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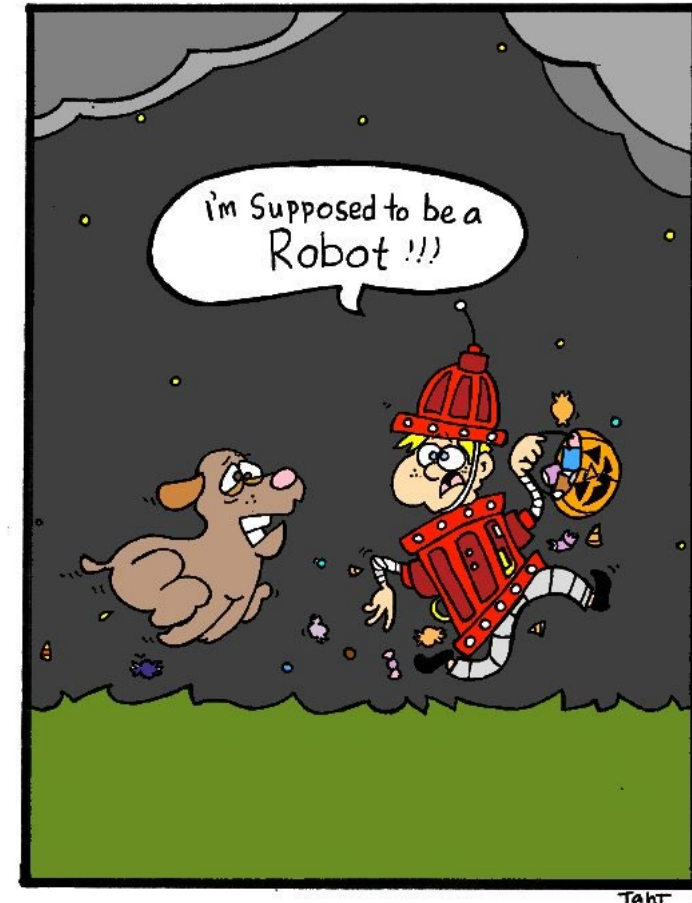
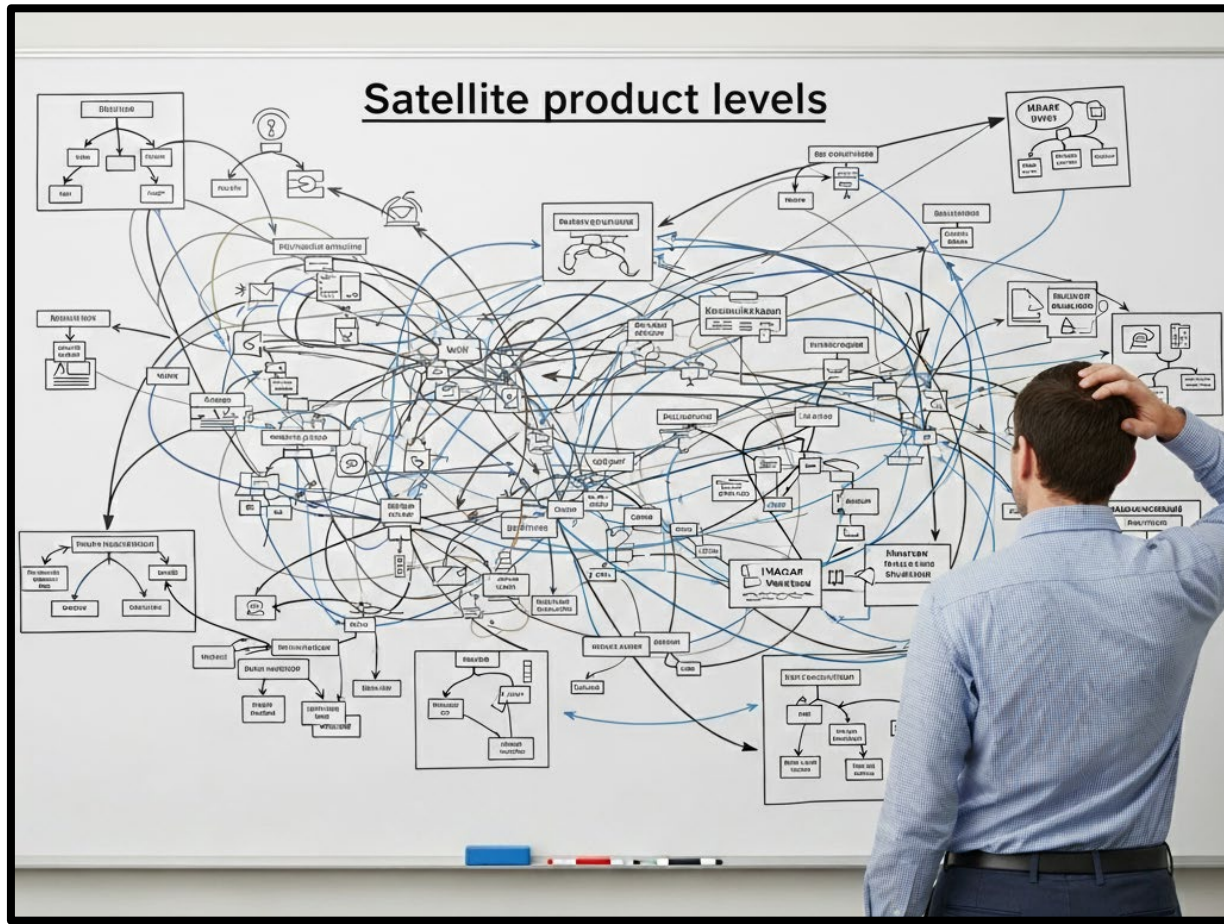


