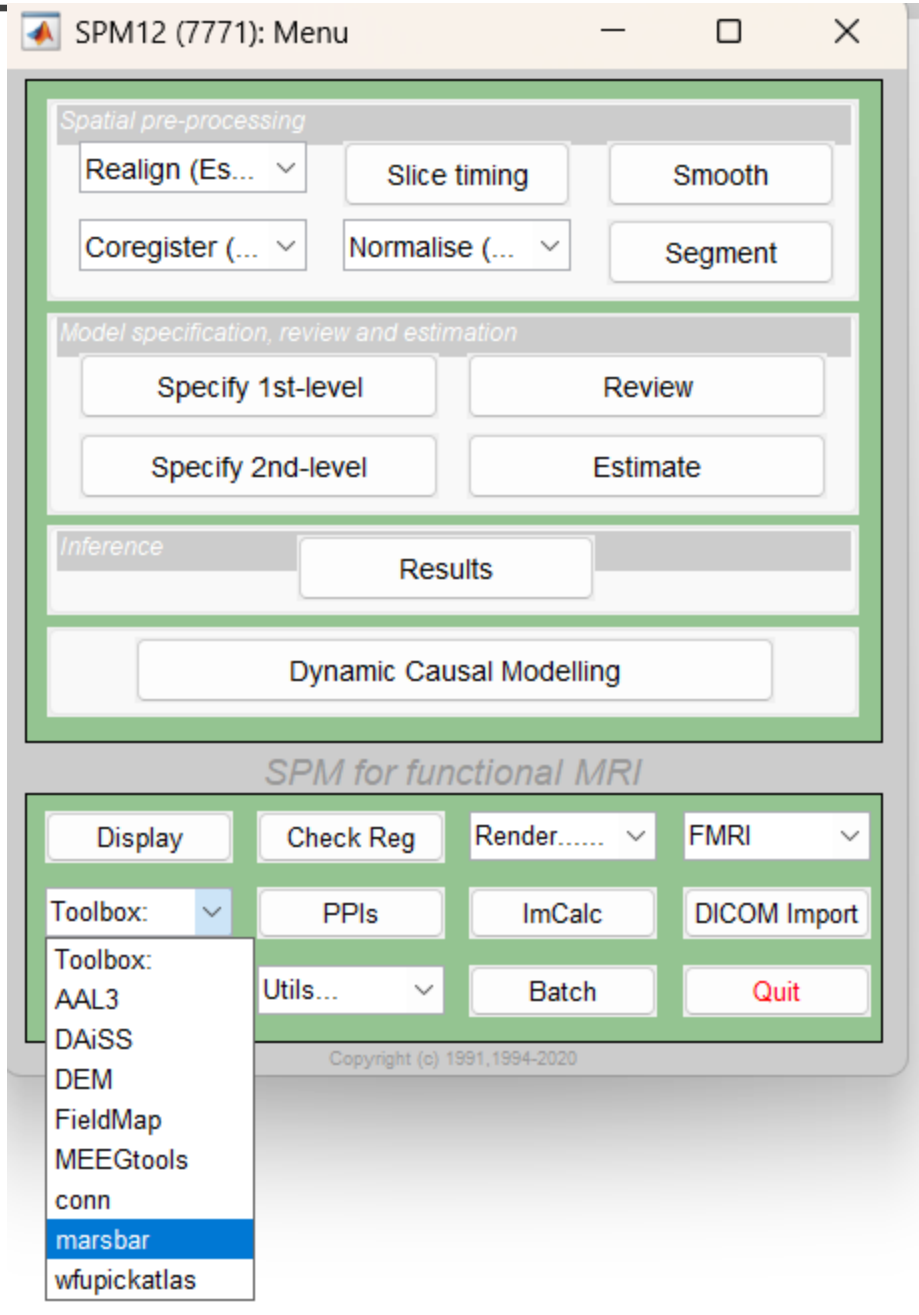




- Download the latest Version
- Unzip it and you will get '**marsbar-0.44**'
- Rename '**marsbar-0.44**' to '**marsbar**'
- Copy 'marsbar' to '**spm12 > toolbox**'

