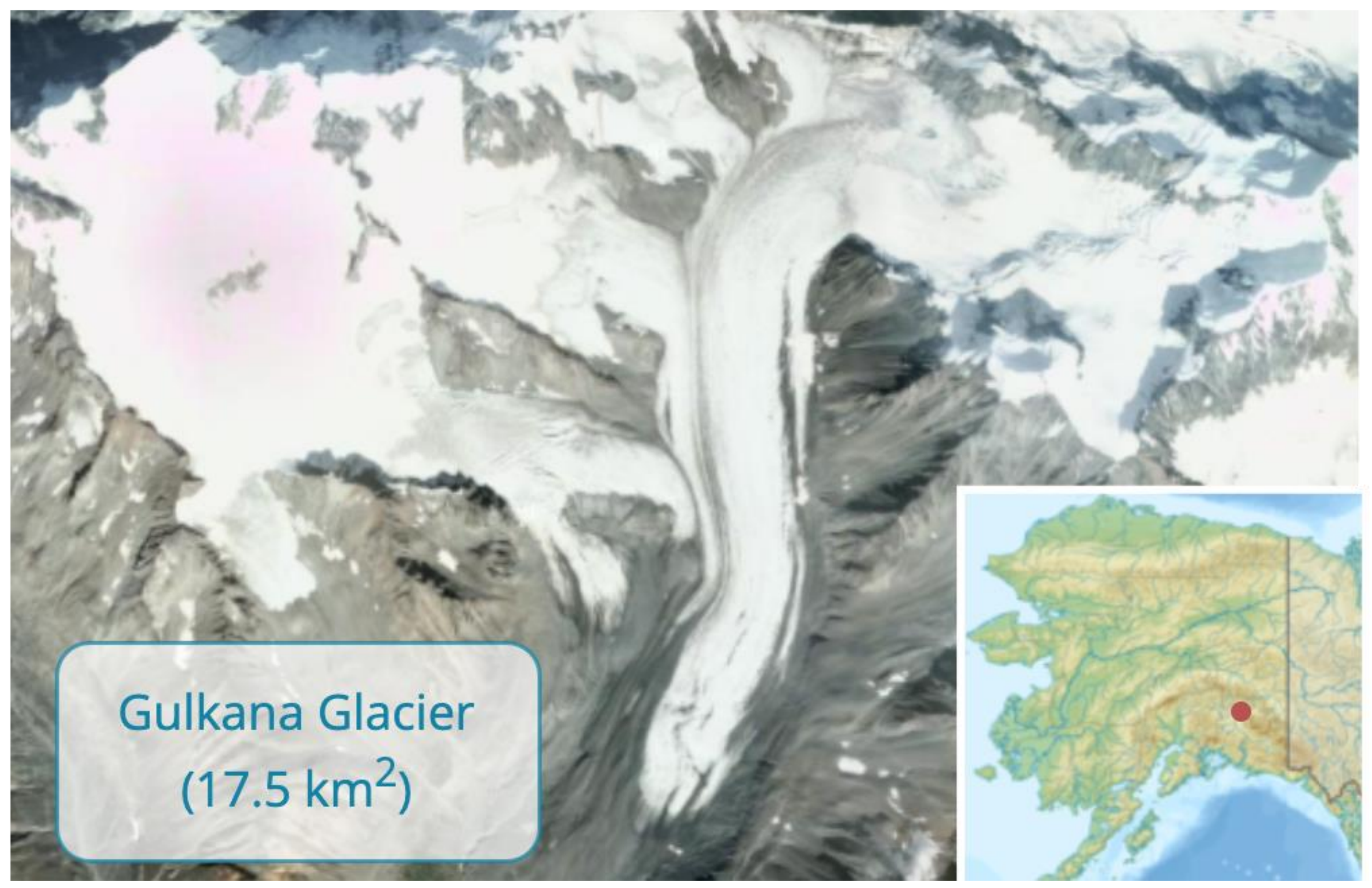
# Leveraging remote sensing data with in-situ measurements for enhanced understanding of Alaskan glacier response to climate change

Carnegie Mellon University
Civil & Environmental Engineering

Albin Wells and David Rounce – Civil and Environmental Engineering, Carnegie Mellon University – awwells@andrew.cmu.edu