# Open-Source Preprocessing Workflow for Maxar's Level 1B Satellite Imagery to Enhance Detection & Identification of Marine Mammals

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Caleb Robinson, Juan Lavista Ferres, Claire Porter, Michelle LaRue

# Background & Motivation

## Why Level 1B?





# Background & Motivation



2A CATID 103001000CD56600





# Background & Motivation

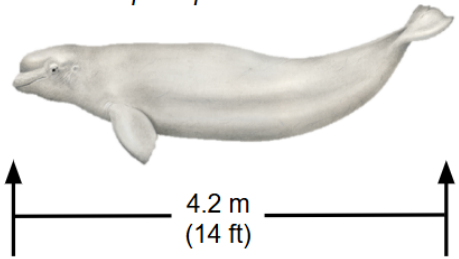


Open source workflow to:

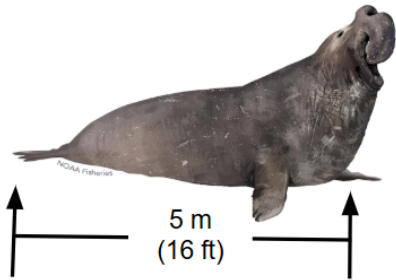
- Promote transparency, reproducibility, & collaboration
- Support human-in-the-loop identification of marine mammals

# Case Studies

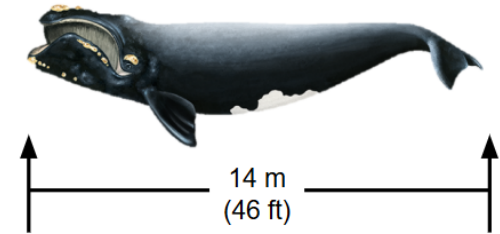
Beluga whale  
*Delphinapterus leucas*



Elephant seal  
*Mirounga angustirostris*



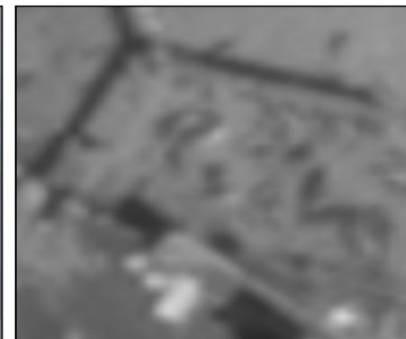
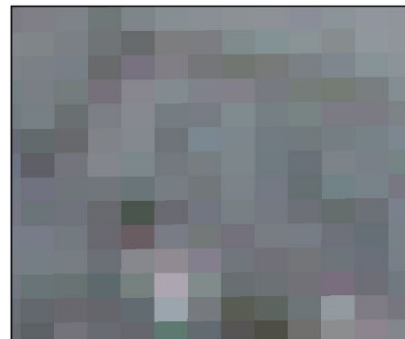
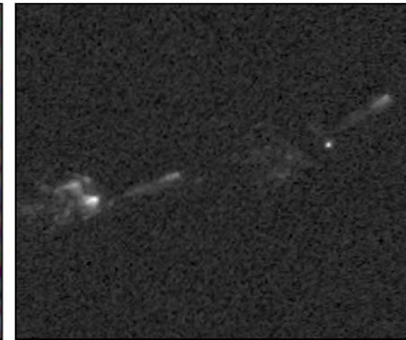
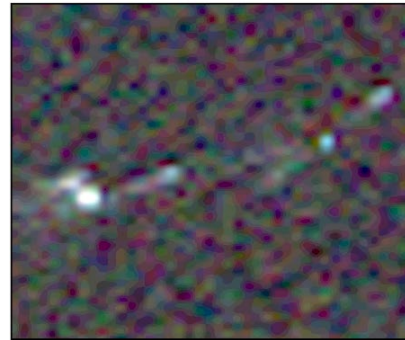
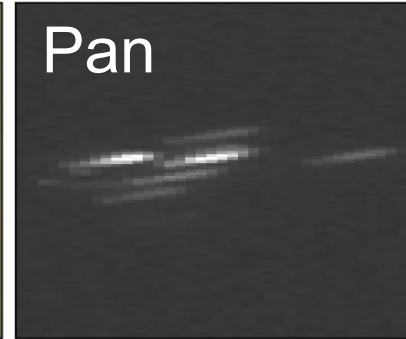
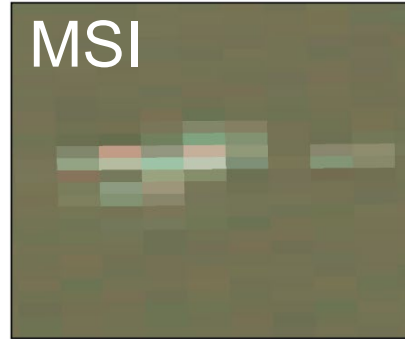
North Atlantic right whale  
*Eubalaena glacialis*