Marsbarの準備

- Then it can be accessed from SPM GUI ->Toolbox ->marsbar



fMRI解析の参考資料
(6) ROI (Region of Interest)解析

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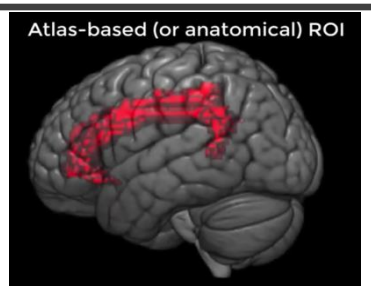
ROI とは

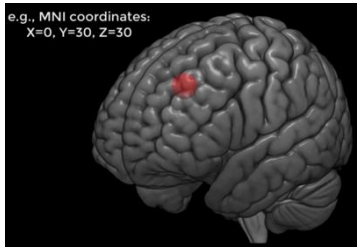
- ROI（Region of Interest）＝関心領域
- 解剖学的領域（Atlasに基づく）や機能的領域（先行研究/解析結果のクラスター）
- 目的：特定の領域に絞って統計的検出力を高める
- ROI解析とは、ROI mask ボクセルの一部（サブセット）からデータを抽出する手法です。
- **ROI解析の前提は、研究者がすでに明確な仮説を持っていることです。**

- ROI（Region of Interest）＝関心領域
- Can be anatomical (based on atlas) or functional (from literature coordinates/analysis clusters)
- Goal: Increase statistical power by focusing on specific regions
- ROI analysis is a method of extracting data from a ROI mask (subset of voxels).
- **The premise of ROI analysis is that the researcher already has a clear hypothesis.**

ROIの定義方法 / Sources of ROI

- **解剖学的ROI**
  - AAL3(automated anatomical labeling)
    - *wfu_pickatlas* に実装
    - *https://www.nitrc.org/projects/wfu_pickatlas/*
- **機能的ROI**
  - 文献に記載された座標から
    - *Marsbar*などのツールを通して
    - *https://sourceforge.net/projects/marsbar/files/*





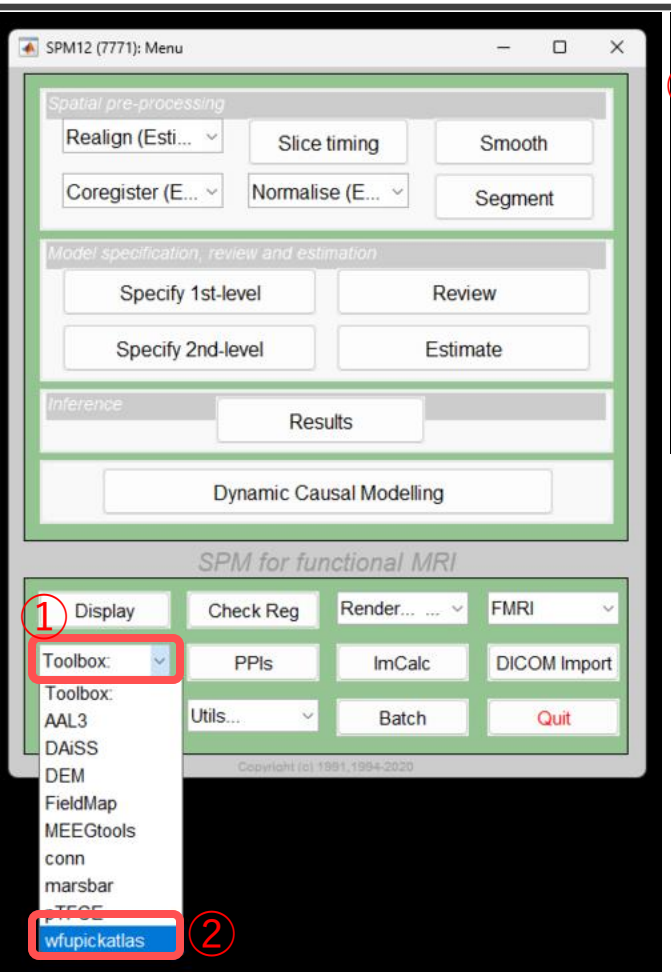
- **Anatomical ROI**
  - AAL3(automated anatomical labeling)
    - Implemented on *wfu_pickatlas (https://www.nitrc.org/projects/wfu_pickatlas/)*
- **Functional ROI**
  - from literature coordinates
    - Through toolboxes such as *Marsbar*
    - *https://sourceforge.net/projects/marsbar/files/*

