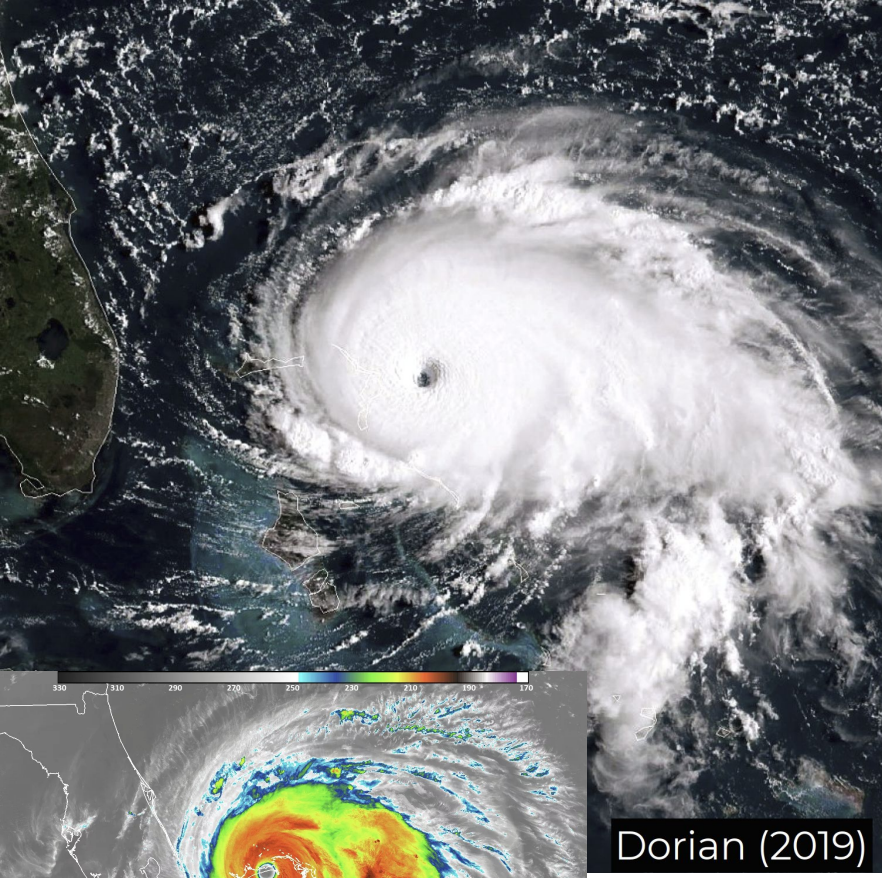

Identifying Distributional Differences in Convective Evolution Prior to Rapid Intensification in Tropical Cyclones

