

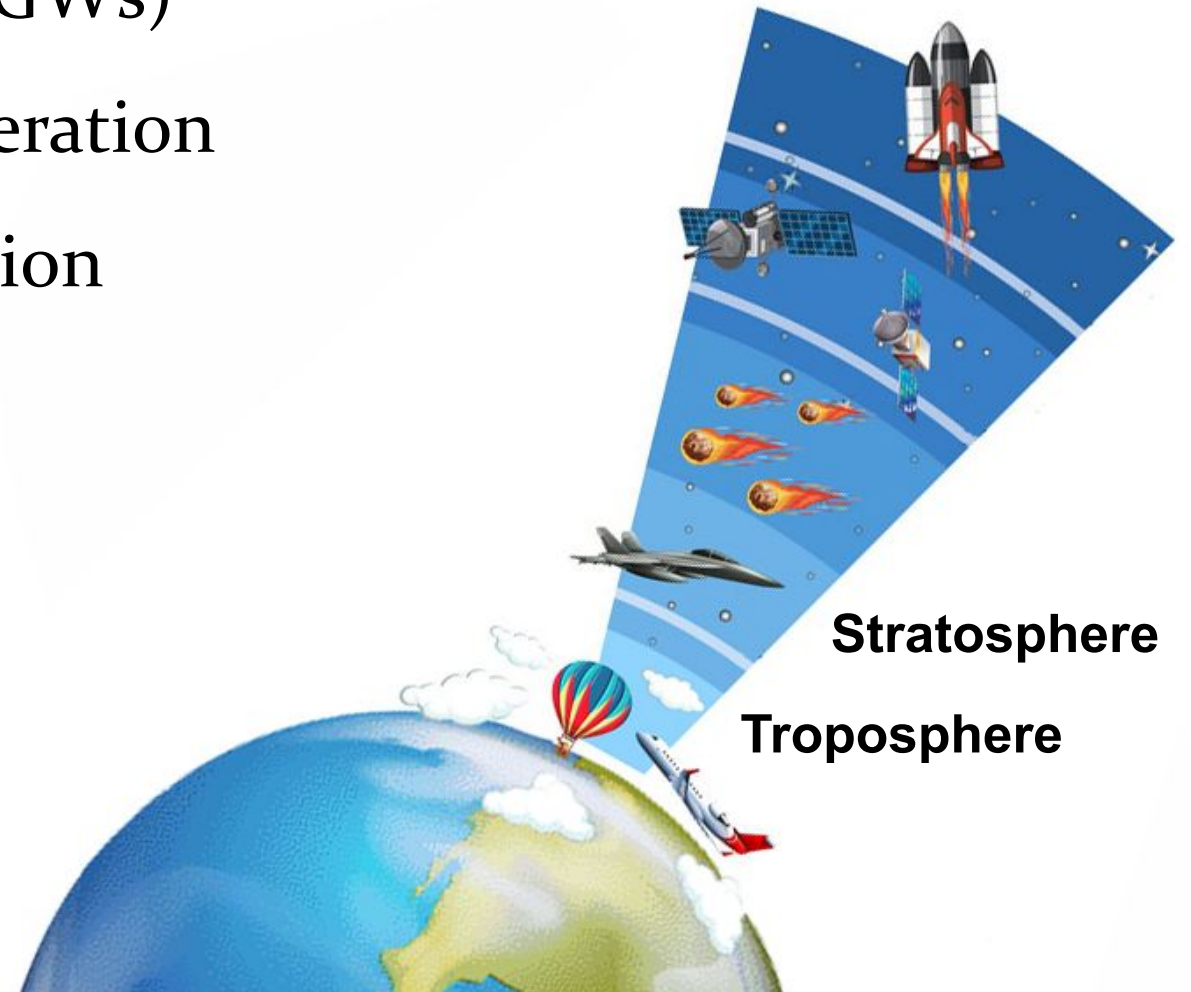
Studying Vertical Variability of Small-Scale Gravity Waves using GNSS-RO Temperature Measurements