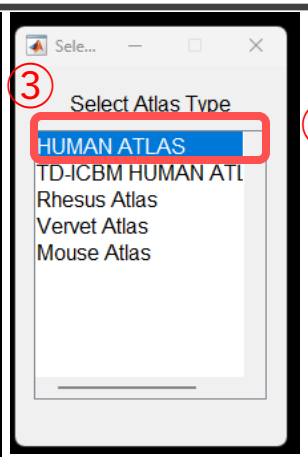
ROI分析の流れ / Workflow

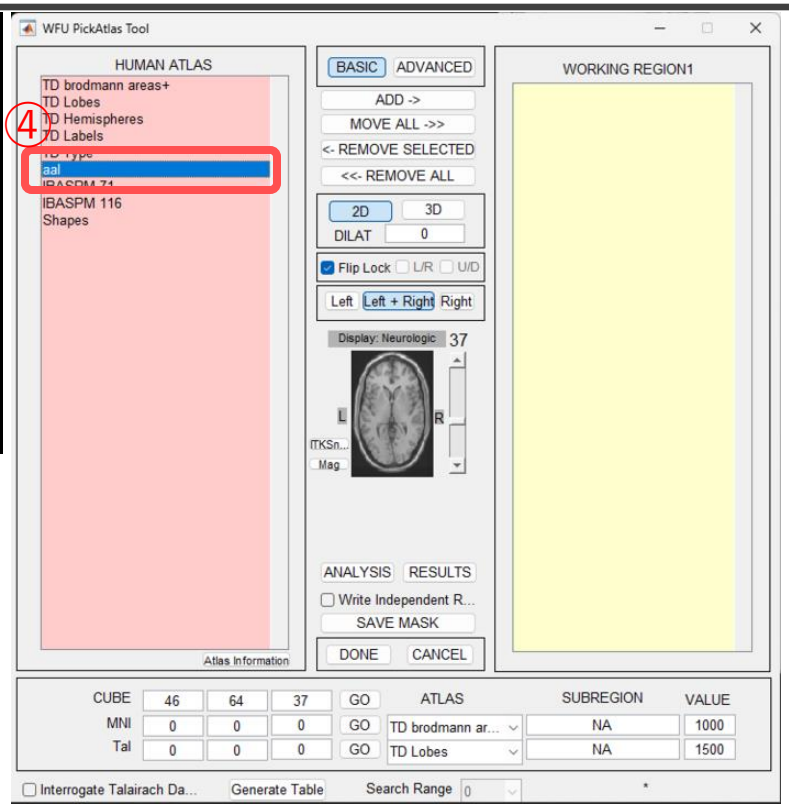
- ROIを定義 （ツールボックス（wfupickatlas や Marsbar など）を使用して）
- β画像やコントラスト画像から信号を抽出
- 統計検定（t検定、ANOVA、相関など）
- 可視化（棒グラフ、散布図など）

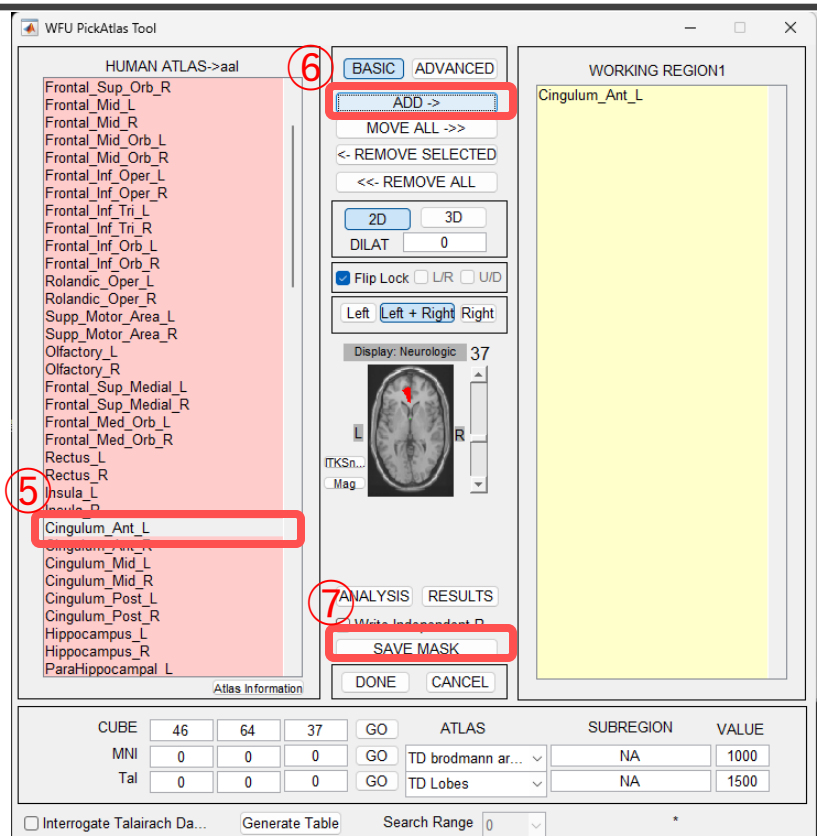
- **Define ROI** (using toolbox such as wfupickatlas or Marsbar)
- **Extract signal from beta or contrast images**
- **Perform statistical tests (t-test, ANOVA, correlation)**
- **Visualize (bar plots, scatter plots, etc.)**

