



Detecting Wetland Fragmentation using InSAR and Deep Learning

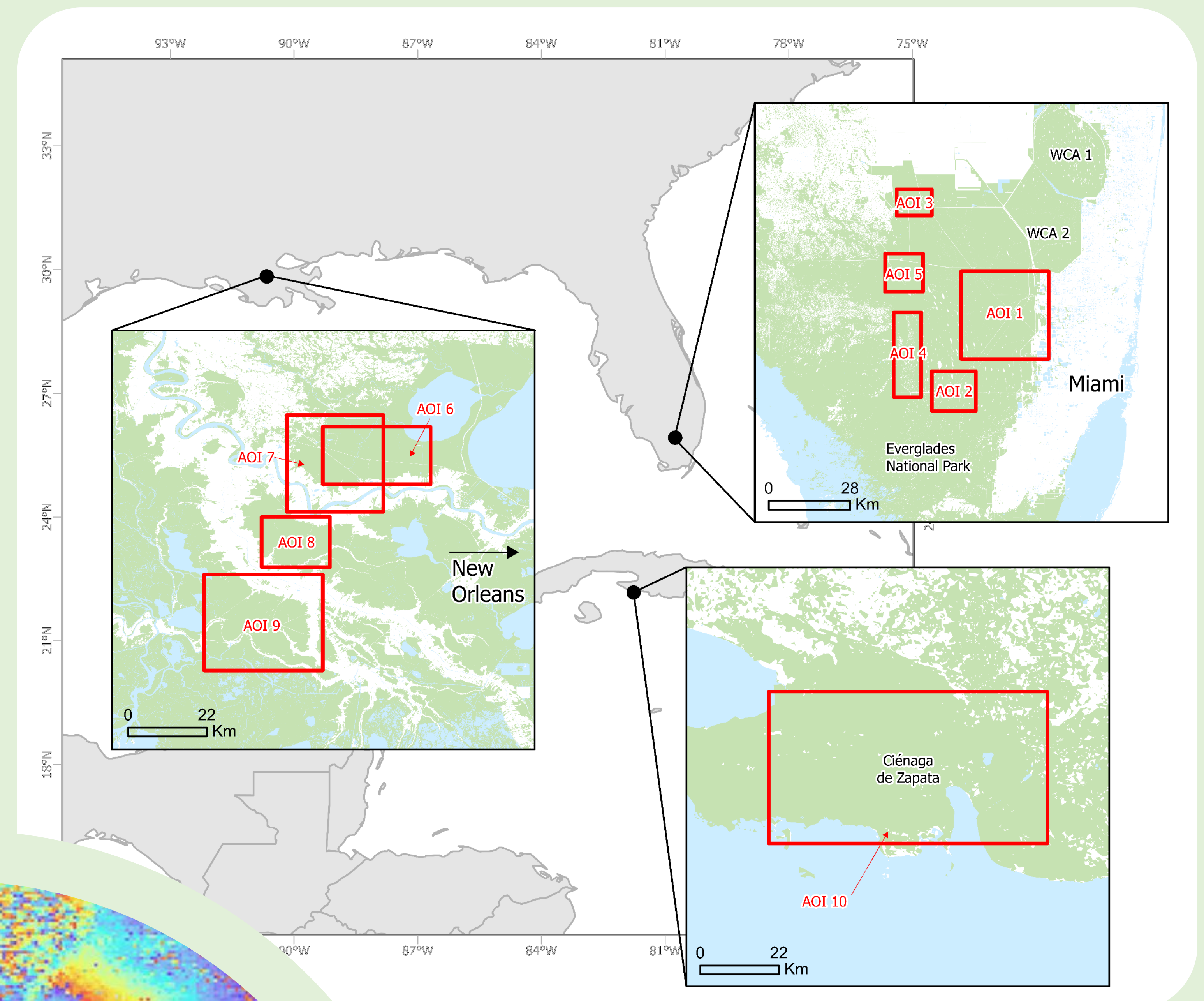
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Background

1

The construction of roads, channels and water control schemes has significantly impacted wetlands globally and altered natural hydrological processes. These **barriers disrupt free intra-wetland species and nutrient movement** and have led to wetland degradation and loss. The identification of such features is crucial for the restoration of impacted wetlands. In this study Interferometric SAR (InSAR) is used in combination with Deep Learning techniques to **identify hydrological barriers** in several wetlands.