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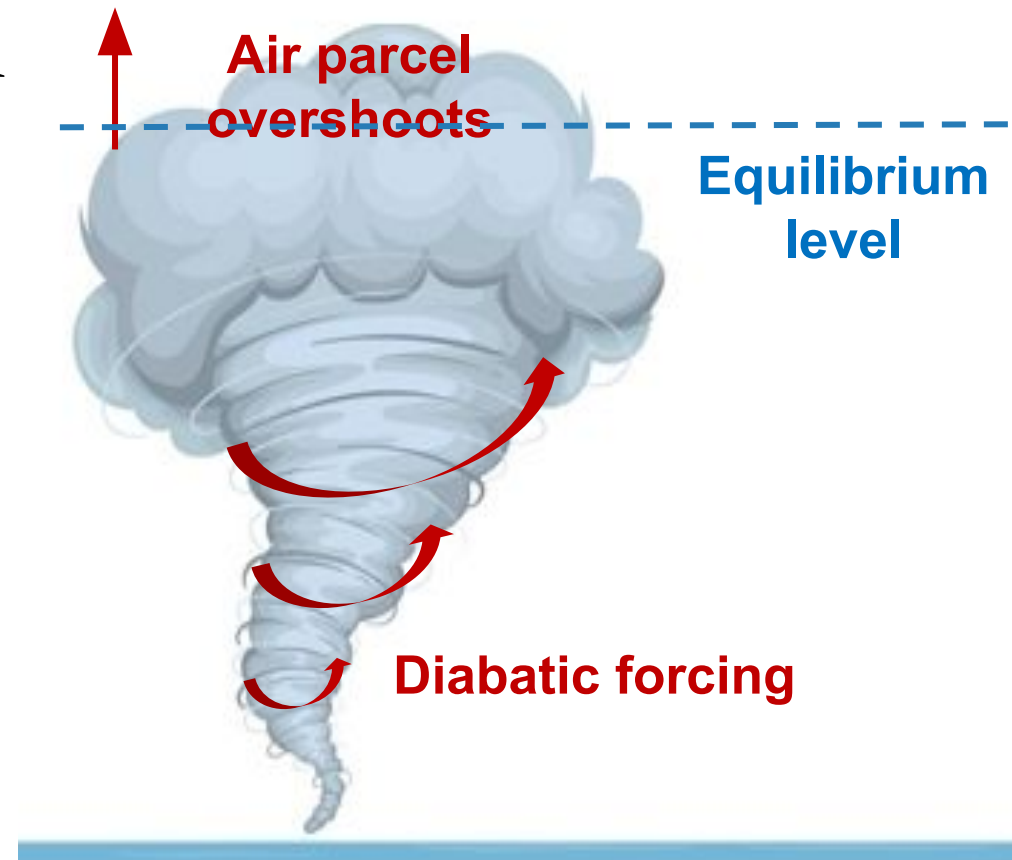
Introduction

- Gravity Waves (GWs)
- Convection generation
- Wind modification



Introduction

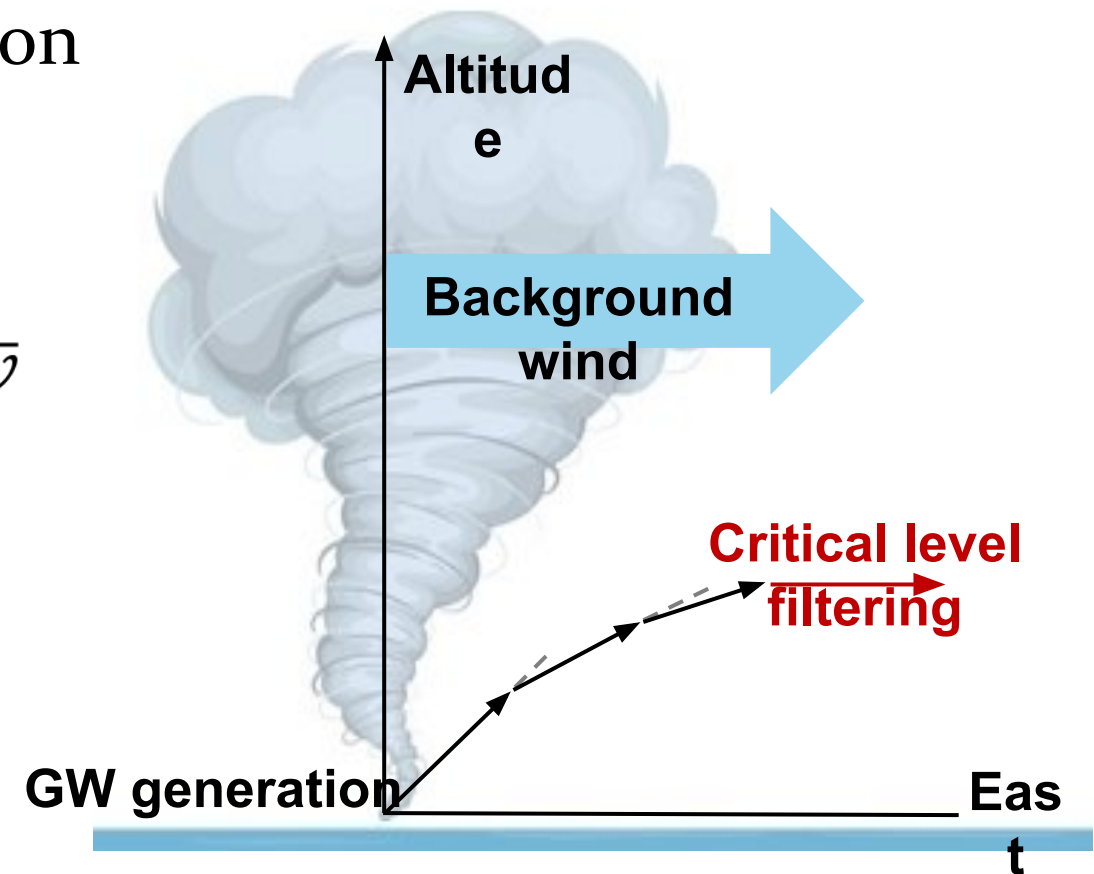
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Introduction

- Gravity Waves (GWs)
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$$\hat{\omega} = \omega - k \cdot \bar{u} - l \cdot \bar{v}$$



Current Stage

Challenge

- Identify small-scale GWs
- Analyze vertical variability
- Lack of high-resolution data

Objective

- Use GNSS-RO retrievals
- Characterize GW properties
- Explain driving mechanisms