AALを用いて解剖学的ROIマスクを作成する/Create anatomical ROI Mask using AAL



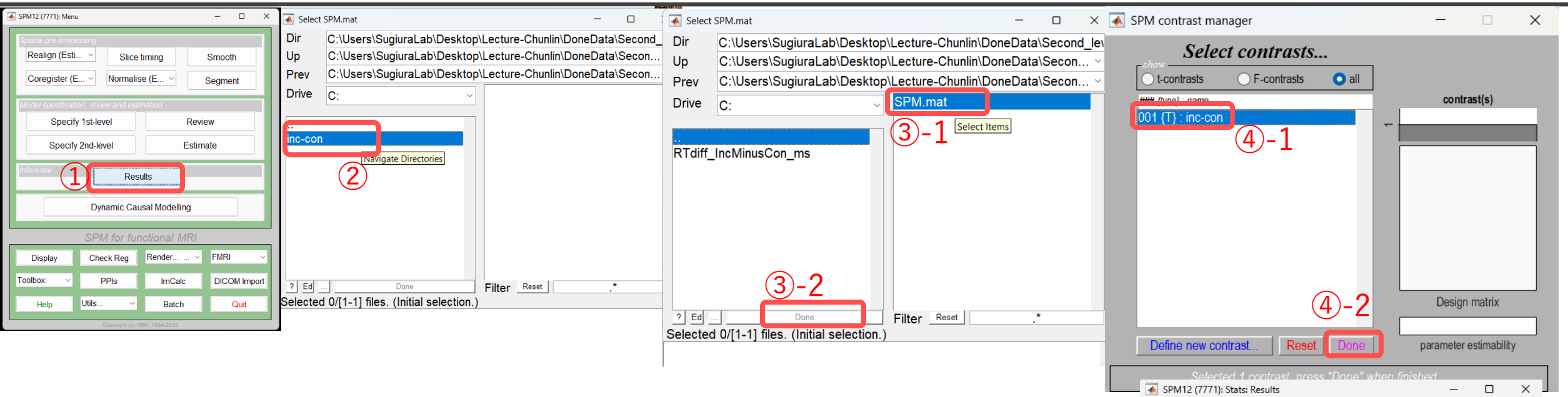






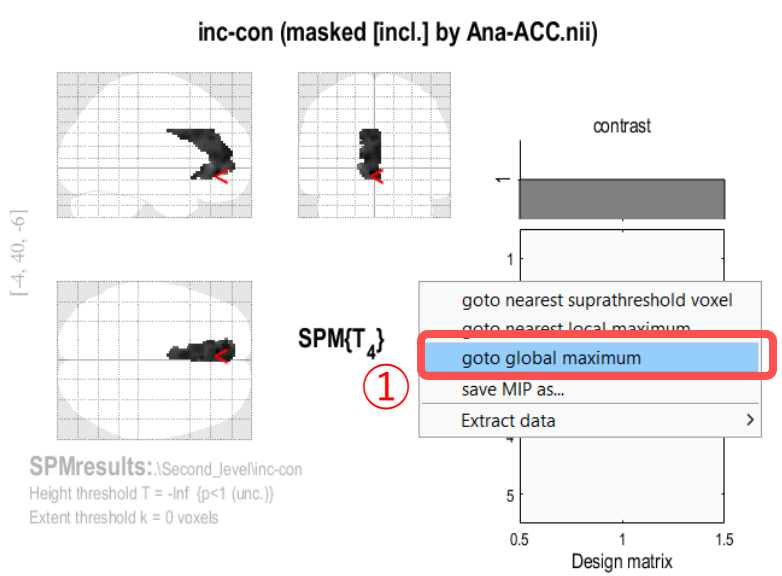
1. Click **Toolbox** in SPM.
2. Select the toolbox: **wfupickatlas.**
3. Choose **HUMAN ATLAS.**
4. Select **AAL.**
5. Select the desired **ROI.**
6. Click **ADD.**
7. Click **SAVE MASK.**

