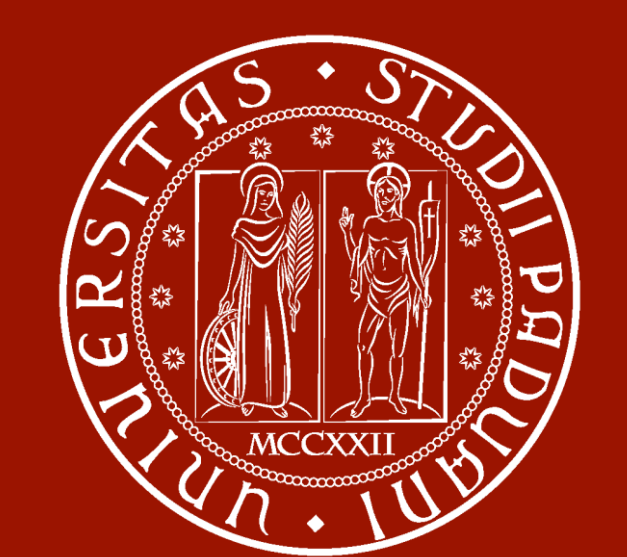


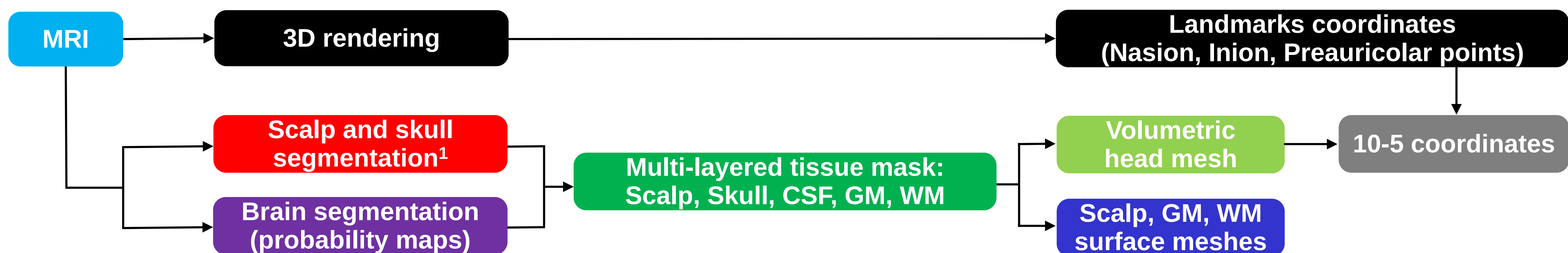


A 4D paediatric head model for diffuse optical imaging of 4.5 to 18.5 year old children

