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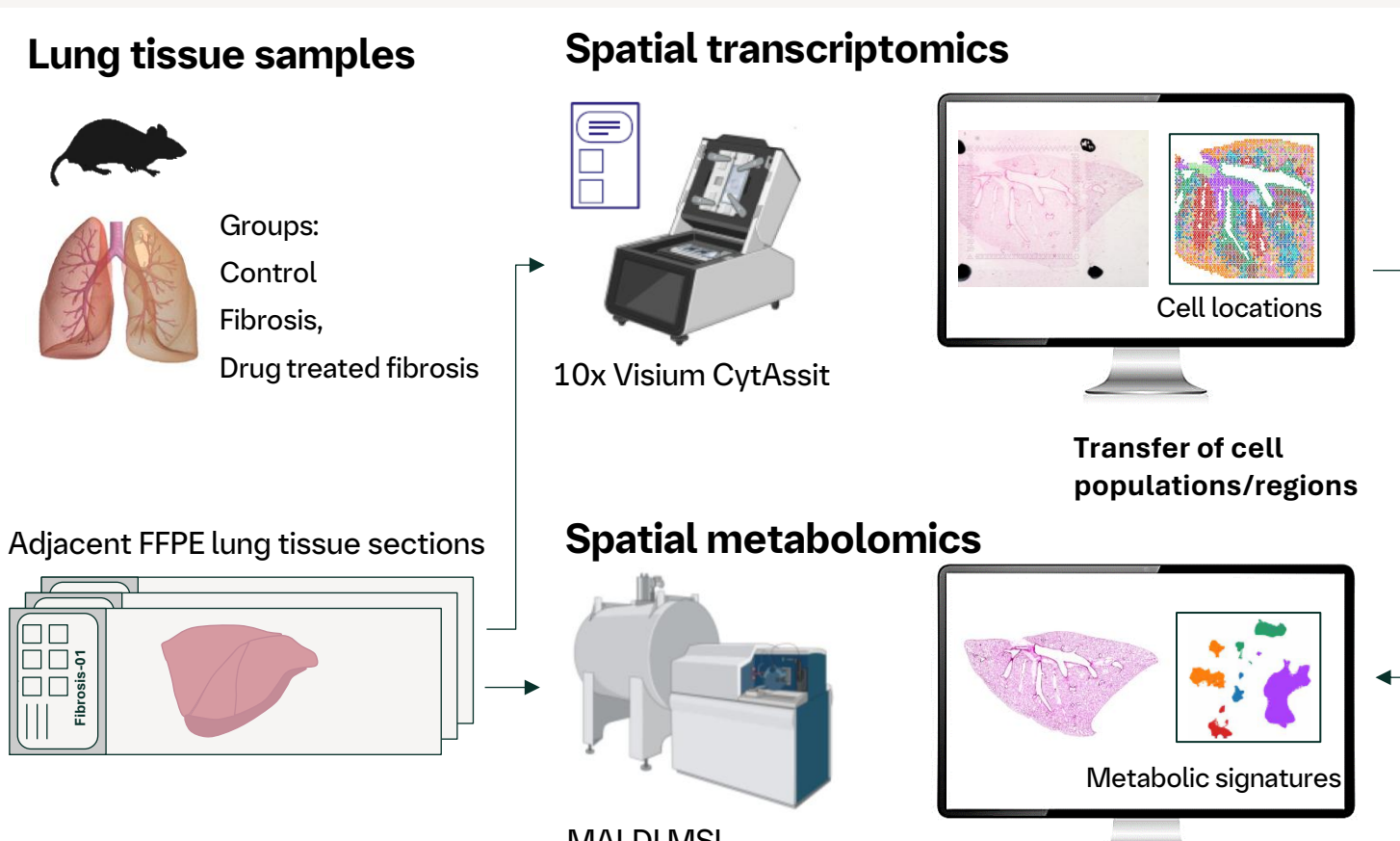
Integrating Spatial Transcriptomics and Mass Spectrometry Imaging to uncover gene-metabolite interactions across cell populations in pulmonary fibrosis

