

# Towards an improved understanding of high-resolution impurity signals in deep Antarctic ice cores

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Pascal Bohleber<sup>1</sup>, Marco Roman<sup>1</sup>, Carlo Barbante<sup>1,2</sup>, Martin Šala<sup>3</sup>, Barbara Stenni<sup>1,2</sup> and Barbara Delmonte<sup>4,5</sup>

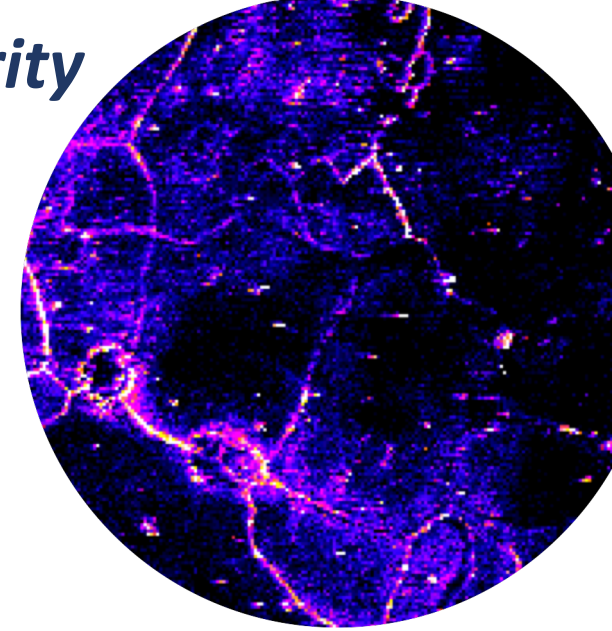
<sup>1</sup>Ca' Foscari University of Venice, Department of Environmental Sciences, Informatics and Statistics, Italy

<sup>2</sup>Institute of Polar Sciences, CNR, Italy

<sup>3</sup>National Institute of Chemistry, Ljubljana, Slovenia

<sup>4</sup>Università degli Studi di Milano-Bicocca, Dept. of Earth and Environmental Sciences

<sup>5</sup>EUROCOLD Laboratory for Glaciology and Paleoclimate, Milano, Italy

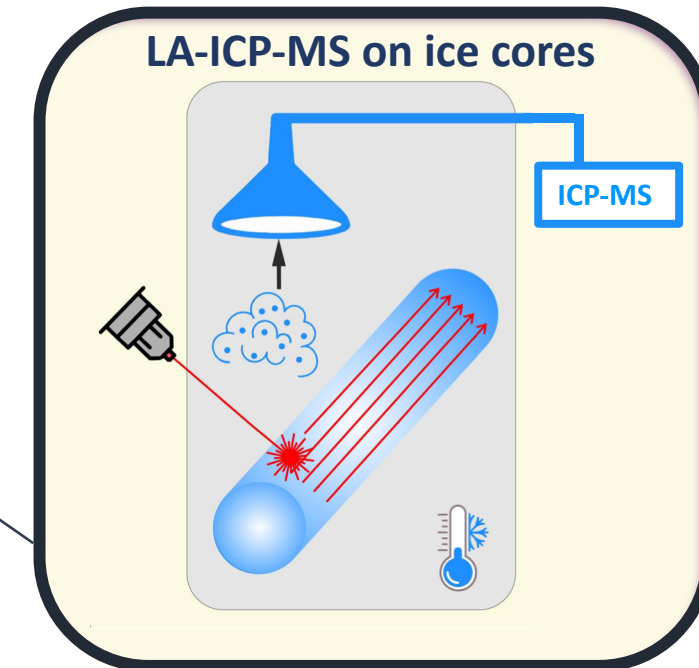


## Background & Motivation



- Retrieve a 1.5 million year old ice core record from Antarctica
- Investigate ice core proxies over the mid-Pleistocene transition
- Deepest layers are highly thinned
- We need methods to resolve fine detail from thinned ice!