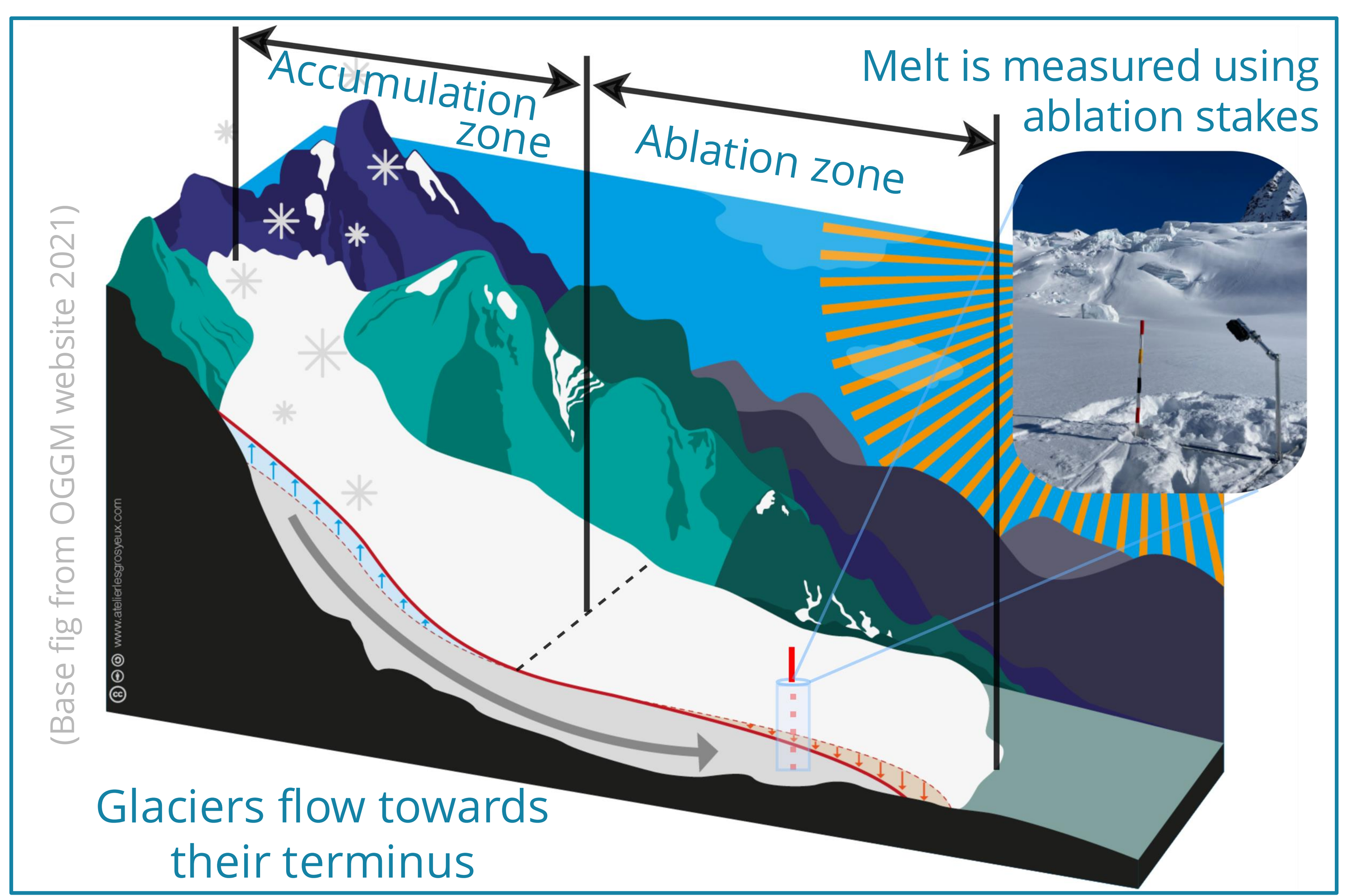
## INTRODUCTION

Roughly 25% of global mountain glacier mass loss is from Alaska.[1] Large-scale remote sensing offers unprecedented opportunity to monitor glaciers. Still, a paucity of in-situ observations that are critical to remote sensing validation limit our confidence in these products.




The project site, Gulkana Glacier, and its location within Alaska.