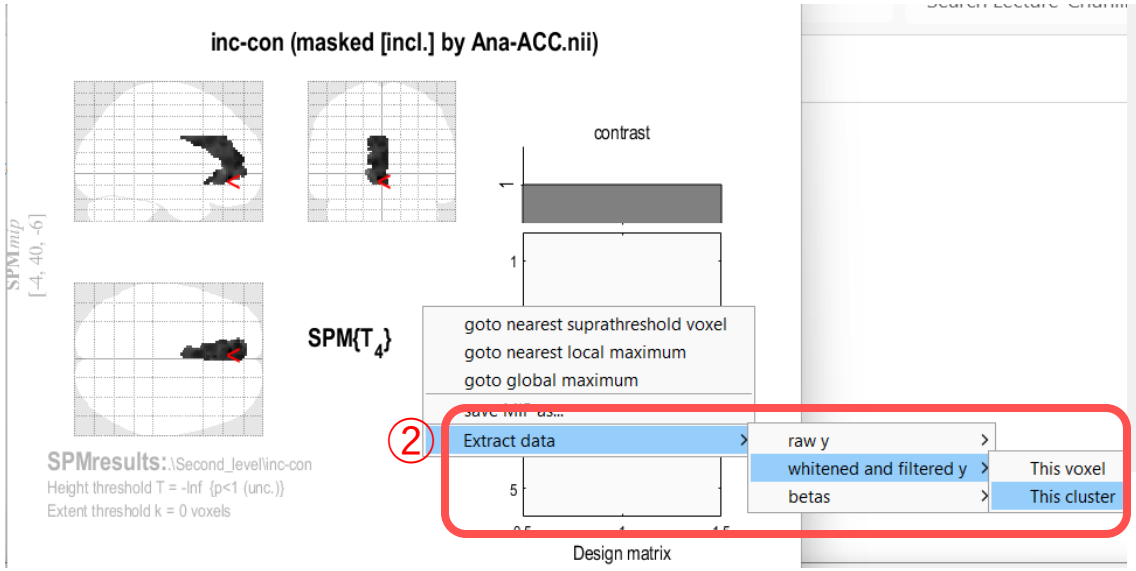
解剖学的マスクからデータを抽出する/Extracting Data from the Anatomical Mask

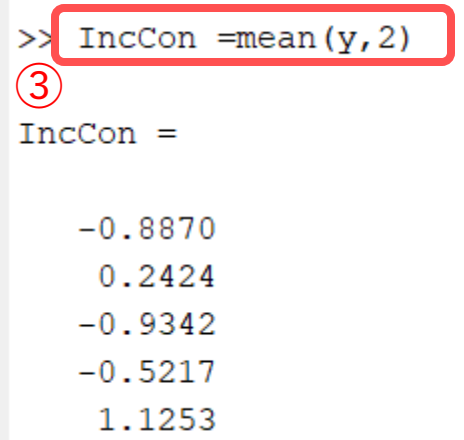


1. Click '**Results**' from the SPM GUI.
2. Click the folder **Second_level->inc-con.**
3. Click the **SPM.mat** file from. ->Done.
4. Click the '**inc-con**' contrast. -> Done
5. for '**apply masking**', select '**image**', then load the '**Ana-ACC.nii**' image you created using the WFU_PickAtlas toolbox
6. Choose '**inclusive**' for the nature of the mask
7. Select '**No**' for ROI Analysis
8. '**none**' for the p-value adjustment and type '**1**' for the threshold {T or p value]
9. '0' for & extent threshold {voxels} -> Enter

