

# Breaking Through Tropical Cyclone Intensity Prediction: A Foundation Model Prithvi-TC

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# Problems & Ideas

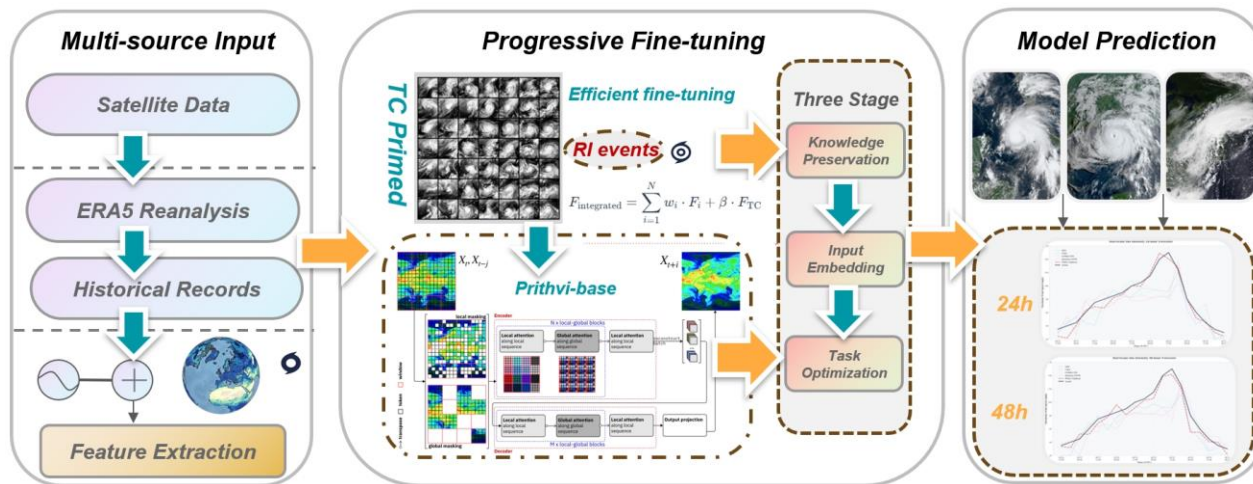
- Problems of Tropical Cyclone Intensity Prediction:
  - Current TC intensity prediction models struggle with accuracy, especially for rapid intensification (RI) events, where forecast errors are 2-3 times larger than non-RI events, while existing deep learning weather models lack TC-specific focus
  - Ideas: Adapt the Prithvi WxC weather foundation model through a three-stage fine-tuning framework that combines general weather knowledge with TC-specific features, using a novel attention mechanism that balances local TC patterns with global environmental conditions.



Tropical Cyclone Cloud Graph

# Main Contributions

- Contributions:
  - Developed a specialized TC intensity prediction model (Prithvi-TC) that achieves state-of-the-art performance, particularly in RI event prediction;
  - Introduced a novel data alignment strategy and progressive fine-tuning protocol that effectively bridges general weather prediction and TC-specific forecasting;
  - Demonstrated significant improvements over existing methods



Comprehensive architecture of the Prithvi-TC framework, illustrating the integration of multi-source data streams and progressive fine-tuning components for TC intensity prediction