Dataset

- GNSS – Radio Occultation
- High retrieval accuracy ($<0.5\text{K}$) → **COSMIC - 1 & 2**
- High vertical resolution ($<0.1\text{km}$) → **vertical wavelength down to**

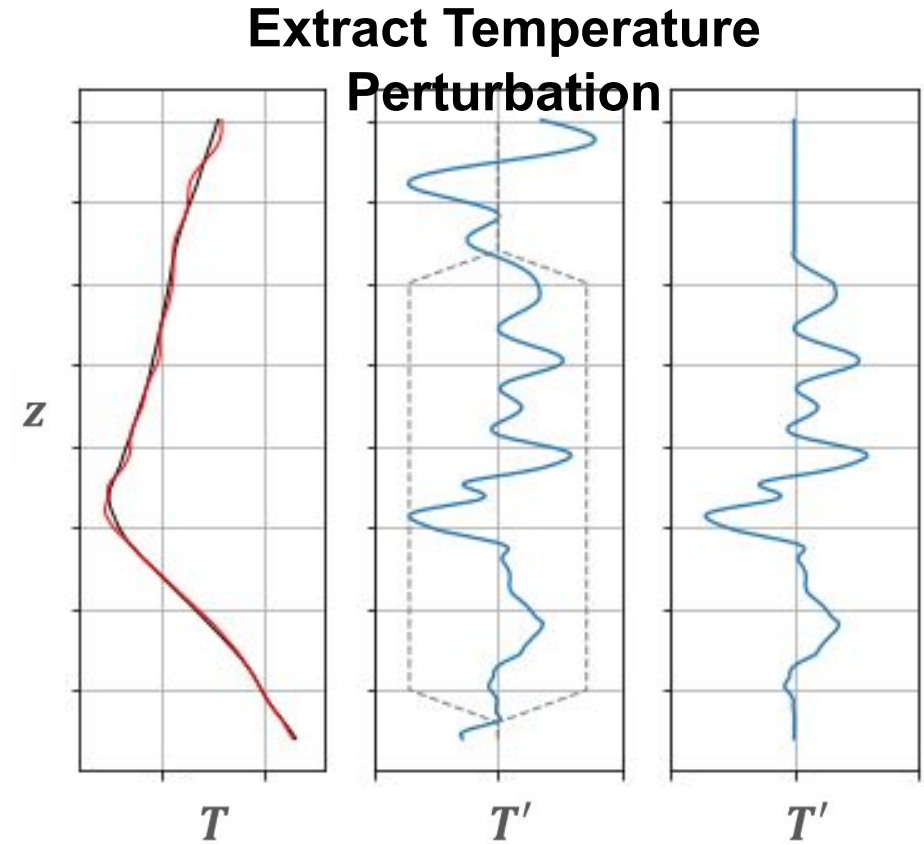


GW Identification

- GW-induced perturbation

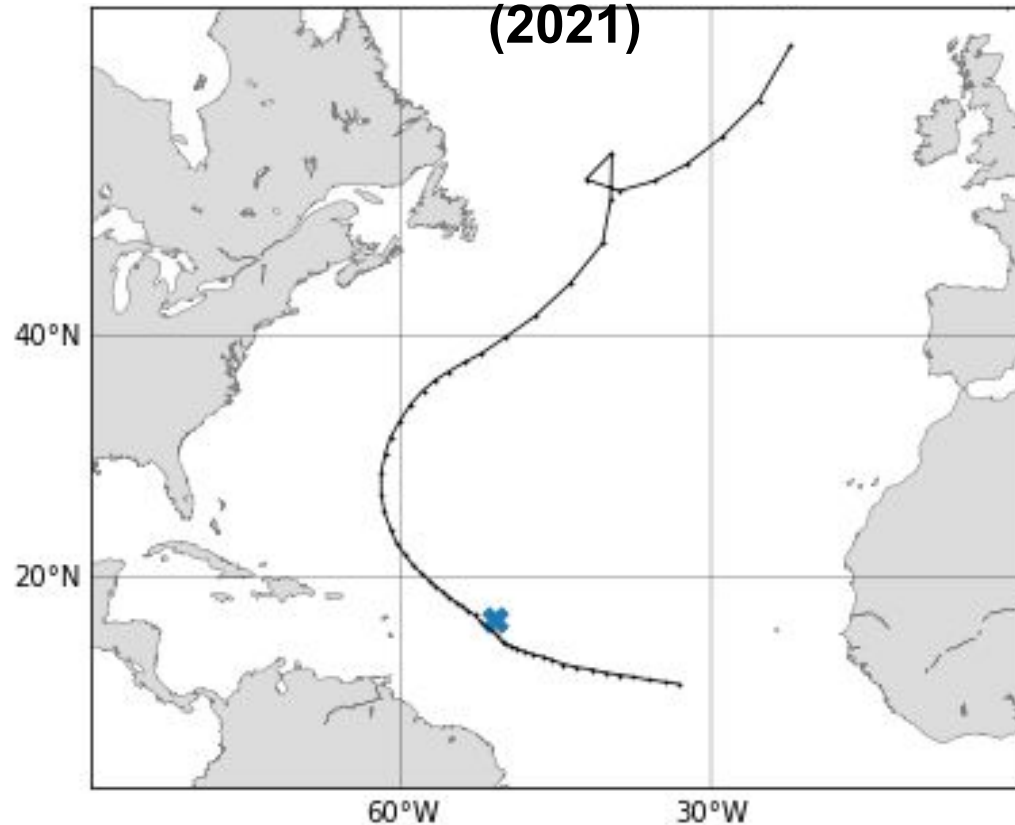
$$T'(z) = T(z) - T_0(z)$$

- Least Squares Wavelet Analysis