## BACKGROUND AND METHODS



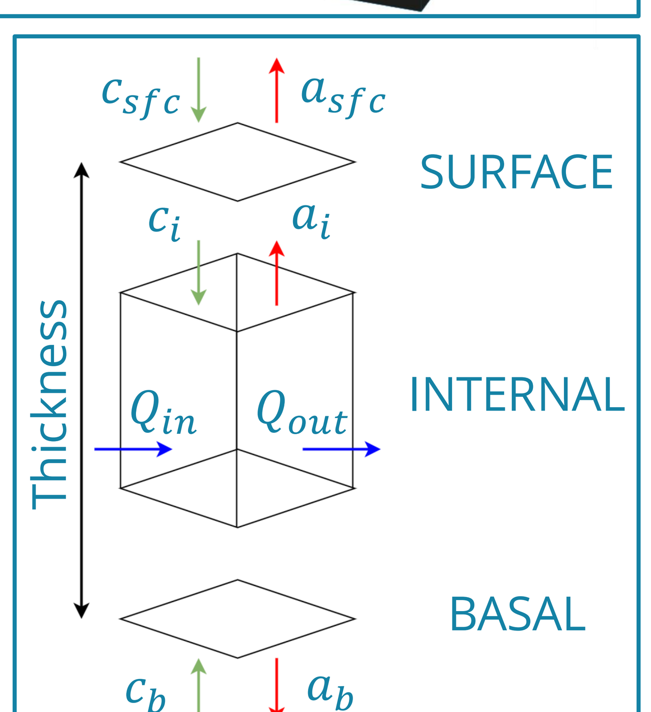

Glacier processes governed by mass conservation. Mass balance is the sum of accumulation and ablation (see right). ***Total mass balance*** is:

$$\dot{b}_{tot} = dh/dt$$

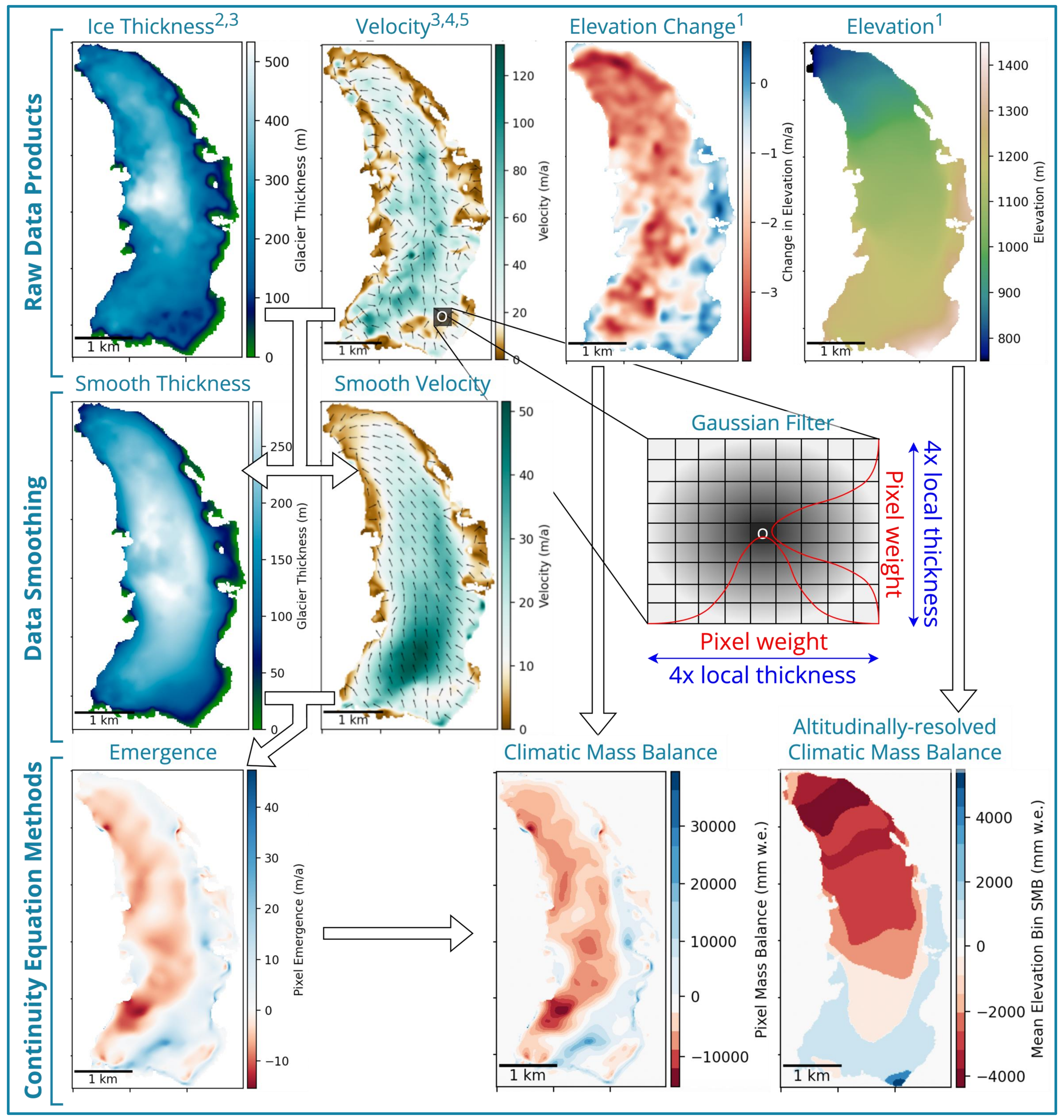
***Climatic mass balance*** accounts for ice flux to reveal true regions of melt:

$$\dot{b}_{clim} = dh/dt + \nabla q$$

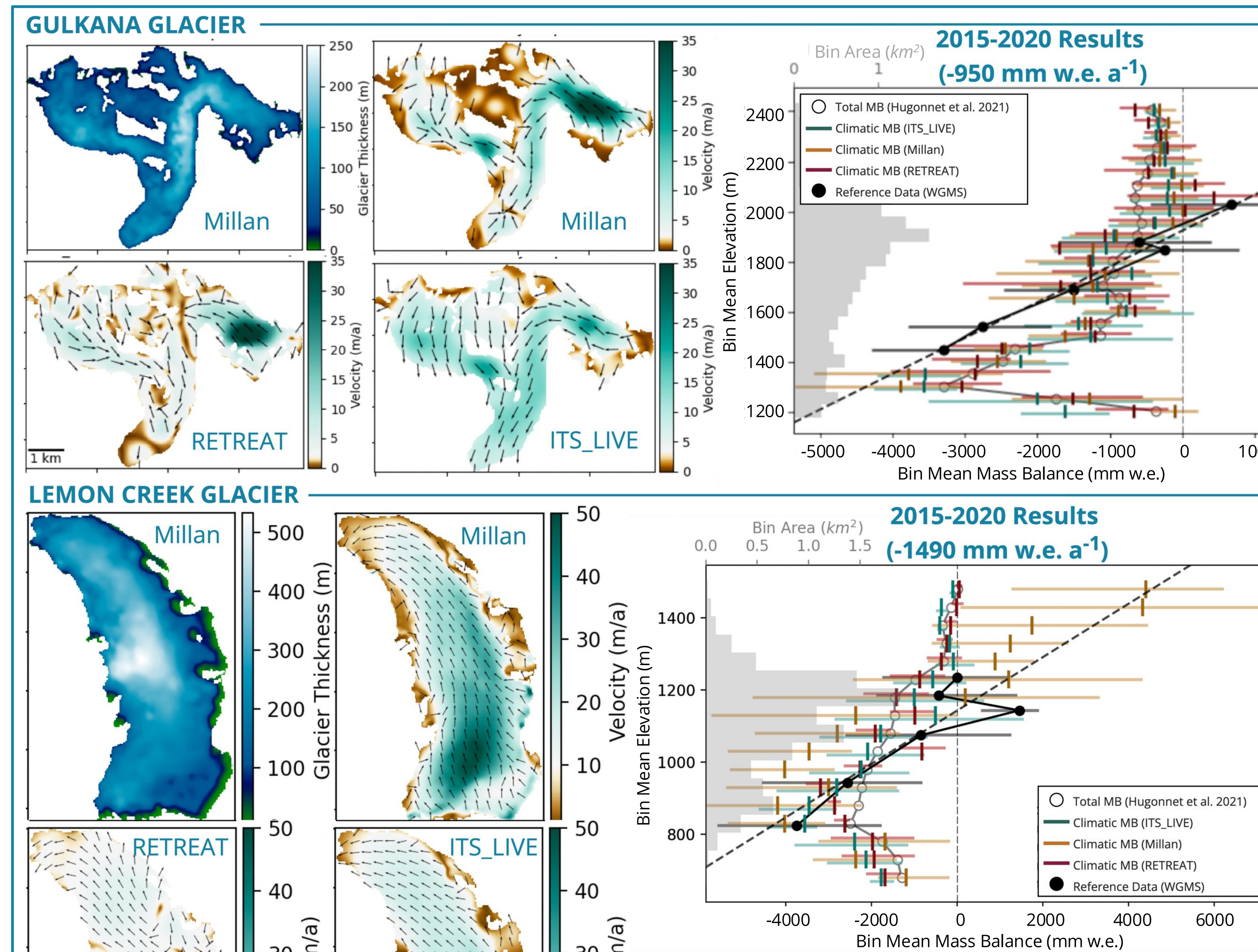
where $\nabla q = h(\frac{du_x}{dx} + \frac{du_y}{dy})$