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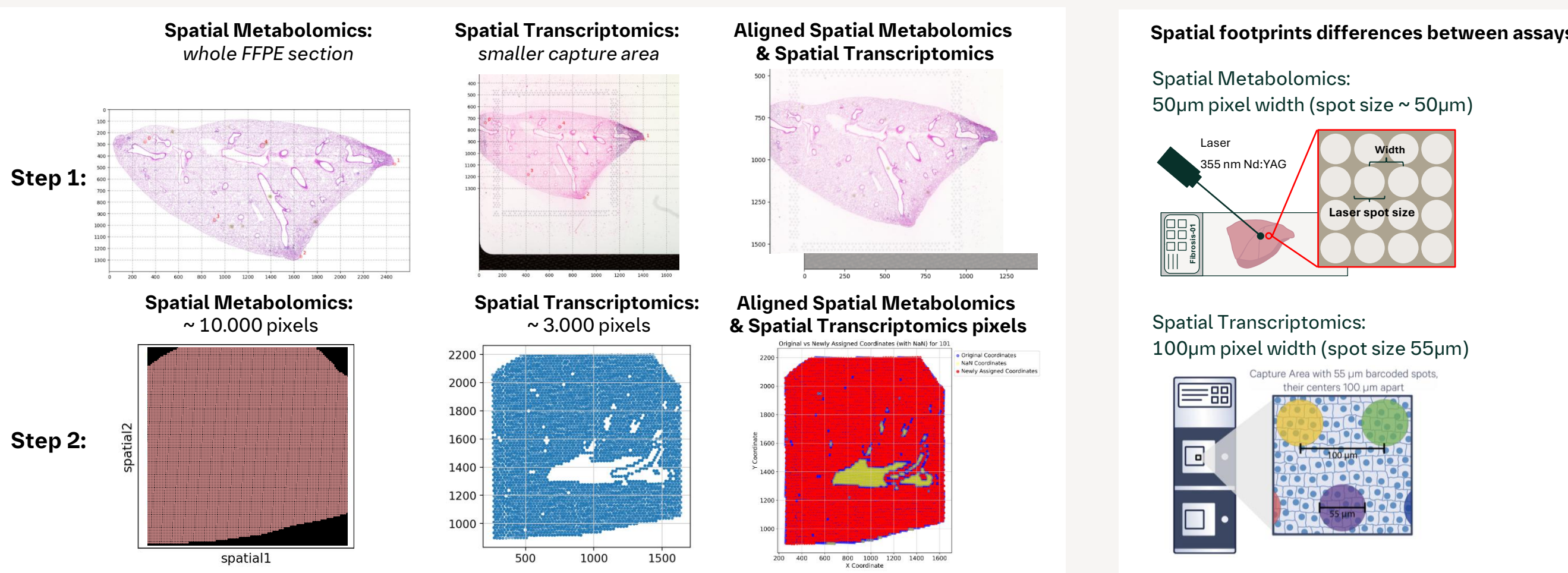
Introduction

Multimodal tissue analyses that combine different detection technologies enhance biological insight beyond single-method approaches. We demonstrate a robust workflow integrating mass spectrometry imaging (MSI) data with spatial transcriptomics results, both generated from FFPE tissue sections. This spatial multi-omics approach enables unique correlations between metabolite distributions and gene expression profiles that are linked to distinct cell populations in idiopathic pulmonary fibrosis. By correlating datasets across biomolecular and spatial scales, this method provides unprecedented insights into the complex interplay of molecular classes within tissue contexts, advancing the understanding of diseases.