マスクからデータを抽出する/Extracting Data from Mask





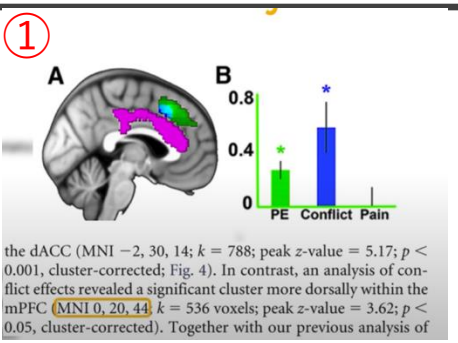


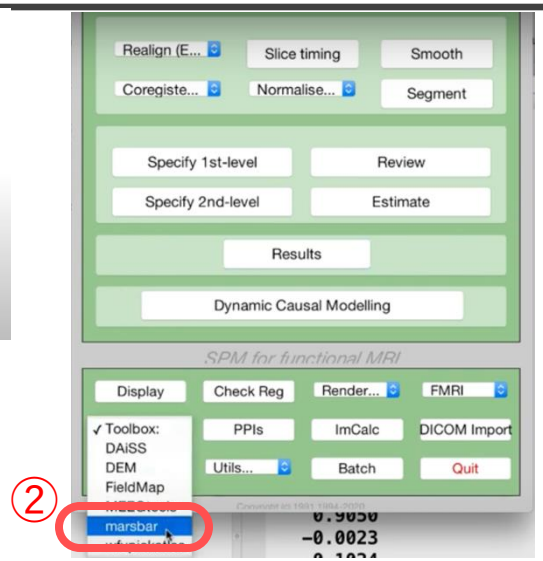
Statistics: *p-values adjusted for search volume*

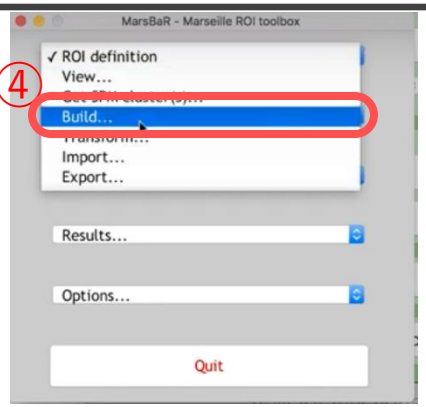
set-level		cluster-level				peak-level					mm	mm	mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	(Z_E)	p_{uncorr}			
0.264	2	0.632	1.000	1399	1.000	1.000	71.520	2.34	1.76	0.039	-4	40	-6
						1.000	68.249	1.41	1.23	0.109	-8	48	8
						1.000	55.007	1.15	1.05	0.146	0	52	12
		0.632	1.000	1	1.000	1.000	55.007	-0.81	-0.09	0.536	-14	52	-4

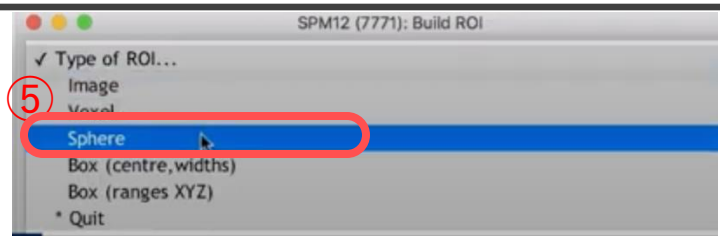
1. Right click in any of the glass brain panels and select '**goto global maximum**'.
2. Right-click again, and select '**Extract data**' -> '**whitened and filtered y**' -> '**This cluster**'.
3. type the *Inc-Con = mean (y,2)* on Matlab terminal -> Enter