## REMOTE SENSING PROCESSING



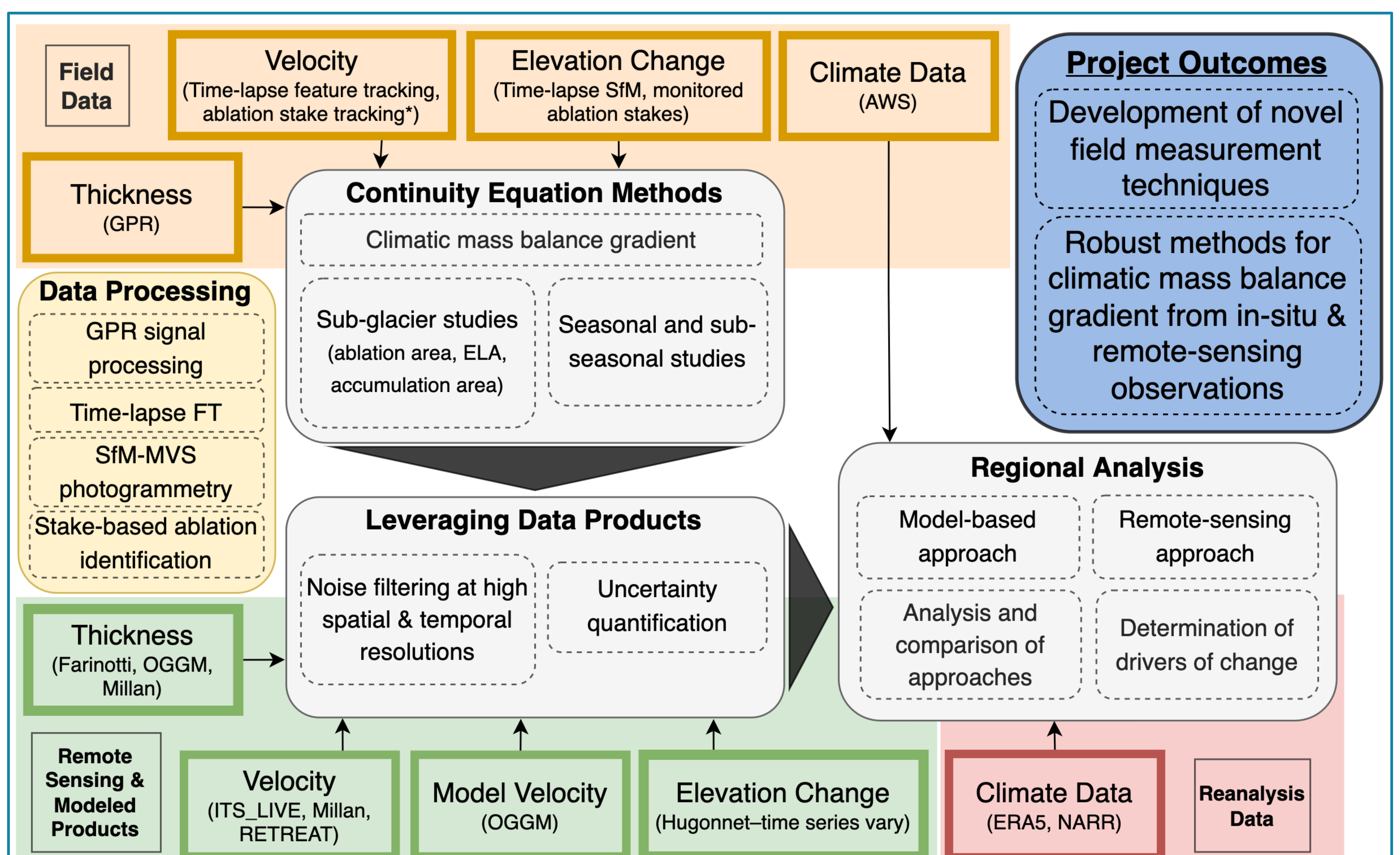

## RESULTS




Annual mass loss for Alaskan benchmark glaciers

| Glacier | 2000-2020 | 2015-2020 |
|---|---|---|
| Gulkana | 750 mm w.e | 950 mm w.e |
| Lemon Creek | 1120 mm w.e | 1490 mm w.e |
| Wolverine | 750 mm w.e | 870 mm w.e |

## PROJECT OVERVIEW AND PLAN




## CONCLUSIONS AND NEXT STEPS

There are large differences in velocity magnitude and spatial variation between remotely sensed products, which greatly impacts the climatic mass balance gradient estimate. Next:

- Obtain field data (April & September 2022)
- Learn necessary data processing methods (e.g., photogrammetry, feature tracking, GPR signal detection)
- Continue development of methods to quantify differences between remote sensing products and observations, and identify the cause of problematic areas

## ACKNOWLEDGEMENTS

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## REFERENCES


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