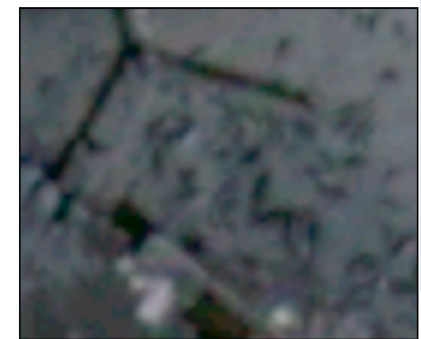
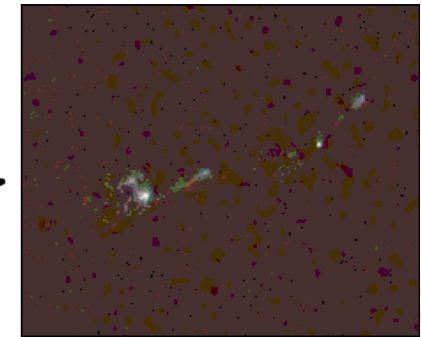
# Objective



## Raw Level 1B



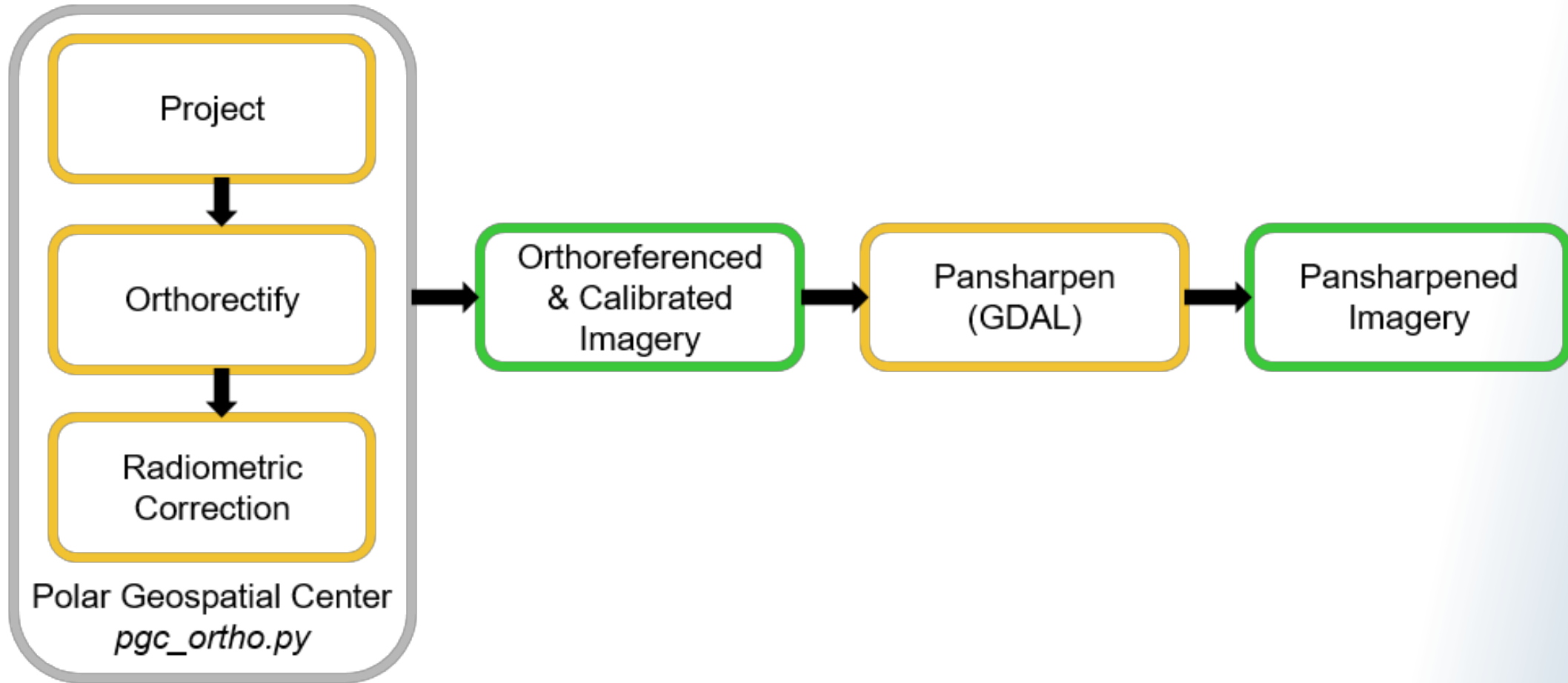