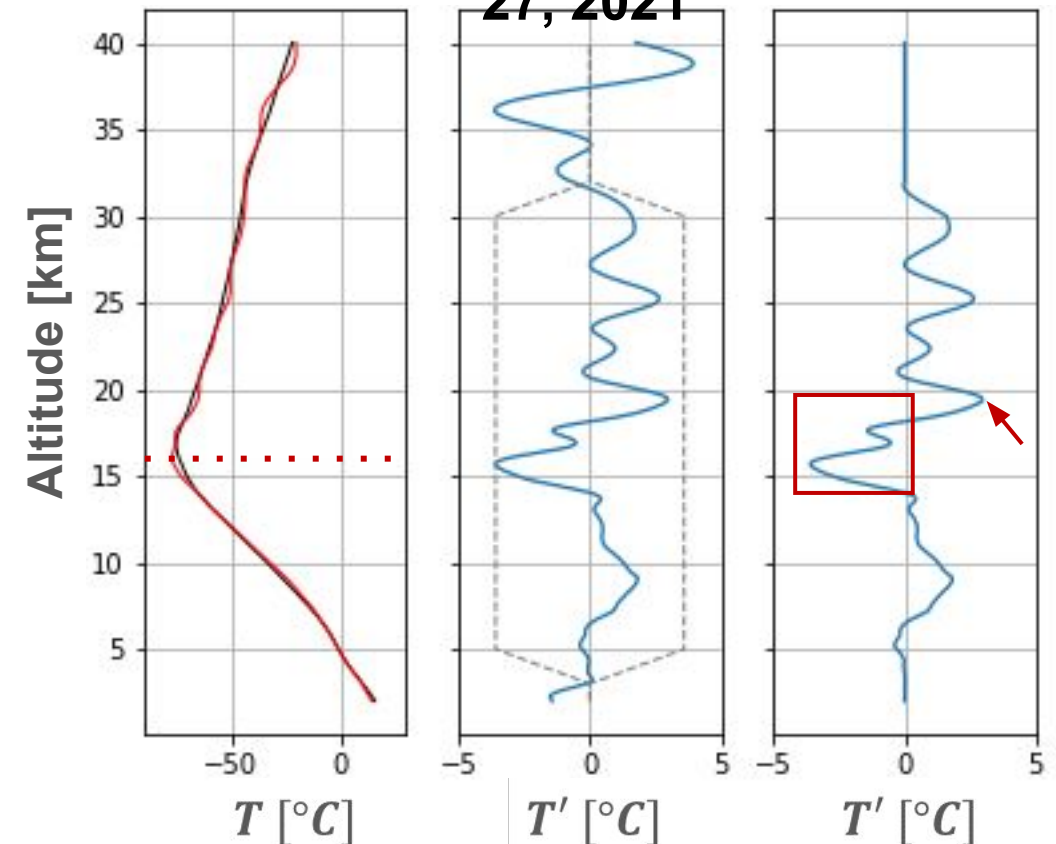


GW Generation and Variation

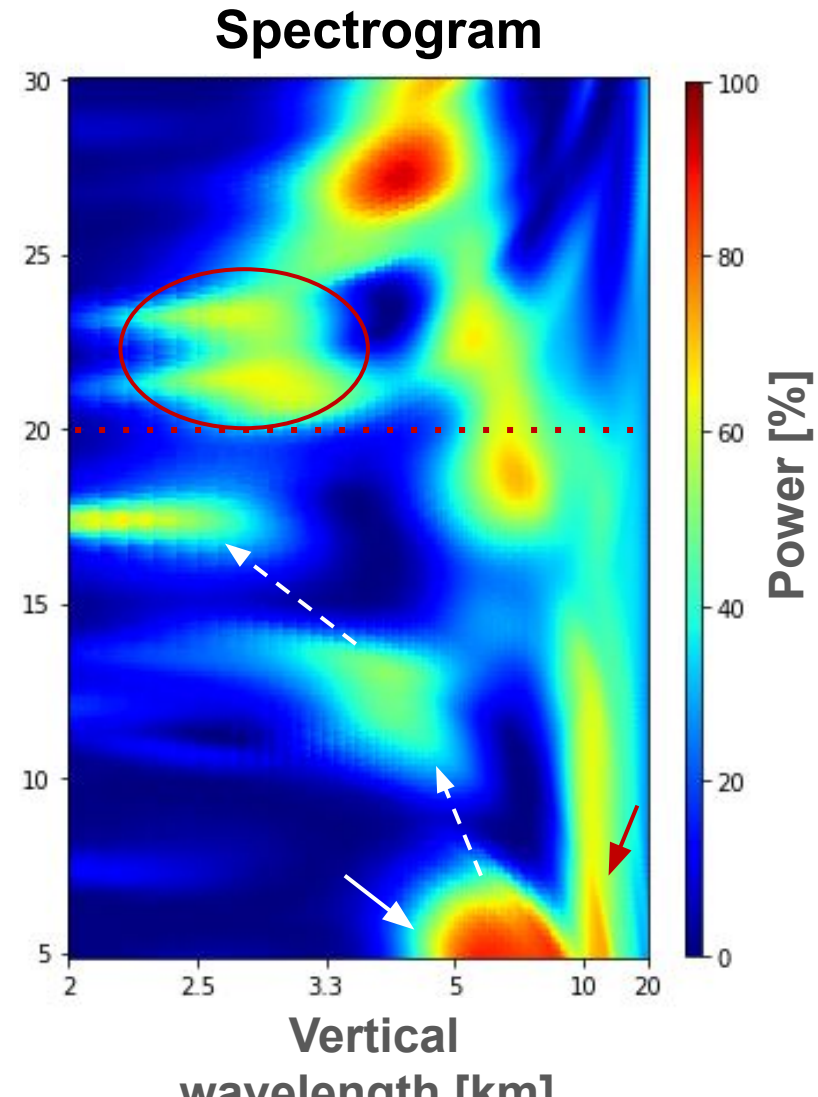
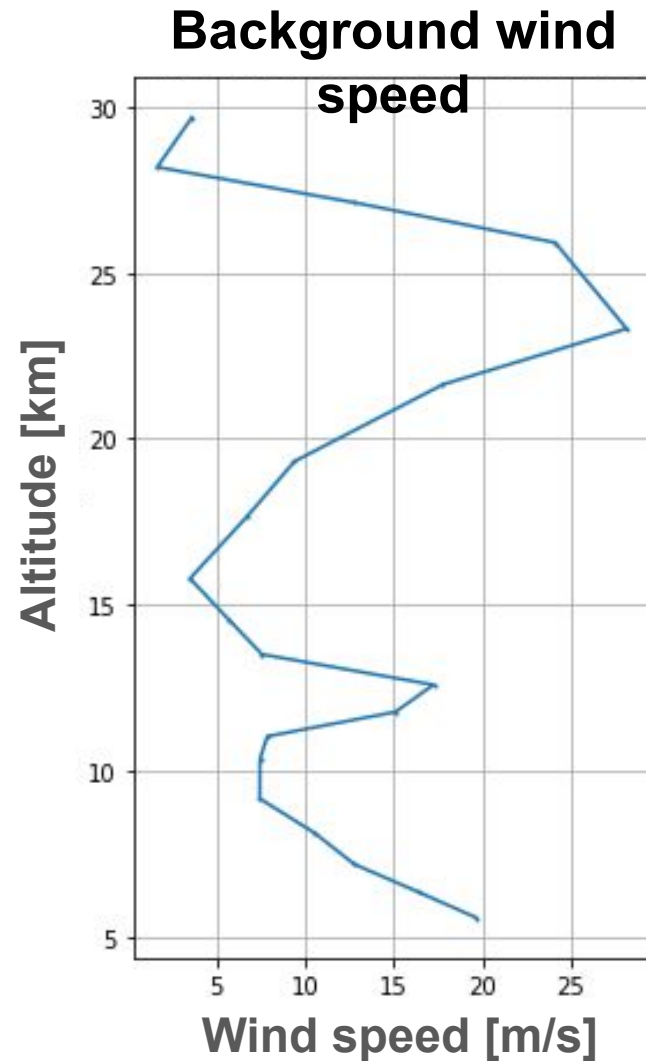
Best Track of Hurricane Sam
(2021)