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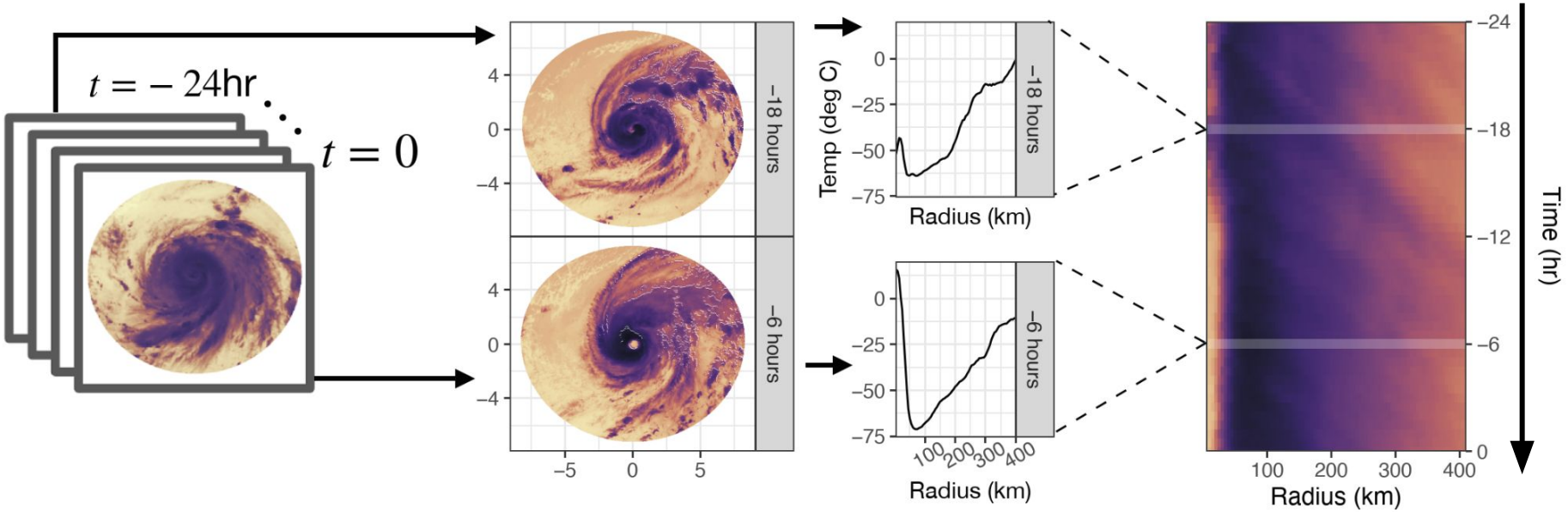
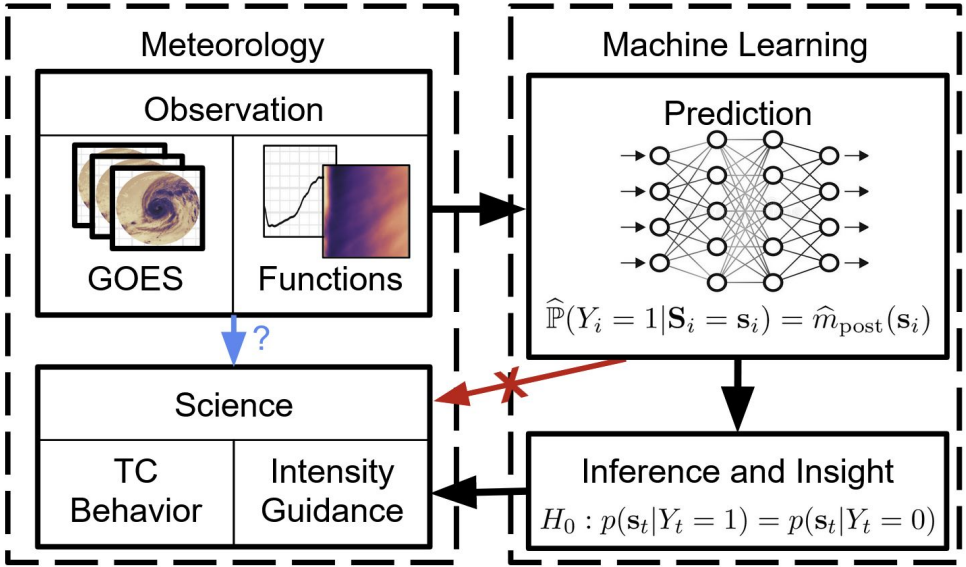
Infrared imagery serves as a proxy for deep convection. ORB functions summarize convective structure over time.



Radial profiles are one example of an ORB function. For more details, see:

Trey McNeely, Ann B Lee, Kimberly M Wood, and Dorit Hammerling. Unlocking GOES: A statistical framework for quantifying the evolution of convective structure in tropical cyclones. *Journal of Applied Meteorology and Climatology*, 59(10):1671–1689, 2020.