## Level 3D



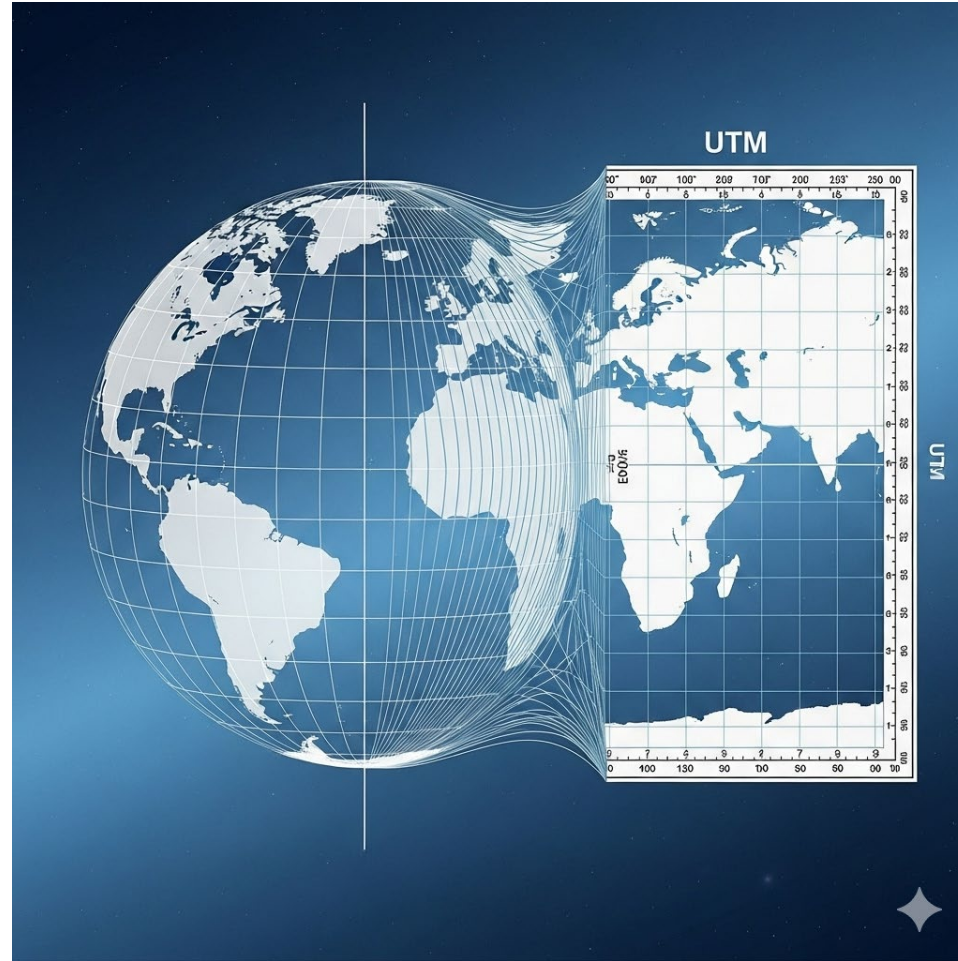
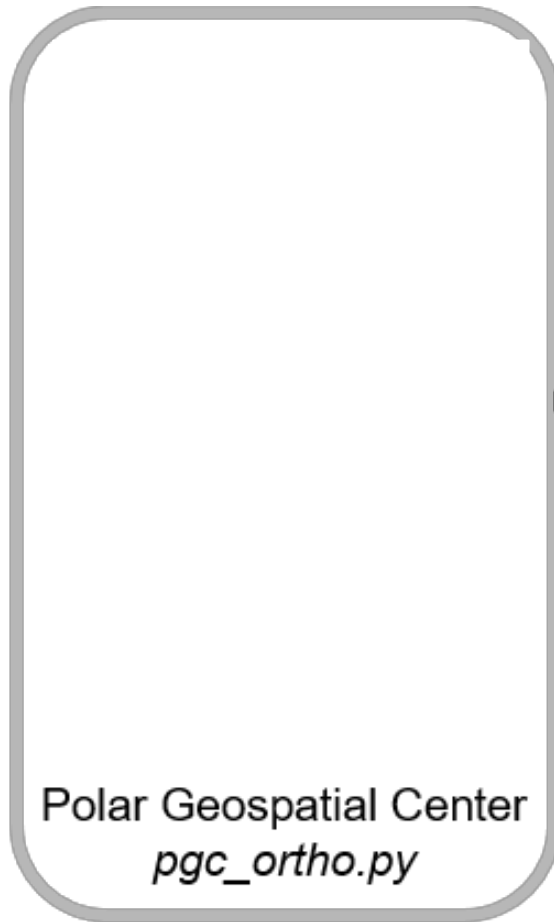
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# Preprocessing Methods