Sabrina Brigadoi^{1,2*}, Jessica Dunn¹, Robert J. Cooper¹, Adam P. Gibson¹

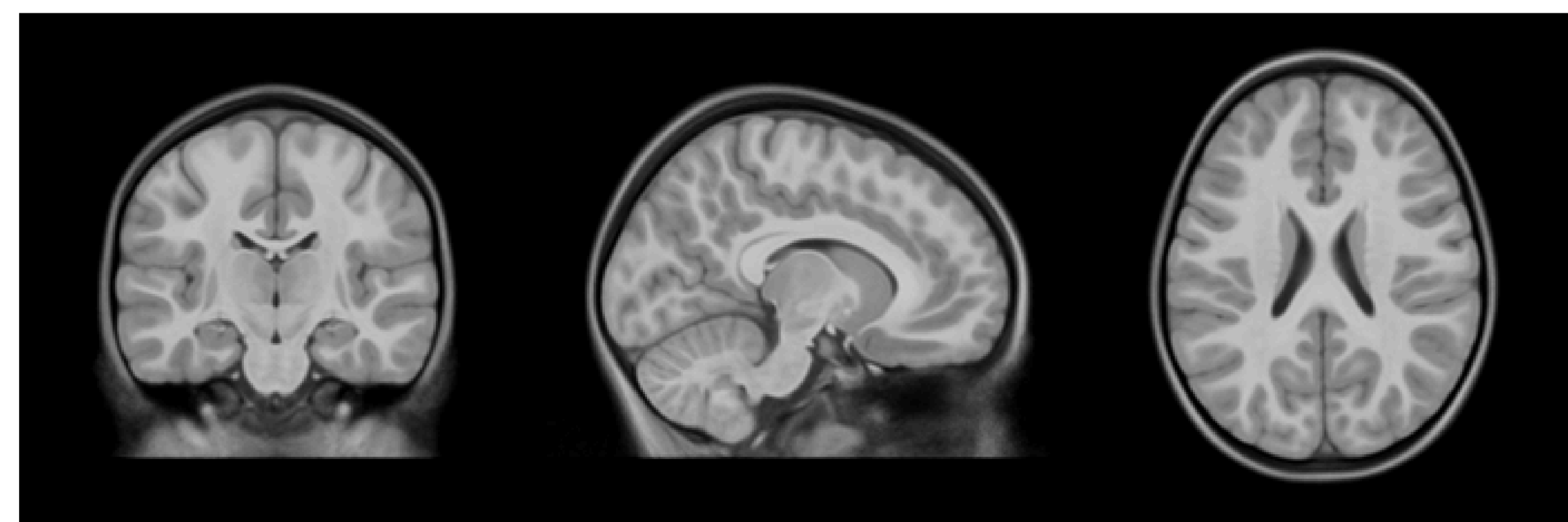
¹Biomedical Optics Research Laboratory, Department of Medical Physics and Biomedical Engineering, University College London, London, U.K.
²Department of Developmental and Social Psychology, University of Padova, Padova, Italy.

*E-mail: sabrina.brigadoi@unipd.it



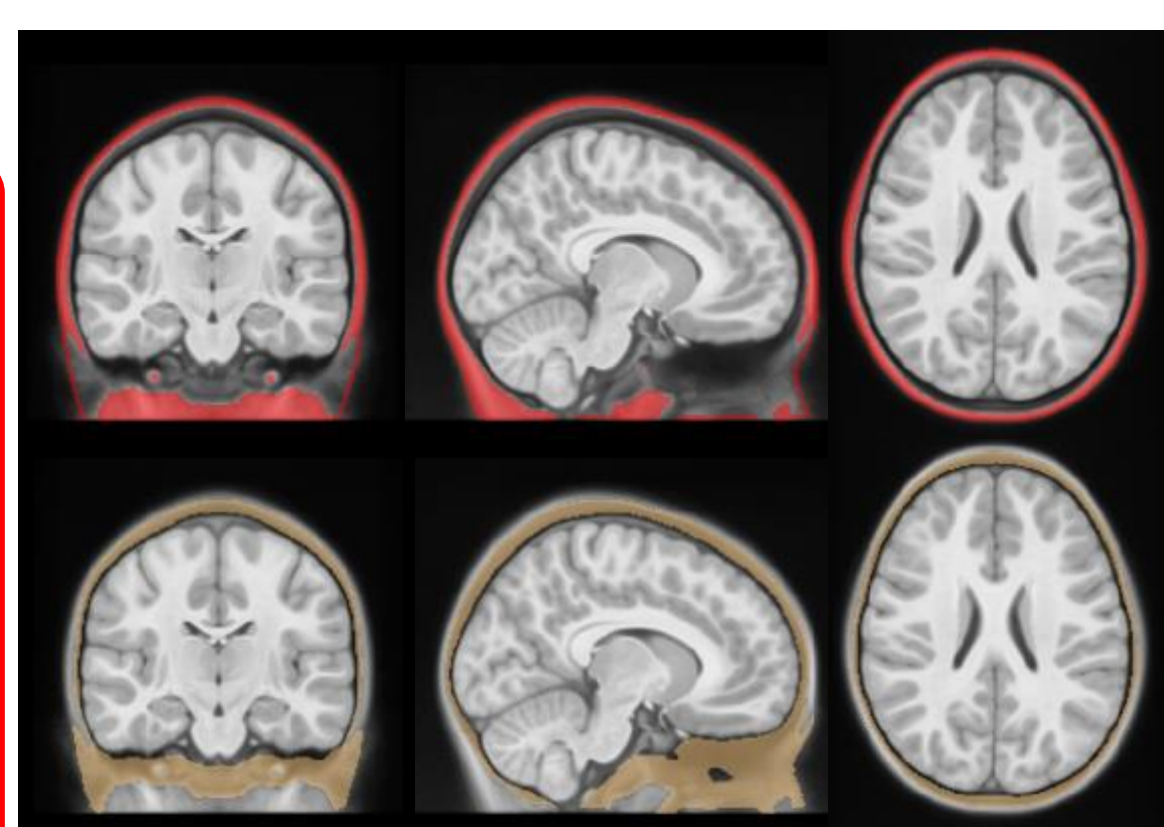
NIH-funded MRI study of normal brain development^{2,3} provided standard pediatric MRI templates for the following age ranges:

- a) pre-puberty (4.5-8.5 years old)
- b) pre- to early puberty (7-11 years old)
- c) pre- to mid puberty (7.5-13.5 years old)
- d) early to advanced puberty (10-14 years old)
- e) post-puberty (13-18.5 years old)



MRI template for the pre-puberty age range (coronal, sagittal and axial view from left to right)

Scalp and skull



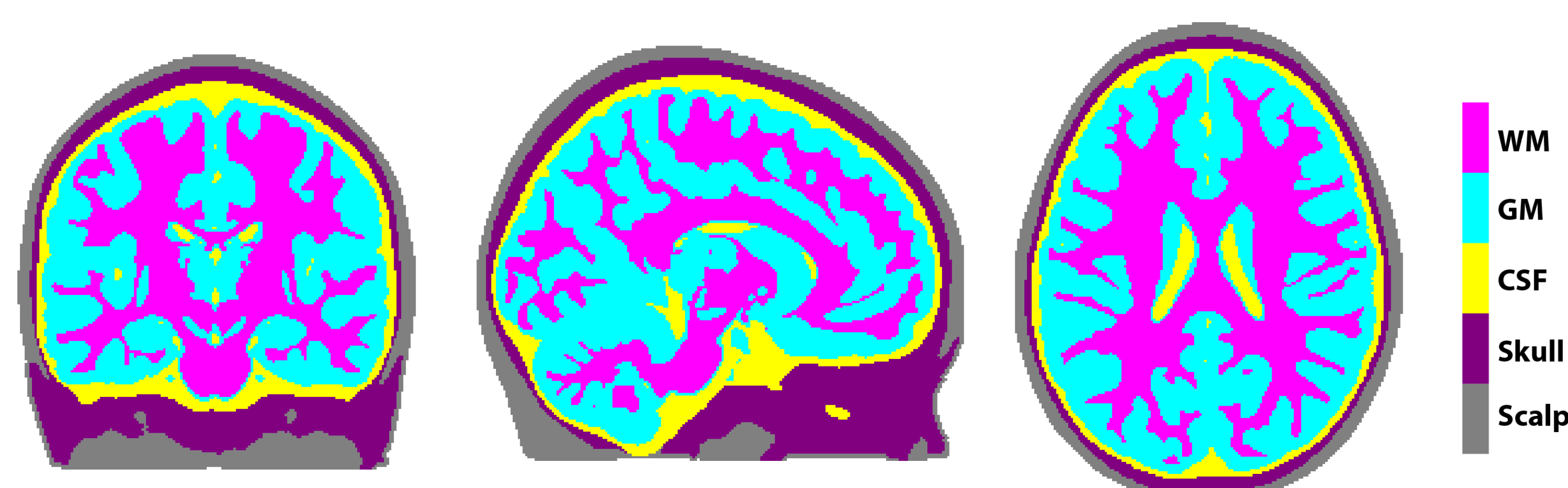
Scalp and skull segmentation¹

Probability maps



Brain probability maps

Tissue mask



Segmentation mask for the pre- to early puberty age range (coronal, sagittal and axial view from left to right)

