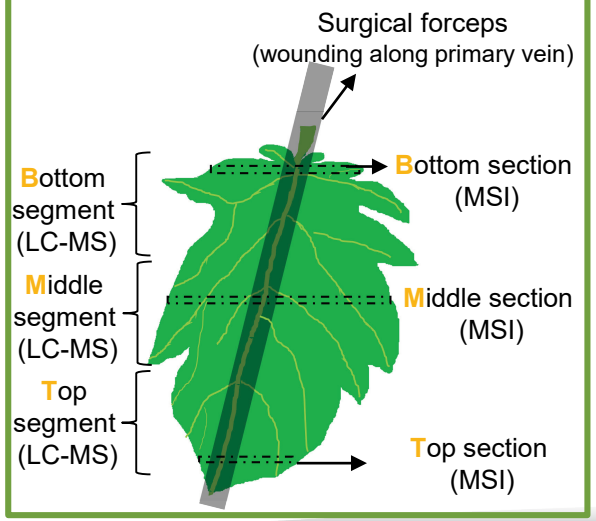
Preserved and variable spatial-chemical changes of lipids across leaves in response to wounding

D. Veličković[1*], R. Chu[1], C. Henkel[2], A. Koch[2], N. Tao[3], J. N. Adkins[1], C. Anderton[1], J. E. Kyle[1], K. Bloodsworth[1], L. Bramen[1], S. Cornett[4], K. Burnum-Johnson[1]

EMSL

- Spatiotemporal mapping of lipid changes that occur at the sight of injury determine localized vs systemic lipid responses and provide lipid markers that are mechanistically linked to plant recovery.
- We used **global lipidomic and multimodal MALDI-MSI approaches (15T SolariX MRMS and timsTOF fleX)** on bio-replicates to better understand these processes.