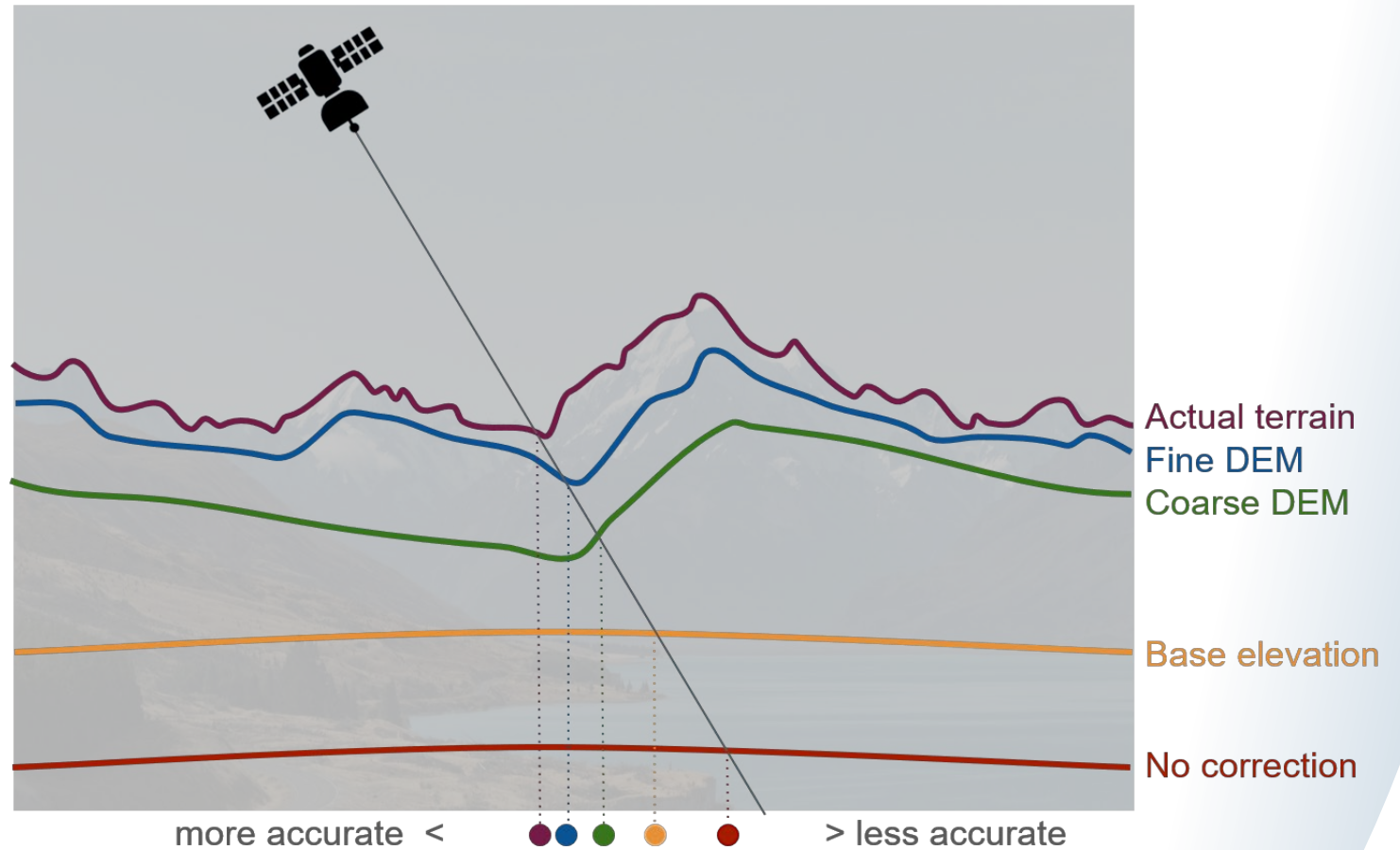
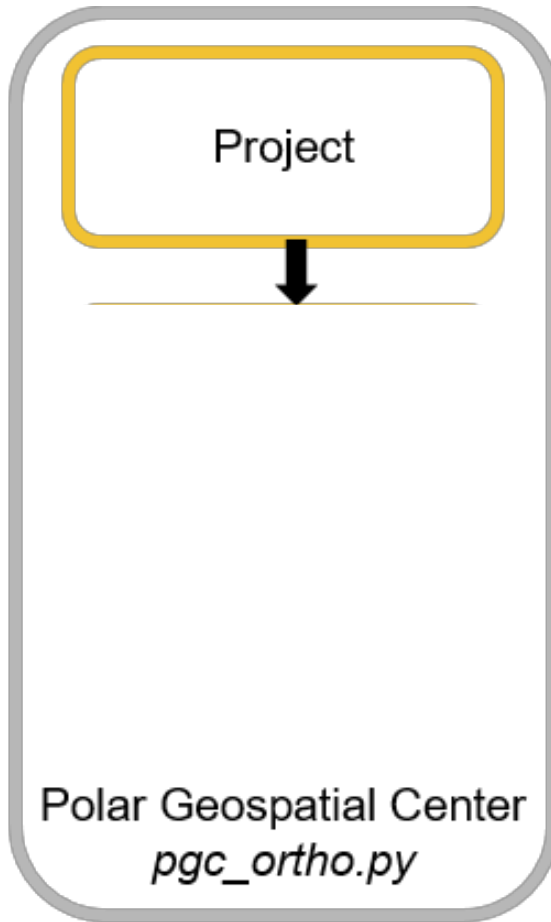


