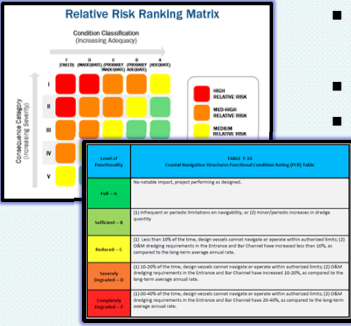


### INFORMING COASTAL STRUCTURE MAINTENANCE WITH VESSEL TRAFFIC BEHAVIOR

#### CHALLENGE



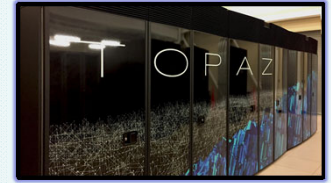
- > 1200 Structures Need Maintaining
- Limited Resources...
- FCR lacks robust "navigability" metrics.



- How can we consider vessel traffic when prioritizing structure maintenance?

#### SOLUTION

- Develop suite of vessel performance metrics
- Mine Marine Cadastre AIS data
  - > 1 billion vessel position reports since 2009
- High Performance Computing (HPC) enables portfolio-scale extraction of vessel metrics



#### METRICS

Metric	Measures	Symbol
Entropy	Traffic diversity.	$E_t$
Seasonality	Traffic seasonality.	$F_s$
Average Distance	Traffic proximity.	$\bar{x}$

#### Seasonal Decomposition

$$y = T + S + N$$

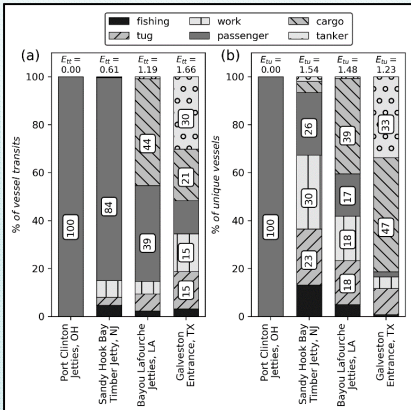
y - signal S - seasonal  
T - trend N - noise

$$F_s = 1 - \frac{Var(N)}{Var(N + S)}$$

$$E_t = - \sum_{i=0}^n p_i \log(p_i)$$

#### EXAMPLES

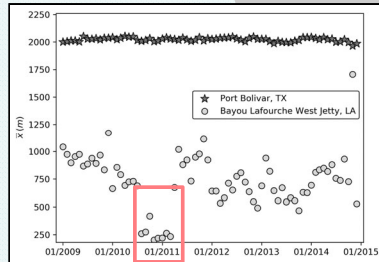
##### Low-to-High Vessel Type Entropy



Little too close...



##### Variable-vs-Static Average Distance



Deepwater Horizon Spill and Recovery

#### RESULTS

##### Traffic-Based Structure Groups

- Each structure described by 20 vessel metrics
- Structures grouped by similarity in vessel behavior
- Metrics can flexibly incorporate many factors to support management objectives



##### Low-vs-High Transit Seasonality