2 Methodology

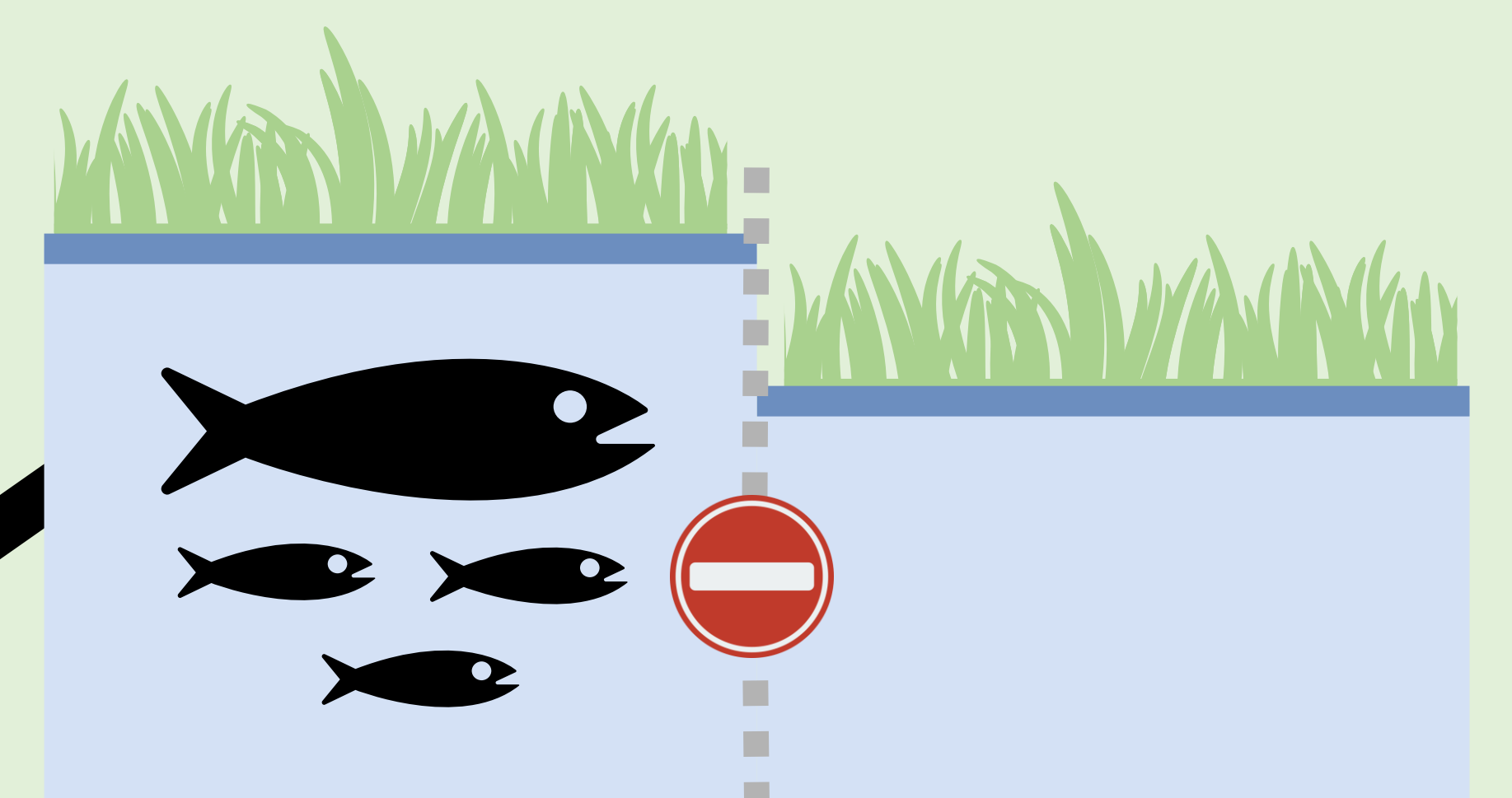
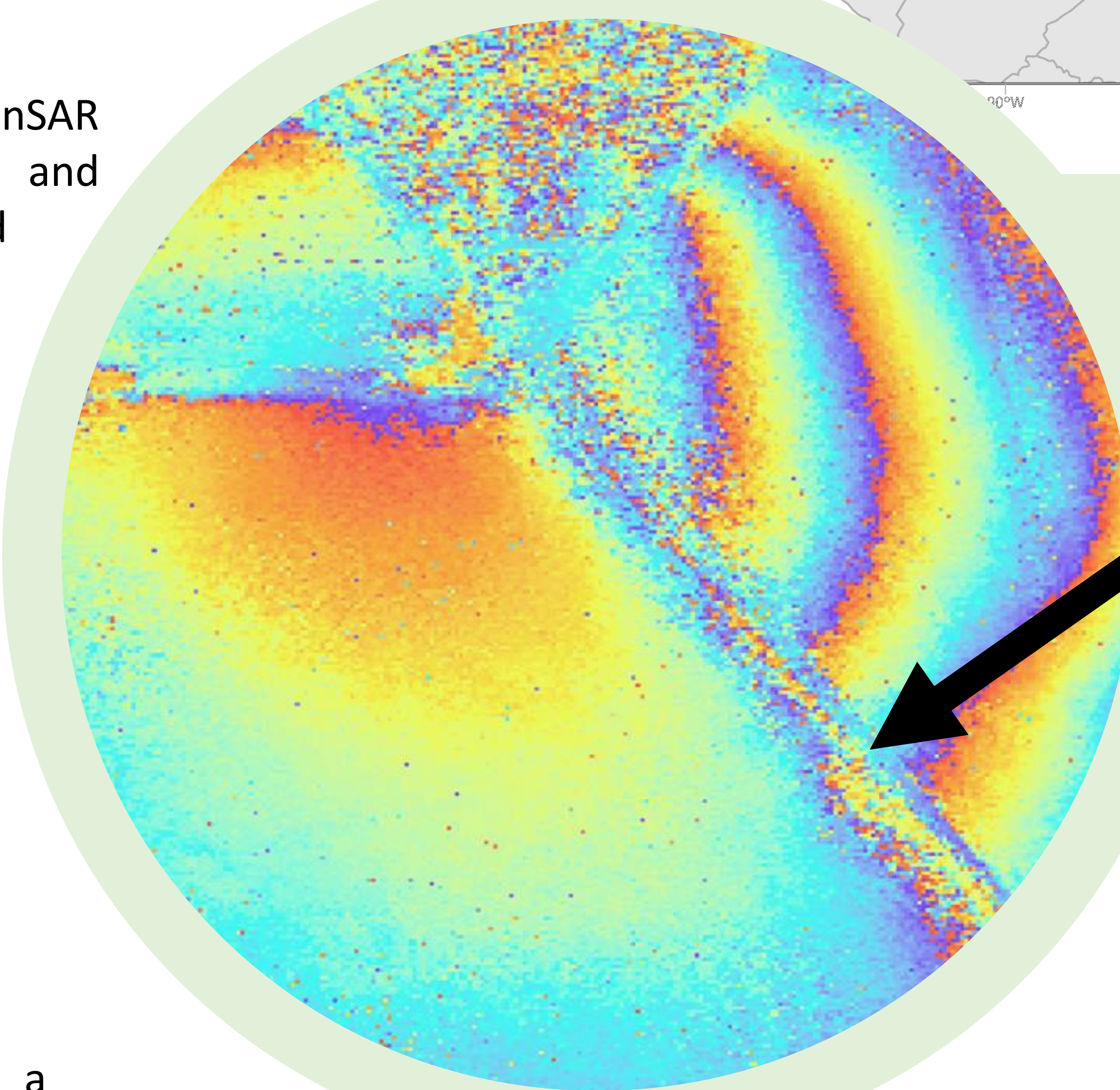
I - II A training dataset is created from InSAR imagery over several areas of interest and combined with manually delineated ground truth masks. **III** The presence of line features is predicted using a UNet-based supervised segmentation model. **IV** The performance of the model is assessed based on length of predicted features using Precision, Recall and F1 Score:

$$\text{Precision} = \frac{\text{True Positives}}{(\text{True Positives} + \text{False Positives})}$$

$$\text{Recall} = \frac{\text{True Positives}}{(\text{True Positives} + \text{False Negatives})}$$

$$\text{F1 Score} = 2 \times \frac{\text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}}$$

V The predicted features are filtered in a final post-processing step to determine the location of the barriers.



3

Model Predictions

	Precision	Recall	F1
Everglades	0.907	0.786	0.842
Louisiana	0.636	0.495	0.557
Zapata	0.552	0.562	0.557

Highest accuracies are found in the Everglades, lowest in the Ciénaga de Zapata.

Generally, the model achieves higher Precision than Recall, showing that while the model misses some barriers, it is less likely to make false positive predictions.