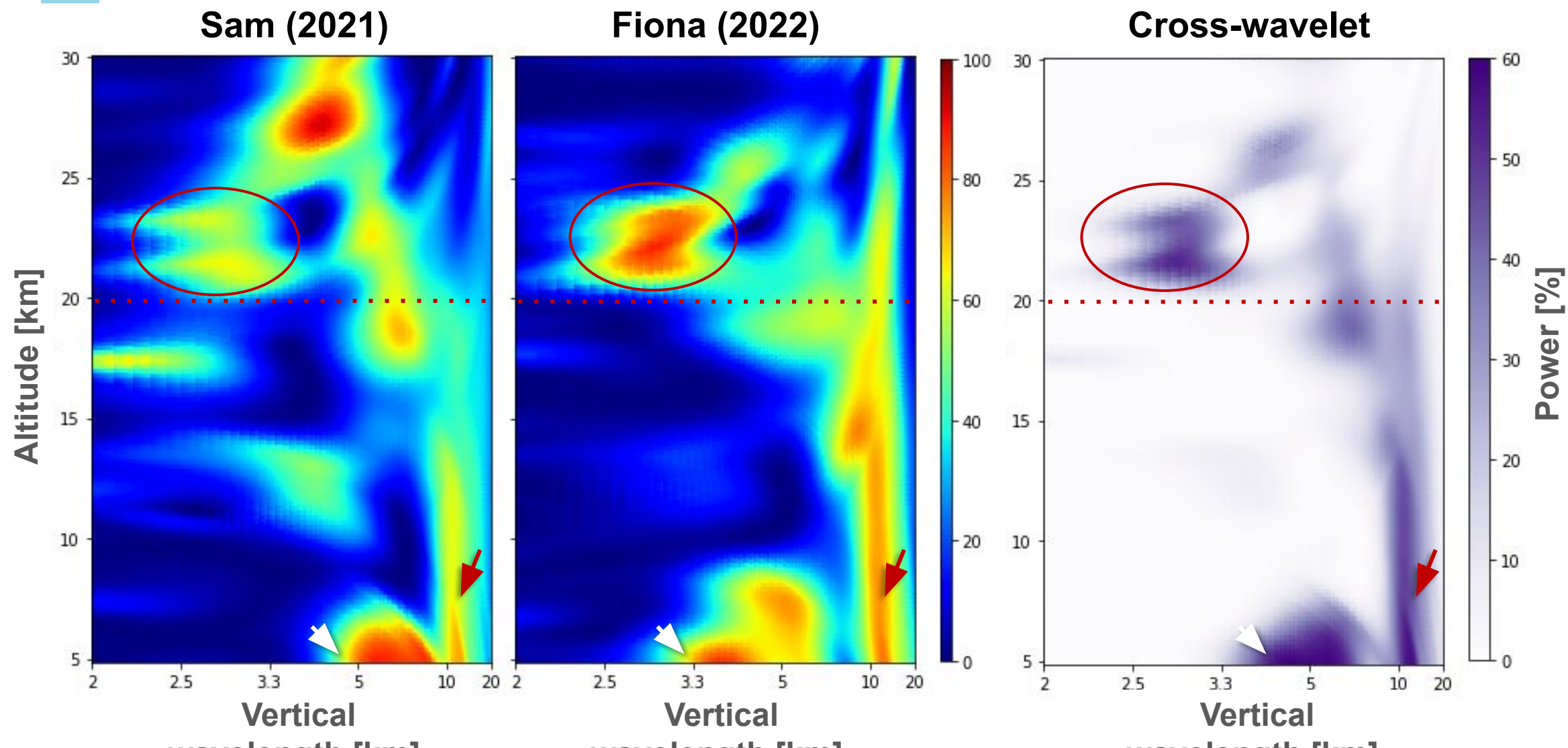
Captured at 5:32 UTC on Sept.
27, 2021



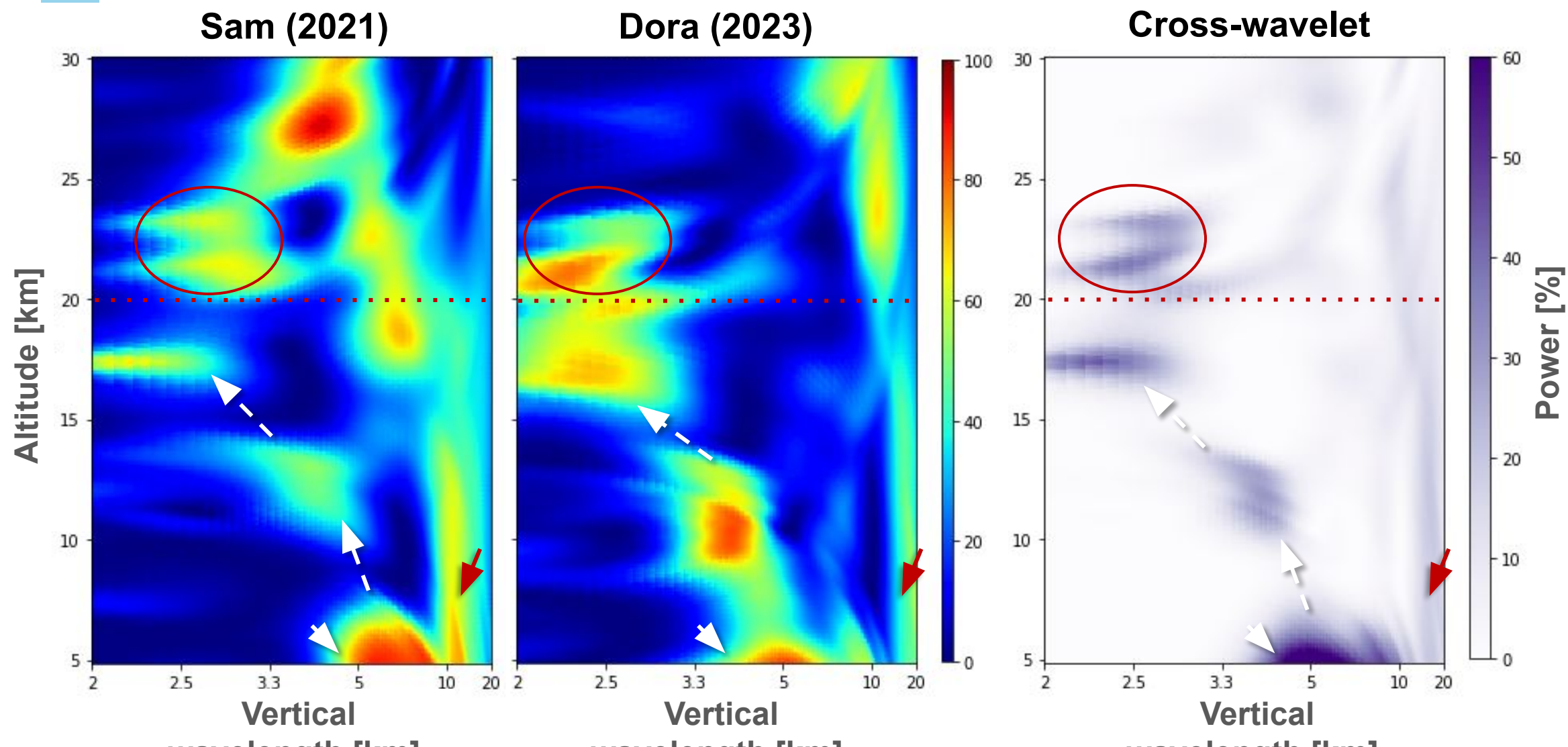
GW Generation and Variation



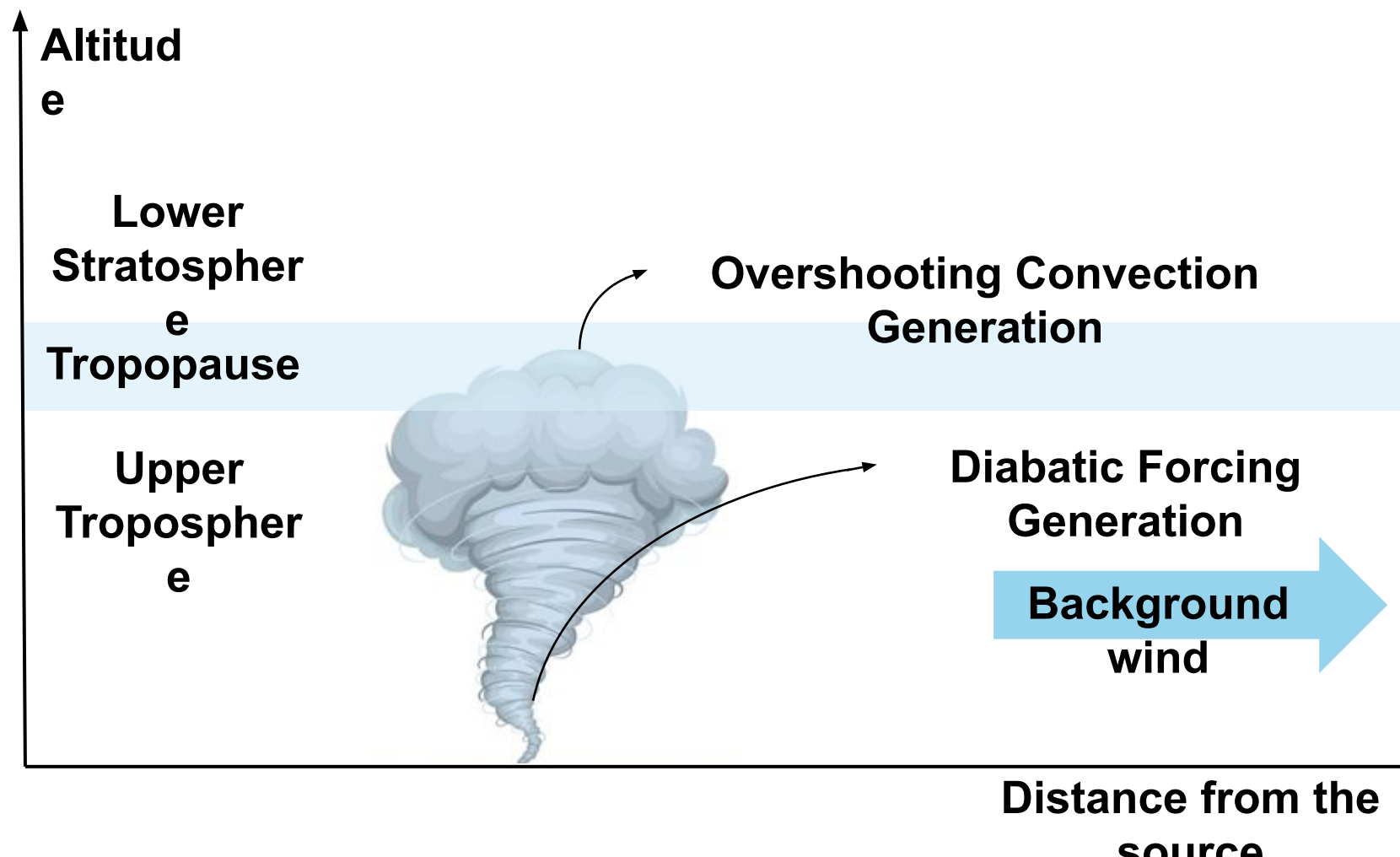
Similarity between Hurricanes



Similarity between Hurricanes



Two-layer convection



- Role of Tropopause :**
- ✓ Trap GWs in unstable layer
 - ✓ Excite GWs in stable layer

Conclusion

- Verified wave generation theories
- Identified three distinct types of GWs
- Demonstrated wind filtering effects
- Adopted two-layer convection concept

Thank you!