Marsbarを用いて機能的ROIマスクを作成する/Create Functional ROI Mask using Marsbar



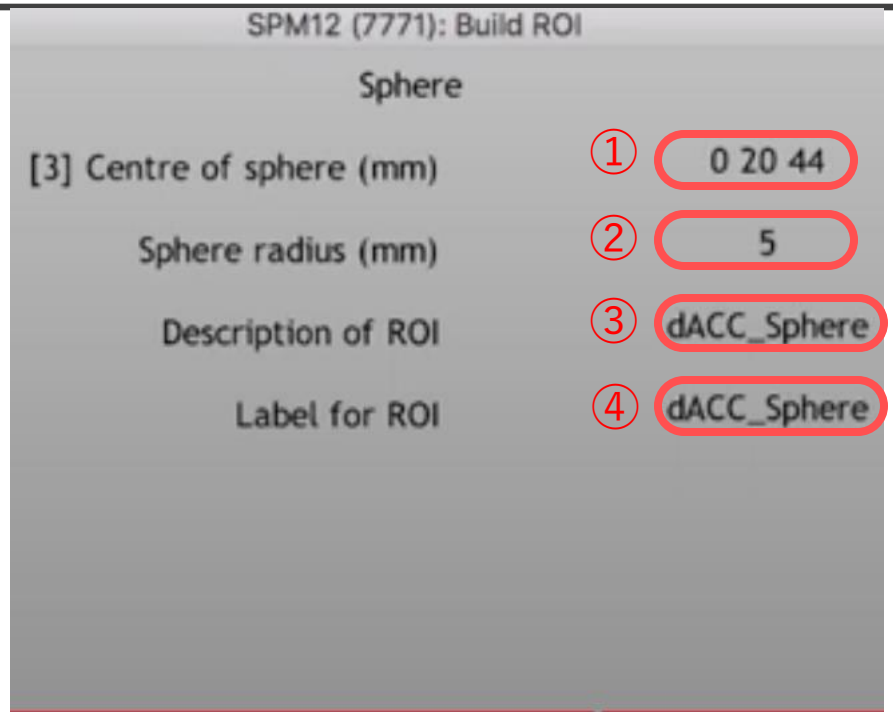


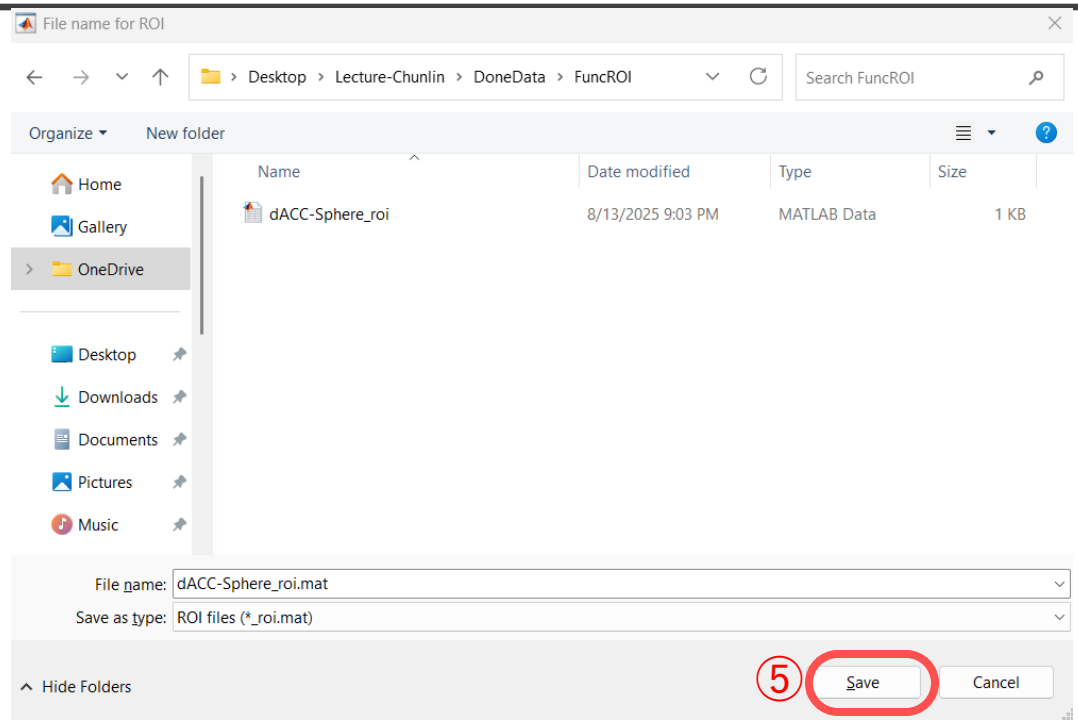




1. Select ROI coordinates from literature that used the same experimental design./同じ実験デザインを使用した文献からROI座標を選択する.
2. From the SPM GUI, click on Toolbox -> **marsbar**
3. Click on '**ROI definition**'
4. Click on '**Build**'
5. From the 'Type of ROI' dropdown menu, select **Sphere**