Reformulating a two-sample test as a prediction problem enables use of powerful ML methods (e.g. CNN).



$$H_0 : p(s \mid Y = 1) = p(s \mid Y = 0) \quad \forall s \in \mathcal{S}$$

$$H_0 : \mathbb{P}(Y = 1 \mid S = s) = \mathbb{P}(Y = 1) \quad \forall s \in \mathcal{S}$$

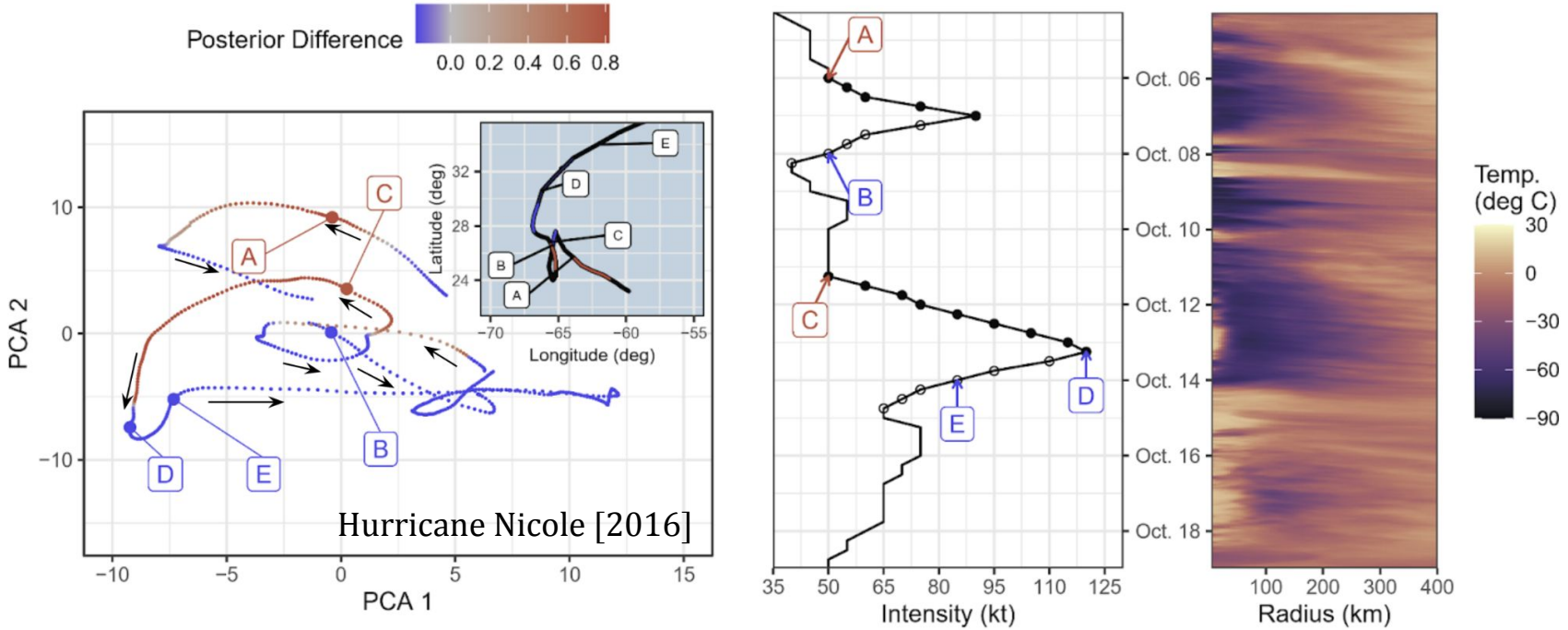
(equivalent via Bayes Theorem)

Is the distribution of convective evolution different prior to rapid intensification?

YES, it differs in both the North Atlantic and eastern North Pacific.

If the two distributions differ, **how** do they differ?
We use posterior differences to investigate.

Posterior Difference: $\lambda(s) = \widehat{\mathbb{P}}\,(Y = 1 \mid S = s) - \widehat{\mathbb{P}}\,(Y = 1)$



Future Work

- Accounting for confounding variables (e.g. vertical wind shear)
- Assessing signals in IR prior to event onset
- Development of associated forecasting pipeline

Full North Atlantic results with sample trajectories