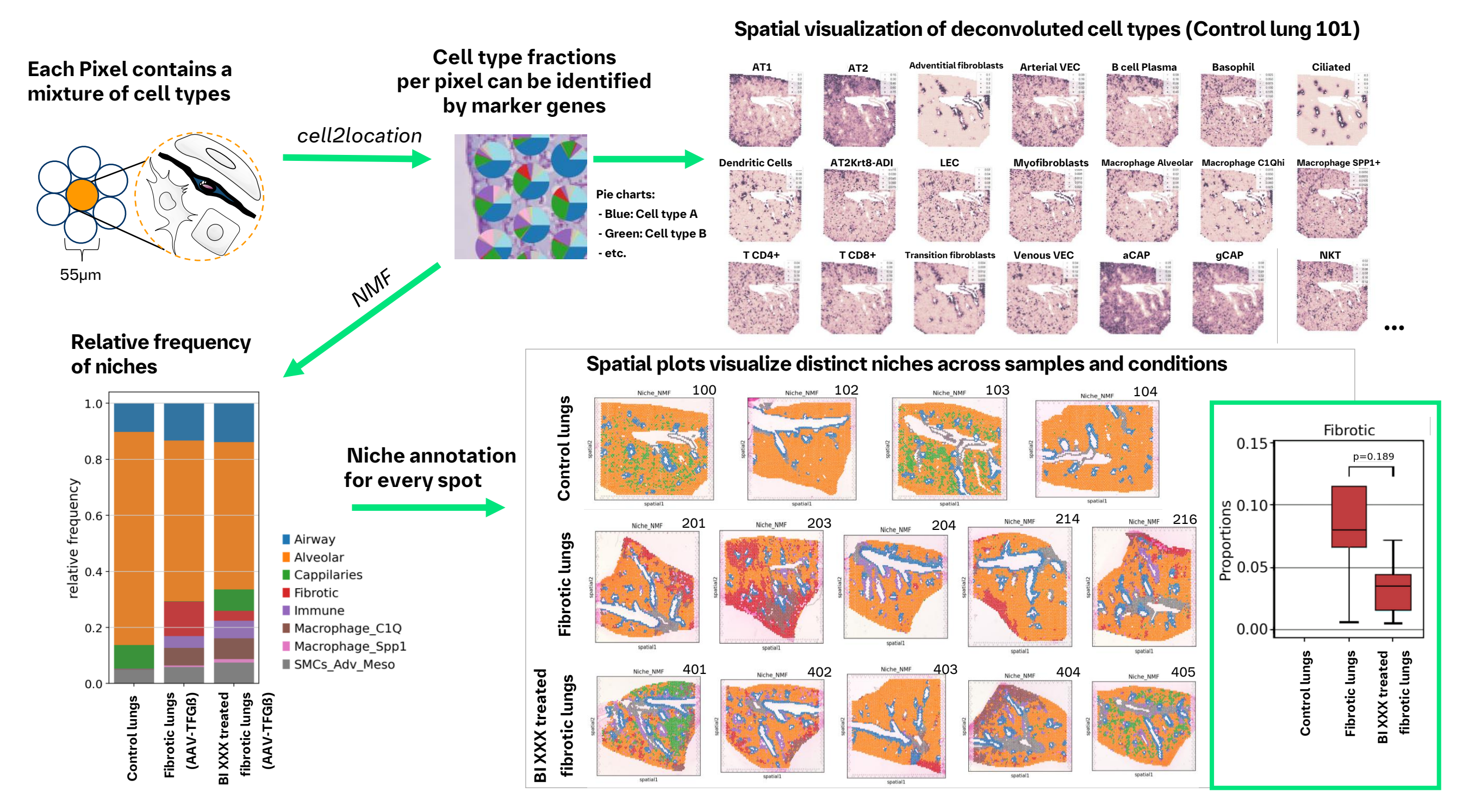


Data Integration

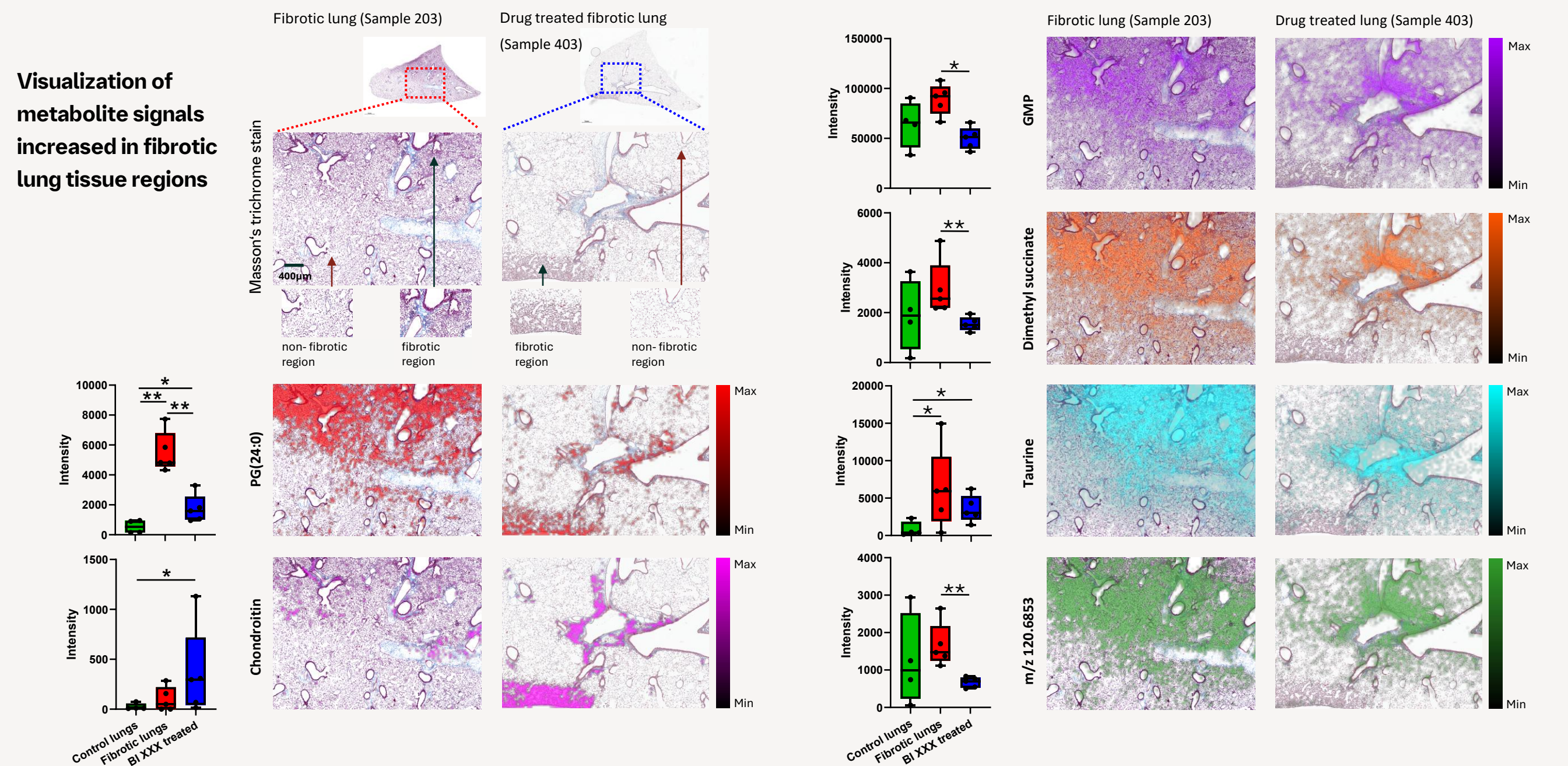
Image alignment of consecutive FFPE tissue sections used for MALDI MSI & 10x Visium
Step 1: Select landmark points in both H&E images for transformation and alignment
Step 2: Assign MALDI MSI pixels to the nearest Visium pixel in max. 20µm distance