# Preprocessing Methods

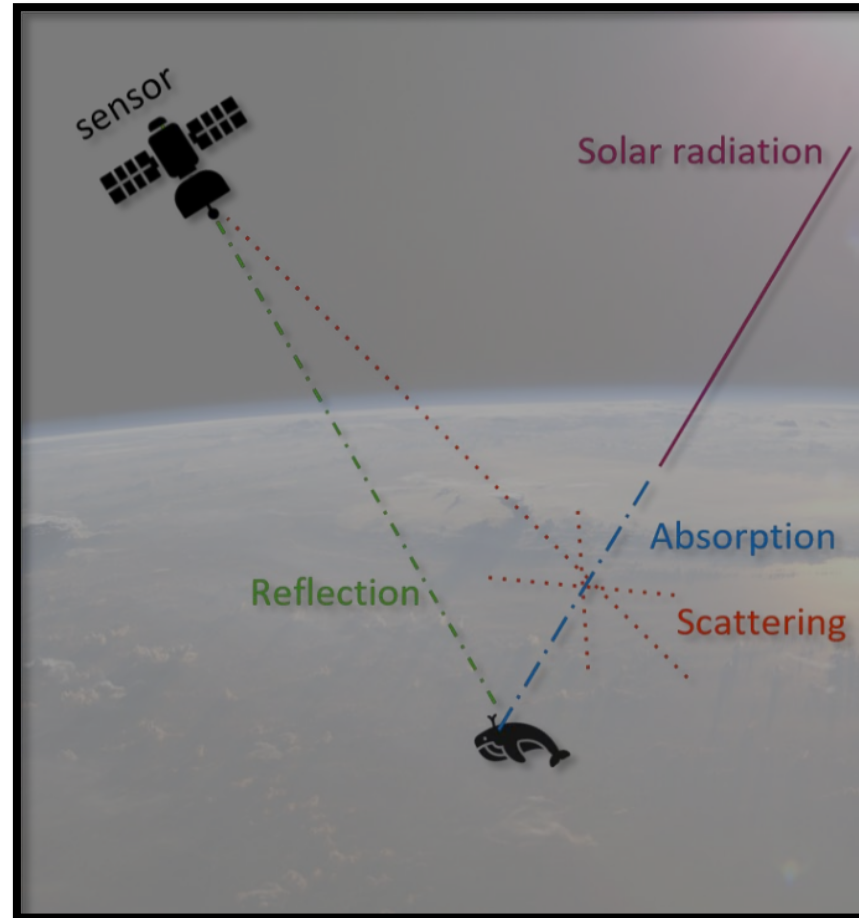
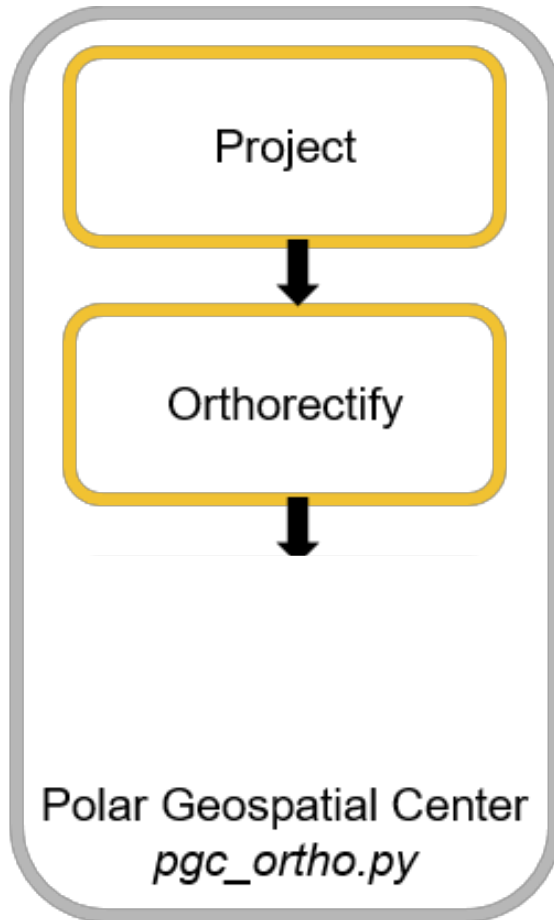