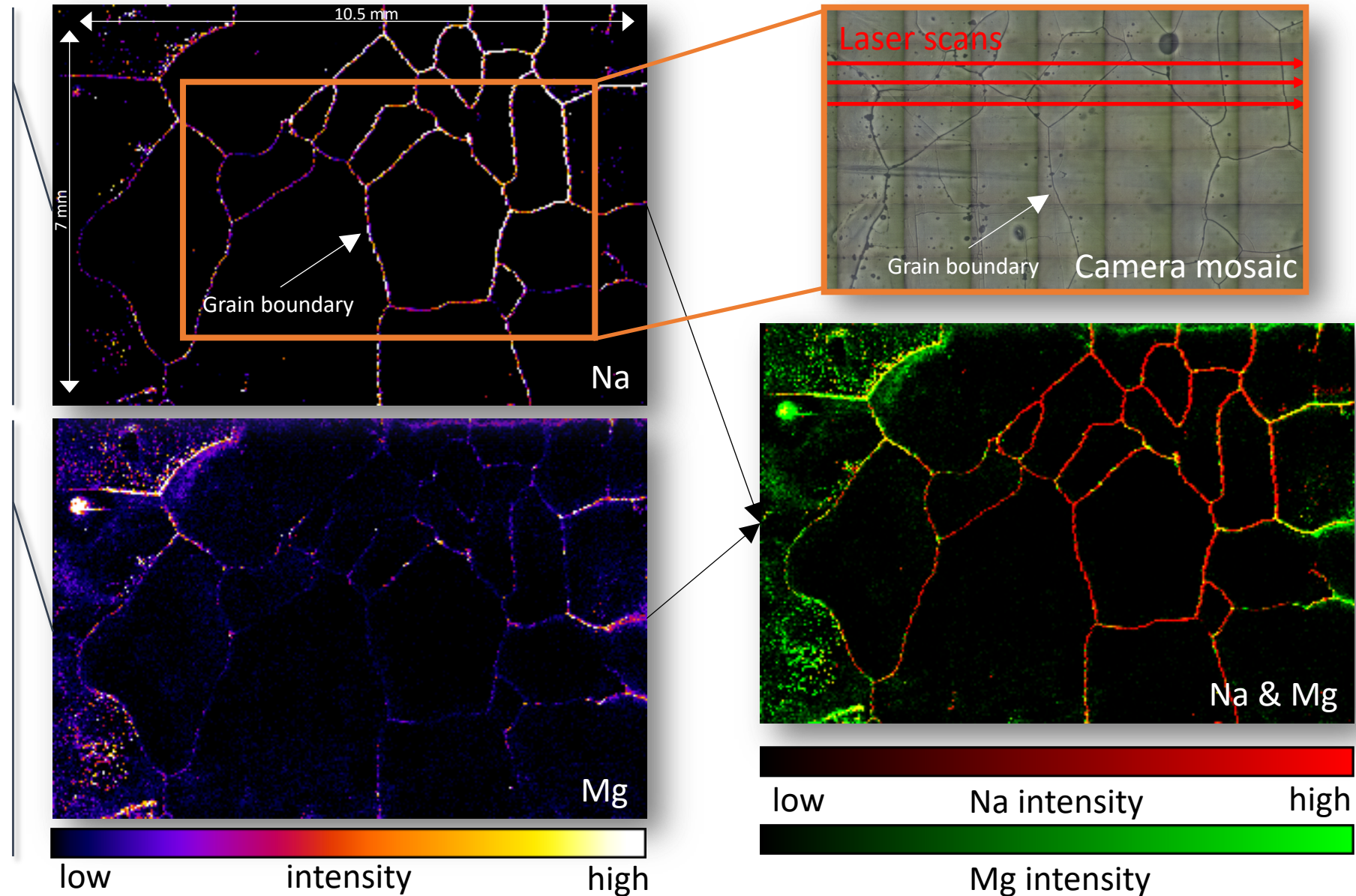
- Micro-destructive (top  $\mu\text{m}$  layers of a surface ablated)
- High spatial resolution (in the range of 100 – 10  $\mu\text{m}$ )
- Unique potential to study highly thinned ice core layers
- Requires understanding signal formation vs. ice micro-stratigraphy!