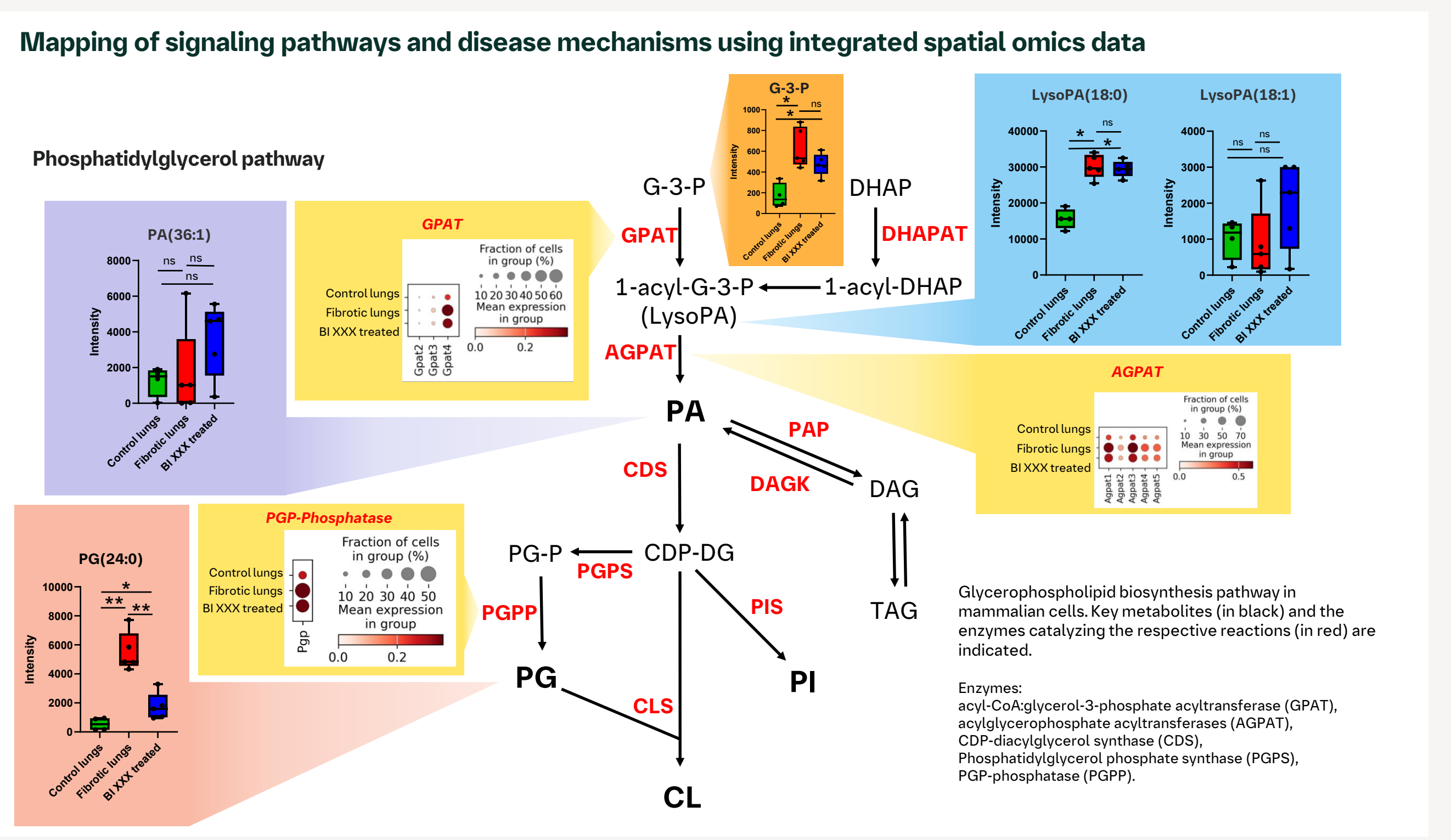
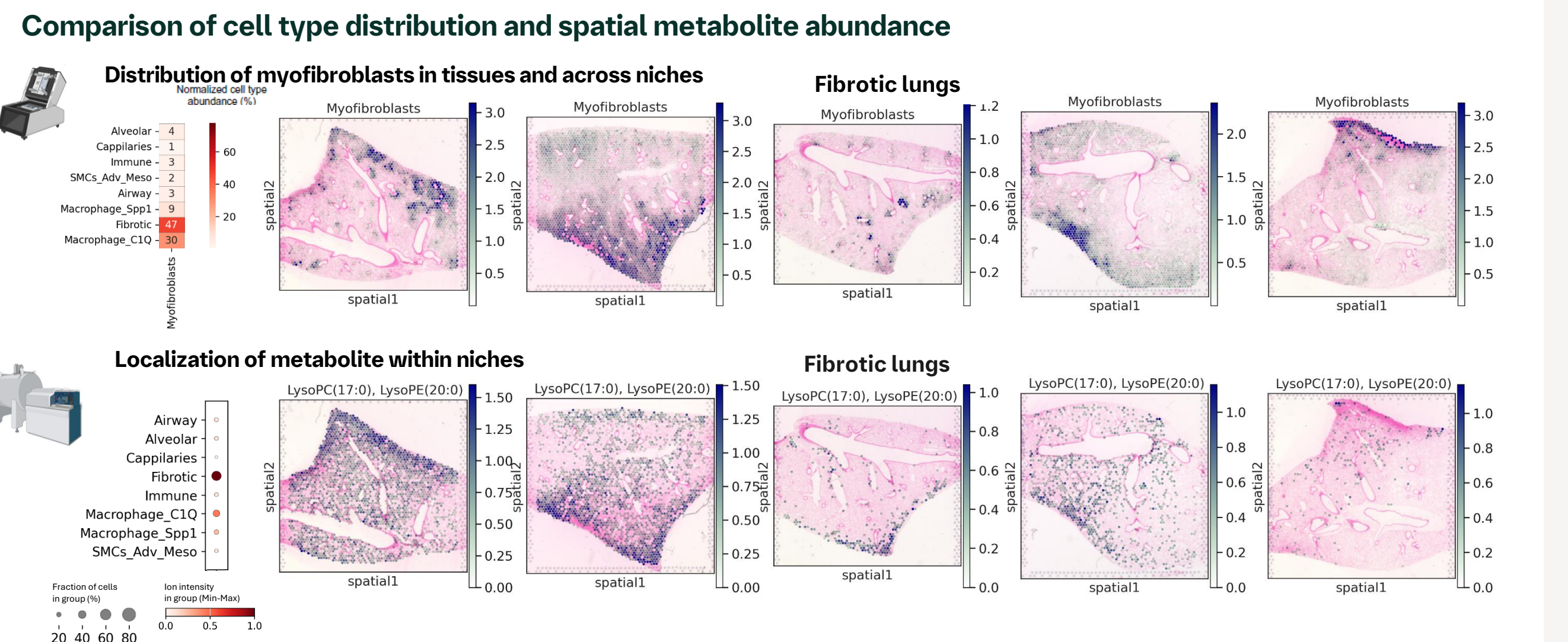
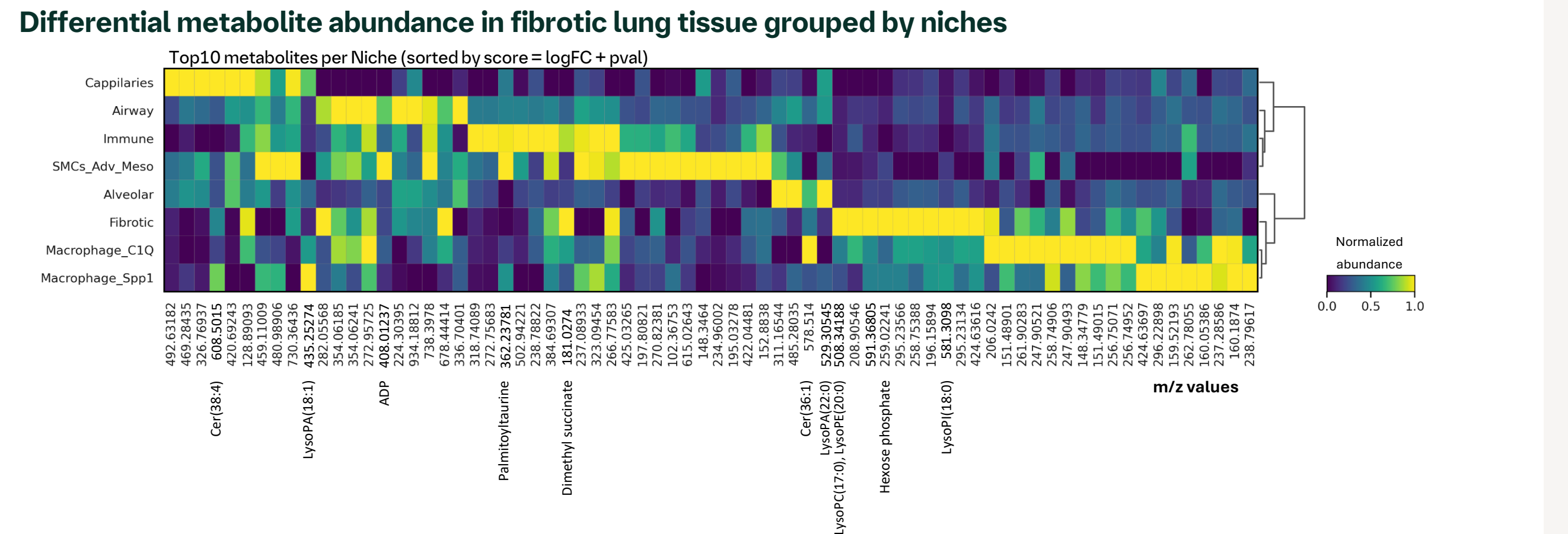
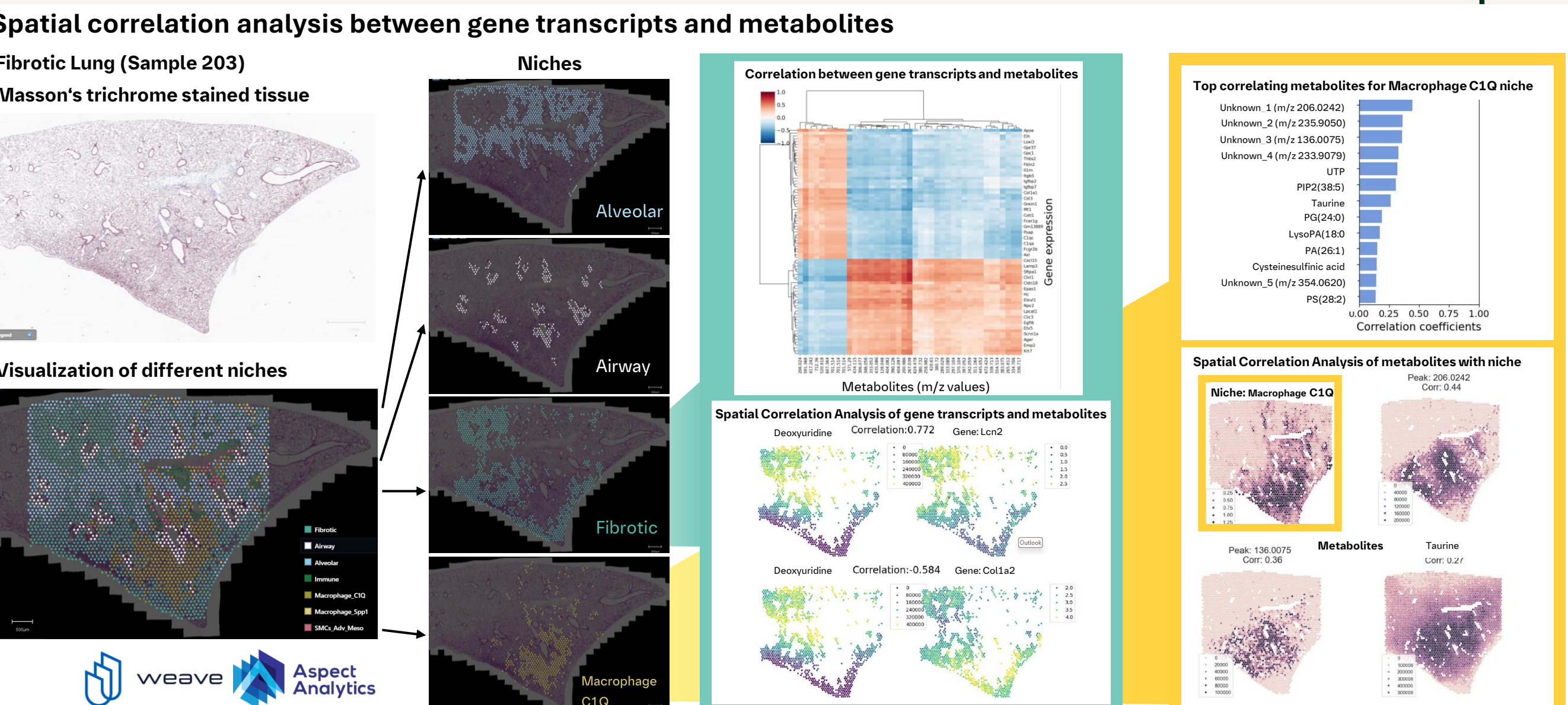
Spatial Transcriptomics Data Analysis



Spatial Metabolomics Data Analysis



Integrated Omics Data Analysis



Summary

Multimodal integration of gene expression profiles (generated by Spatial Transcriptomics) and metabolic profiles (generated by MSI) on tissue sections.

Advantages and potential areas of application:

- Allows cell type-specific molecular profiling after drug treatment within the spatial context of tissue architecture.
- Captures a broad range of molecular data and serves as a hypothesis-generating tool to identify molecular pathways of disease mechanisms or therapeutic response.
- Elucidation and localization of target engagement markers or other PD molecular markers (e.g. physiological response, or outcome-related markers) and marker signatures.
- Generation of new knowledge on mechanisms of action.

Conflicts of interest's disclosure:
The authors declare no conflicts of interest with respect to the research, authorship, and/or publication of this poster.

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