# Preprocessing Methods



# Preprocessing Methods



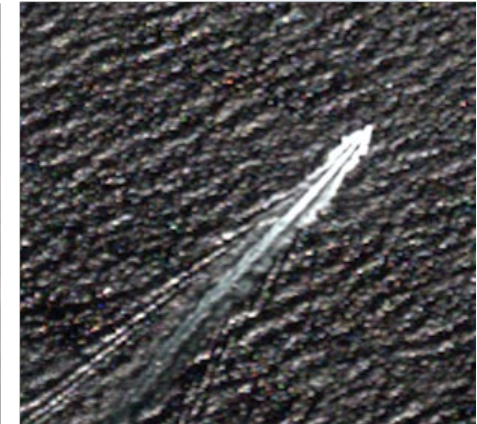
Ideal

Not Ideal

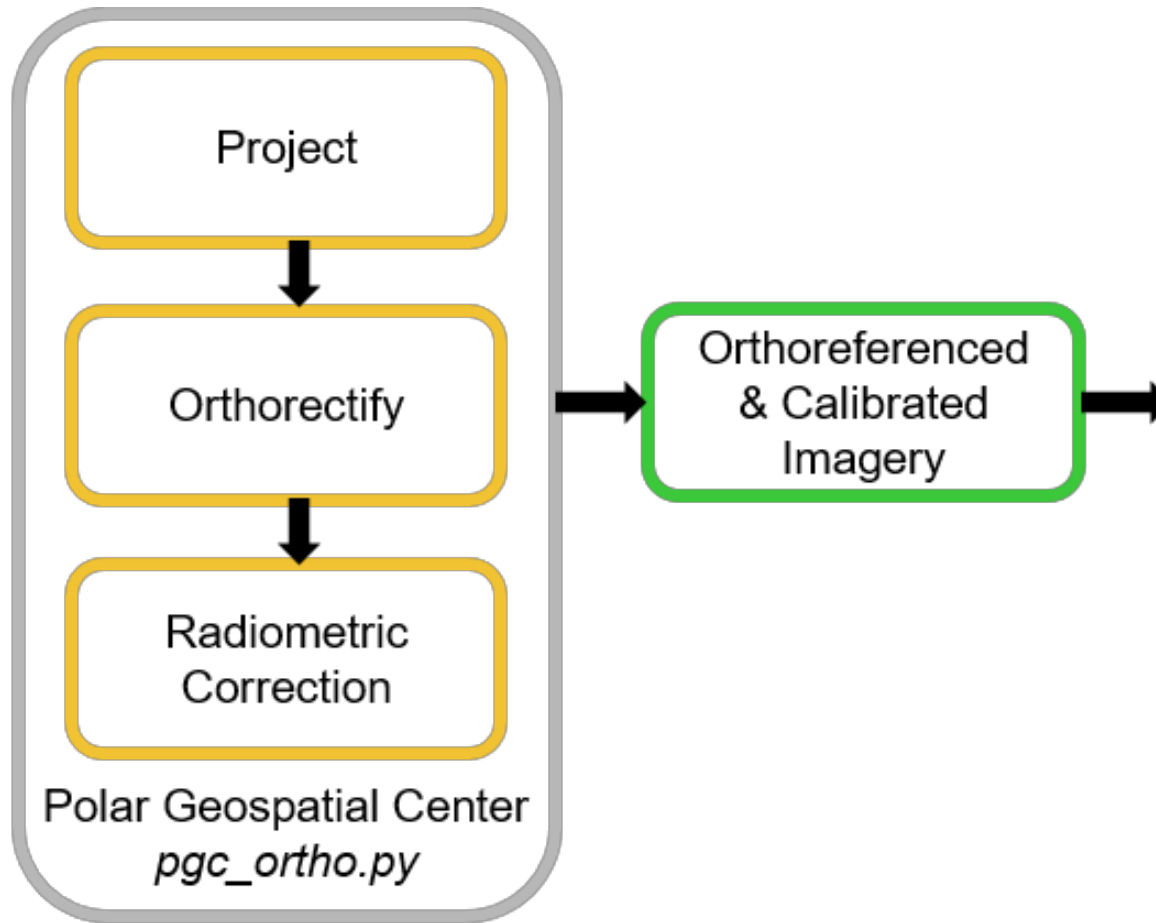
Vessel



VHR Satellite

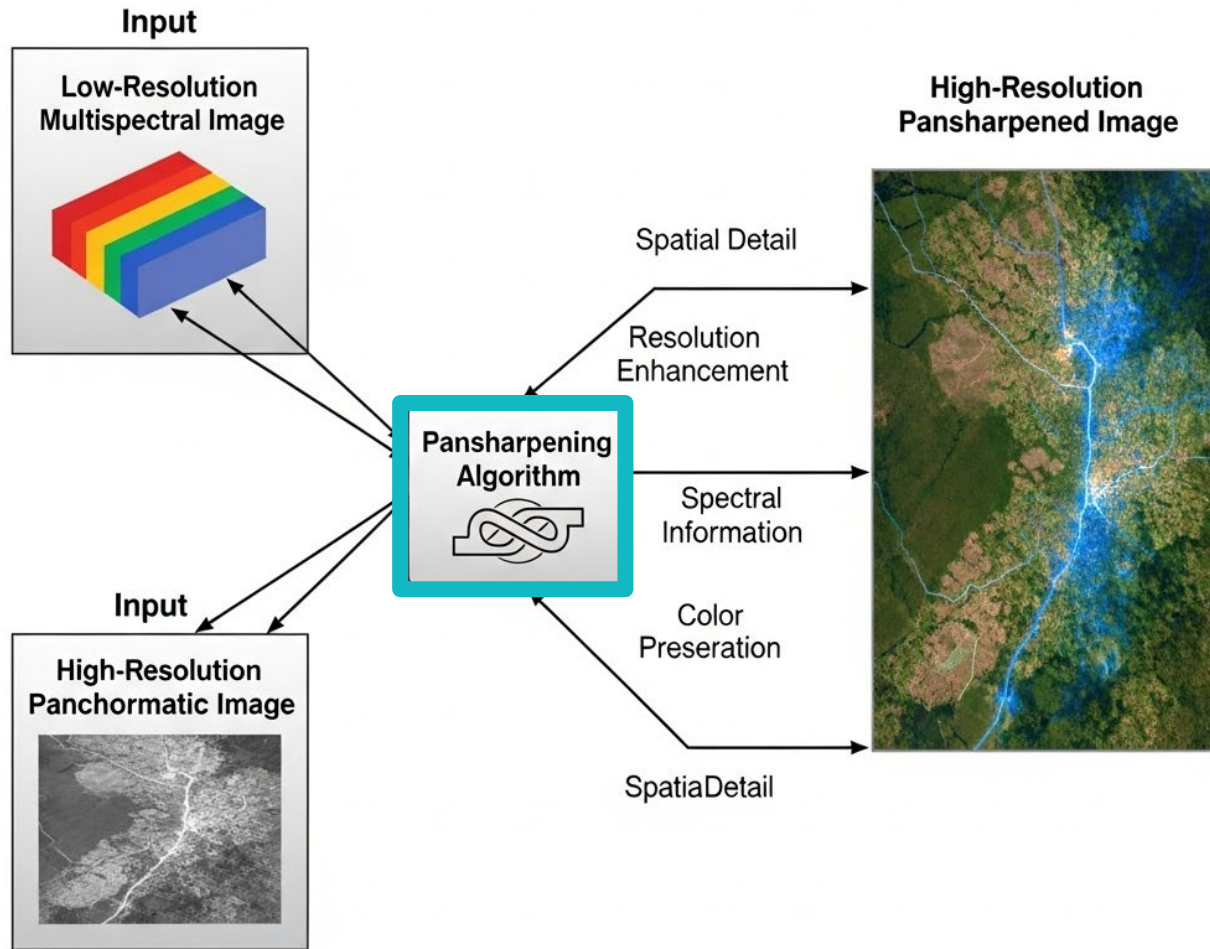


# Preprocessing Methods





# Preprocessing Methods



- Intensity-Hue-Saturation
- Gram-Schmidt
- Brovey

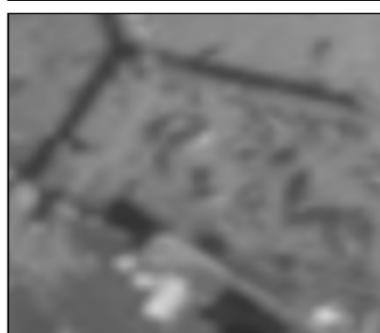
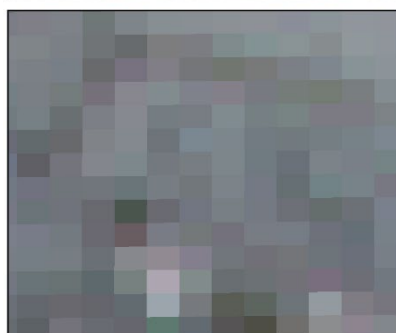
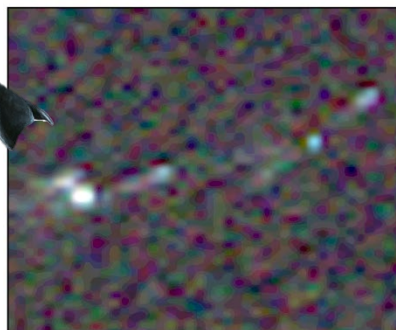
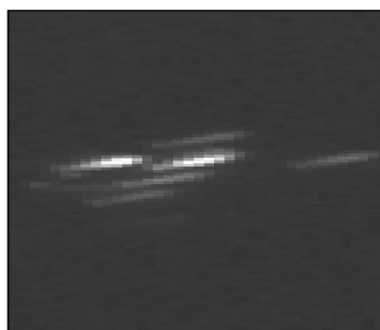
# Results

## Level 1B

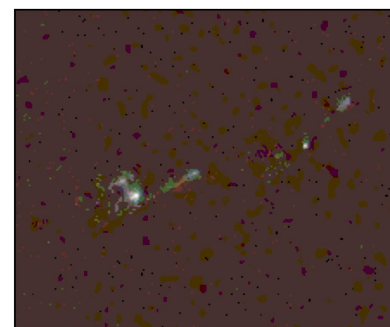
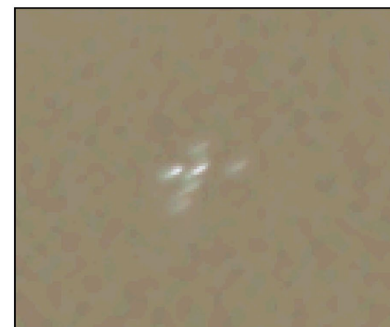


MSI

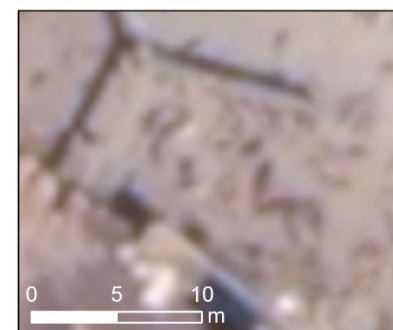
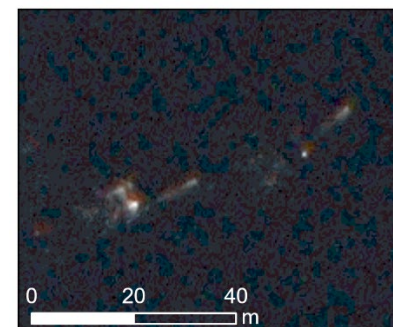
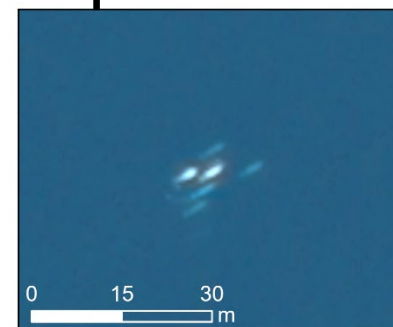
Pan





## Level 3D



## Preprocessed



# Conclusions

- Higher level satellite products  proprietary methods limit transparency & reproducibility.
- Maxar processing workflow changes as technology matures  discrepancies between images processed from different time periods.
- This work presents the first open-source, standardized preprocessing workflow specifically for enhancing marine mammal detections.
- Making satellite image processing more accessible fosters broader collaboration & aligns with international efforts & best practices.



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# Acknowledgments



# GAI A

The logo consists of the letters 'GAI A' in a bold, white, sans-serif font. A white satellite with solar panels is depicted in orbit around the lowercase letter 'i'. The orbit is represented by a thin white line that loops around the 'i' and extends towards the 'A'.

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