# Example: Holocene sample of the Talos Dome ice core, Antarctica

- Ice surface scanned by non-overlapping lines
- Here: 7 x 10.5 mm images
- Image artifacts are avoided
- Decontaminated surface
- High scan speeds yield fast image production (< 2h)

- Clear evidence of localization of Na at grain boundaries
- Peaks in Na signal correspond to grain boundaries
- Mg also located in some grain interiors



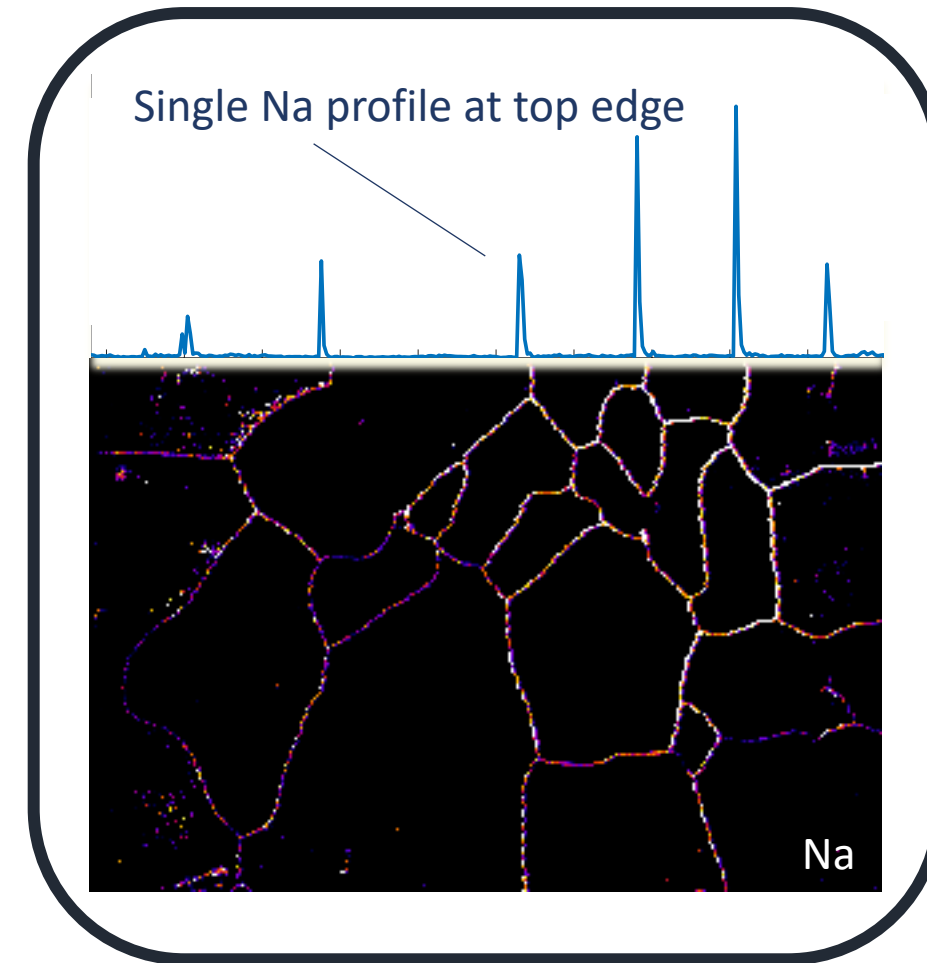
# Conclusions & Outlook

## *Our new approach to LA-ICP-MS ice core analysis provides*

- a refined tool to investigate impurity localization in ice
- higher speed in analysis, to be combined with a larger cryocell
- an improved basis to interpret LA-ICP-MS ice core signals

## *Our results show that*

- for some elements (Na,...) the localization at grain boundaries is the main cause of individual peaks, determining the high-frequency signal components
- spatial significance of high-resolution LA-ICP-MS signals needs to be re-assessed in view of micro-stratigraphy



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