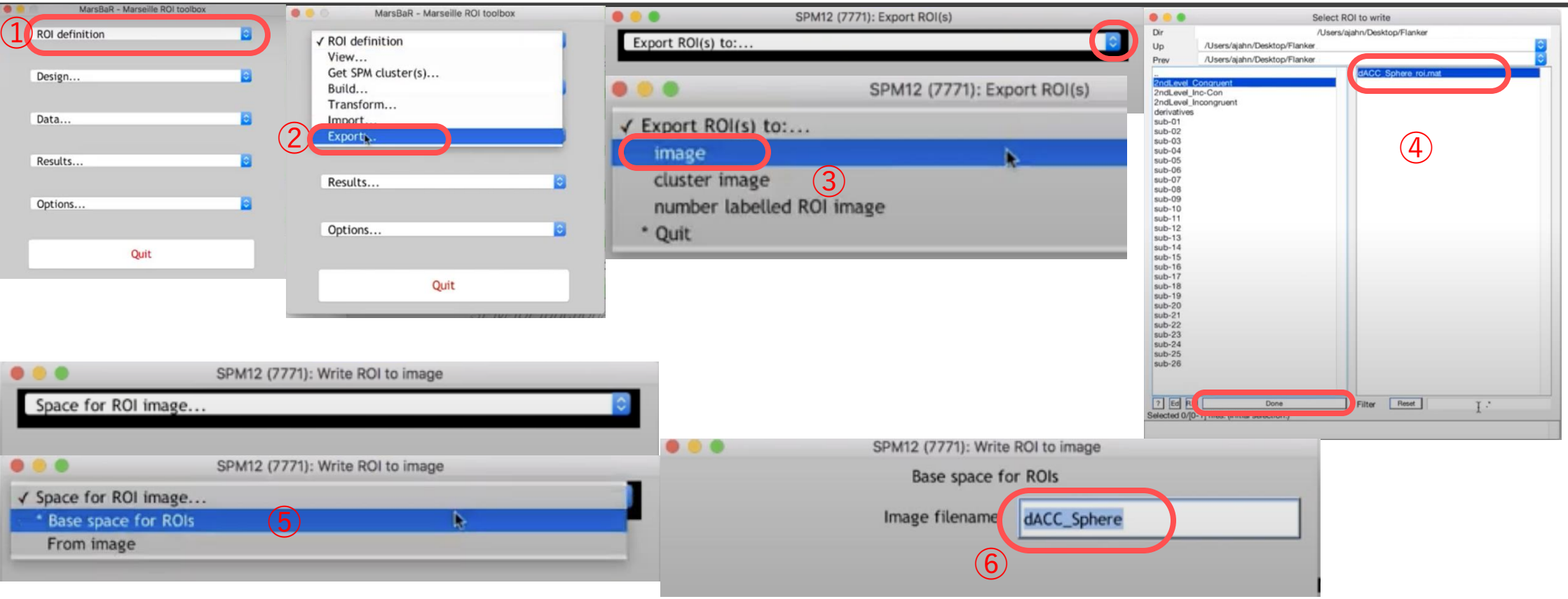
Marsbarを用いて機能的ROIマスクを作成する/Create Functional ROI Mask using Marsbar





1. Center of sphere: enter the coordinates ‘**0 20 44**’.
2. Enter a Sphere radius of ‘**5**’.
3. Description of ROI: dACC_Sphere
4. Label for ROI: dACC_Sphere.
5. Save the created mat.file to your desired directory as ‘dACC_Sphere_roi’.

Marsbarを用いて機能的ROIマスクを作成する/Create Functional ROI Mask using Marsbar



1. Go back to the marsbar ROI and select **ROI definition**.
2. Click on '**Export**'.
3. In the Export ROI(s) to dropdown menu, select '**image**'.
4. Click on the dACC_Sphere_roi.mat file -> Done
5. Leave the Space for ROI image as the default (i.e., **Base space for ROIs**),
6. Select output folder. Label the image as **dACC_Sphere**.
7. Use the same method as for anatomical mask extraction to extract data.