Surface meshes



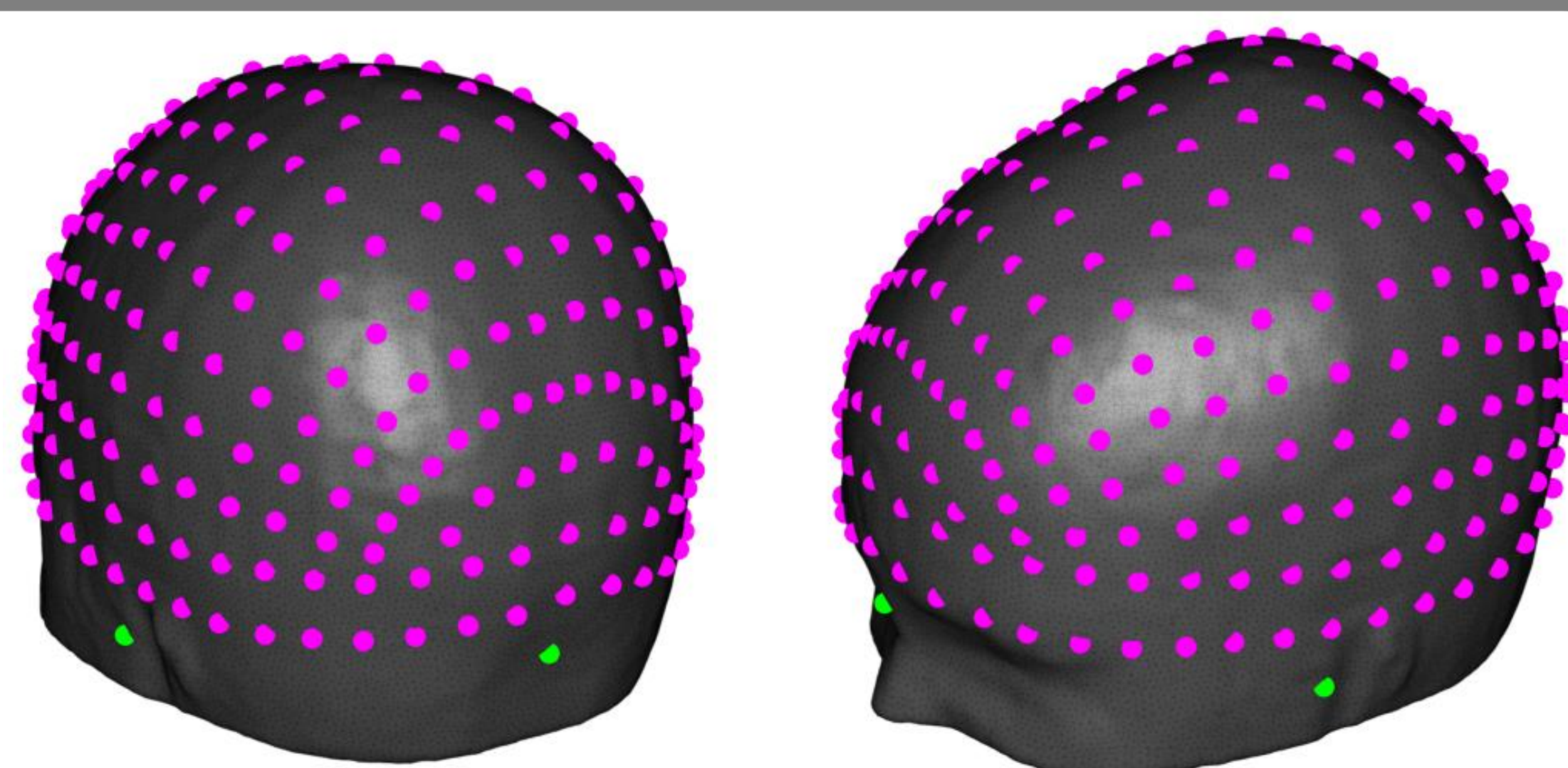
Scalp, GM and WM surface meshes for the early to advanced puberty age range⁴

