# Simultaneous visual and IR UAV imaging of littoral systems for AI driven change detection

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***Figure 1:*** *Carmel River State Beach (Approx. 400m long), shown closed (**left, December, 2016**) and open (**right, January 2017**). Red arrows indicate regions of breach events. Water quality in Carmel Bay (offshore the beach) decreases when the river is open vs. closed.* ***Colored insert*** *is sample infrared (IR) UAV image (red is warm) taken of the Carmel River plume (purple) surrounded by the beach (orange) discharging into Carmel Bay (dark blue).*

## Methodology

- Combine visual and infrared UAV imagery using structure-from-motion and in-situ observations
  - Location will be Carmel River State Beach (Figure to left)
  - In-situ measurements will be made (Winter FY18) from inside and outside the river mouth.
  - UAV surveys will provide morphological and water quality spatial variability
- UAV images will be combined with an existing deep learning (AI) model to improve classification and annotation of heterogeneous littoral environments including infrastructure.

## Deliverables

- Interdisciplinary research projects for (at least) two METOC thesis students
- Development of quantitative UAV change detection methods for littoral environments
- Development of a deep learning model for heterogeneous littoral image classification
- Technical, scientific reporting and publication

## Why/Objectives

- Rapid change and significant damage to infrastructure occur in littoral systems after extreme events

**Objectives**:

- Quantify the morphological change of littoral systems in response to extreme events (beach breaching)
- Monitor the water quality of the river after the breach (Figure1 inset)
- Use UAV visual and IR imagery to expand a deep learning model to account for landscape heterogeneity for deep learning change detection and prediction of vulnerable areas.

NPS PRAESTANTIA PER SCIENTIAM

FY18 Call for Proposals

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