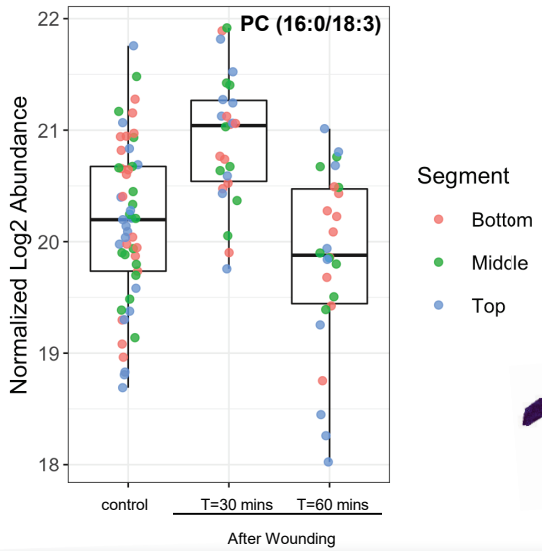


Global lipidomic: LC-MS/MS

Recovery 60 min after wounding

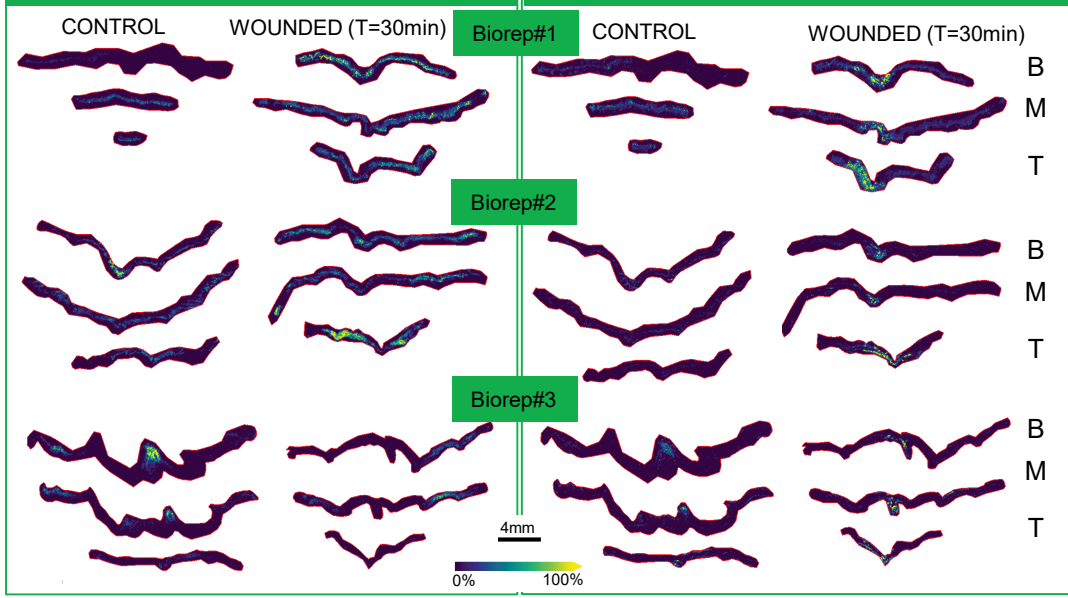
Lipid class	dT=30min	dT=60min
DGs	Down	No change
PAs	Down	No change
PCs	Up	No change
PEs	Up	No change
SQDGs	Down	No change
TGs	Up/Down	UP/No change

Inter-sample and inter-segment variations



MALDI-solariX MRMS-MSI: the importance of bio-replicate imaging

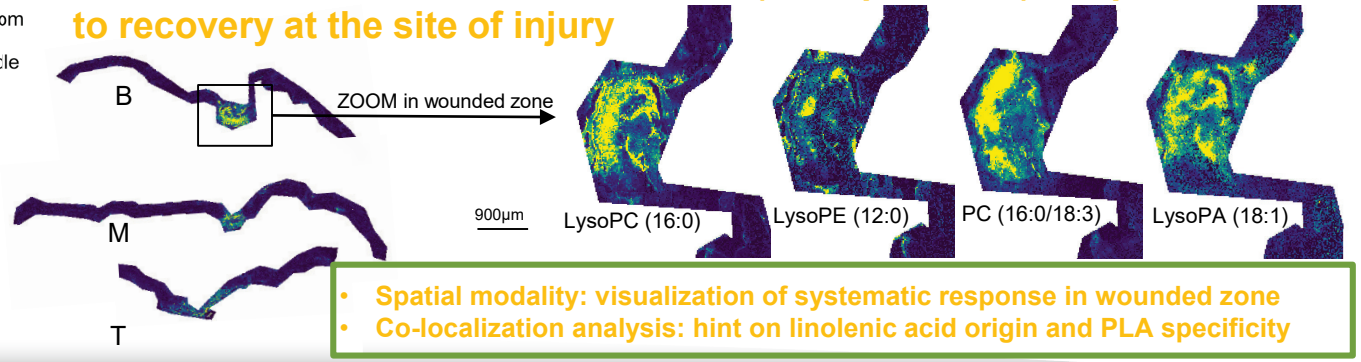
Random spatial changes PC (16:0/18:3) | **Preserved changes: LysoPC (16:0)**



Accumulation in injured zone:

Lipid ID
LysoPE (12:0)
LysoPA (18:1)
LysoPC(16:0)
LysoPC(18:3)
LysoPC(18:2)
LysoPG(16:1)
LysoPI(16:0)

MALDI-timsTOF fleX MSI: Distribution (at 20 µm scale) of lipids linked to recovery at the site of injury



- **Spatial modality: visualization of systematic response in wounded zone**
- **Co-localization analysis: hint on linolenic acid origin and PLA specificity**

[1]*Pacific Northwest National Laboratory (PNNL), Richland, WA, USA,* [2]*Bruker, Bremen, Germany,* [3]*Bruker, San Jose, CA, USA.* [4]*Bruker, Billerica, MA, USA*

* Corresponding author: Dusan.Velickovic@pnnl.gov

This work was funded in part by the U.S. Department of Energy (DOE), Office of Science, Office of Biological and Environmental Research (BER), Early Career Research Program to KBJ.

BRUKER