Volumetric mesh



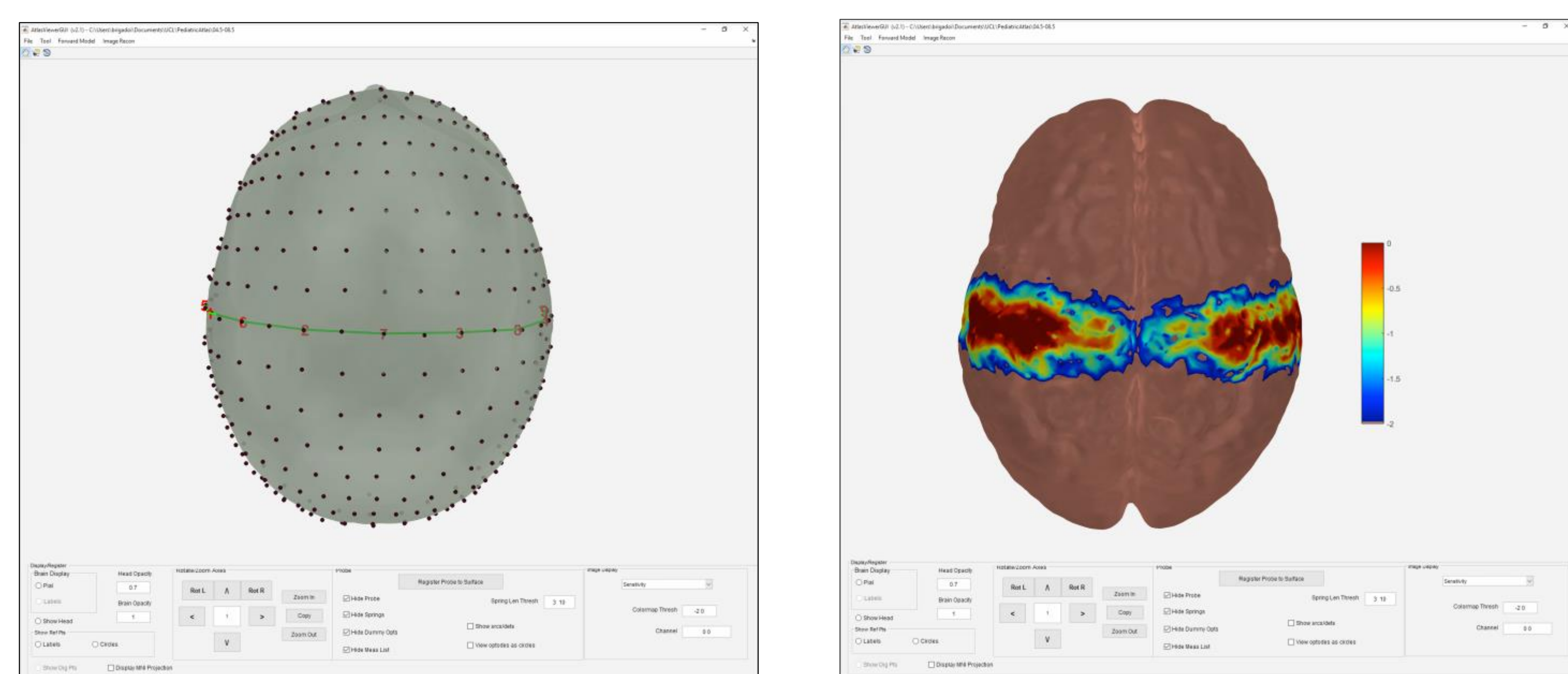
Head volumetric mesh for the post-puberty age range (coronal, sagittal and axial view from left to right)⁴

10-5 coordinates



10-5 point coordinates for the pre- to mid puberty age range

AtlasViewer



Applications:

- Can be used to solve the forward model
- Works with **FEM**, **MCX** and **MMC**
- Can be used to solve the inverse problem and to aid image visualization

Where you can find it (soon):

- www.ucl.ac.uk/medphys/research/4dpaediatricmodel
- AtlasViewer⁵

References

¹Perdue & Diamond, 2014. J. Biomed. Opt. 19(2), 026011.
² <http://nist.mni.mcgill.ca/?p=974>

³Fonov et al., 2011. Neuroimage 54(1), 313-27.

⁴Fang & Boas, 2009. Proc. IEEE Int. Symp. Biomed. Imaging, 1142-45.

⁵Aasted et al., 2015. Neurophotonics 2(2), 020801.