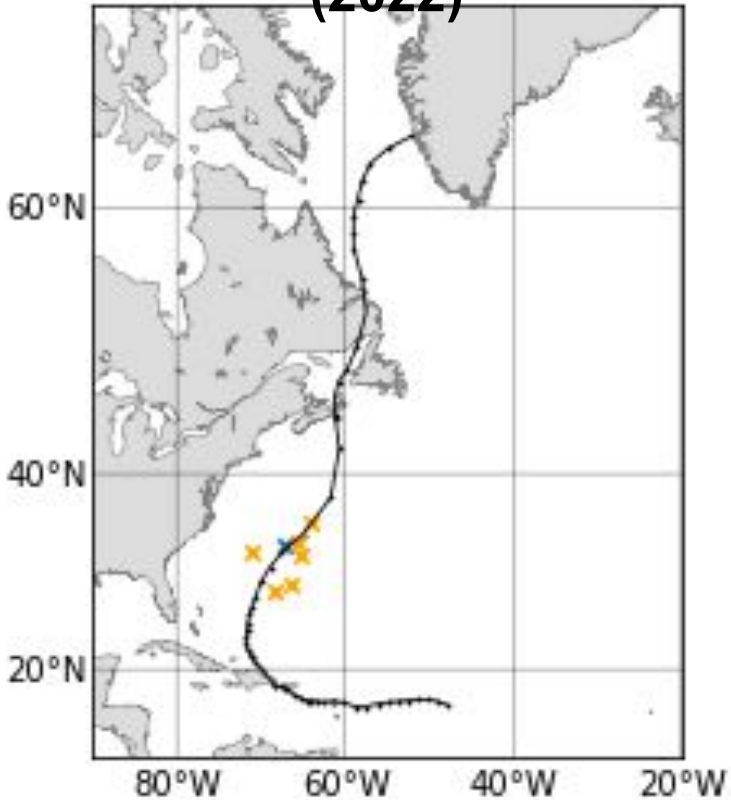
“There is no pride on earth like the pride of intellect and science.”



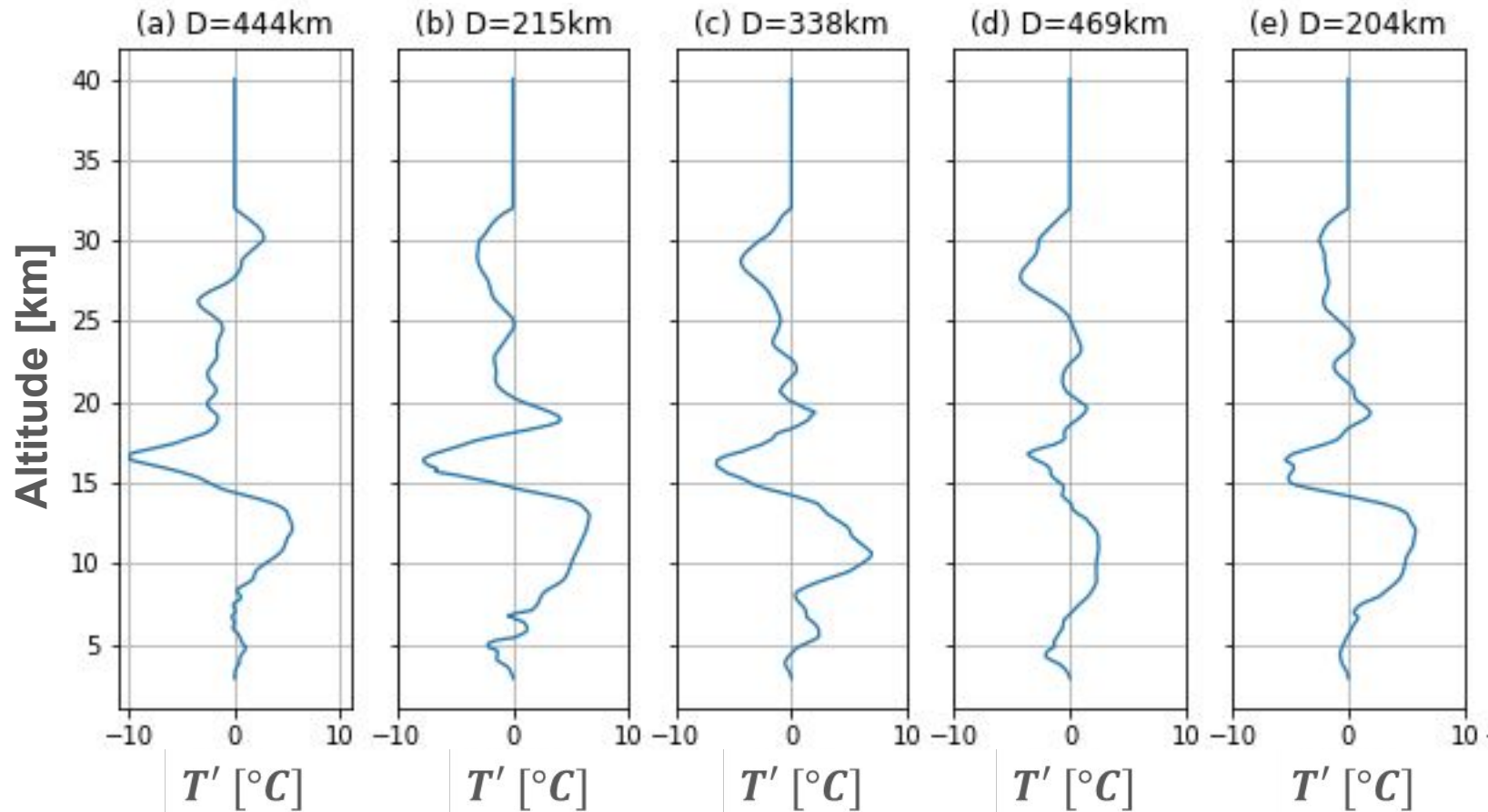
This research is financially supported by an NSERC Discovery Grant held by Professor Pagiatakis.

More about Fiona

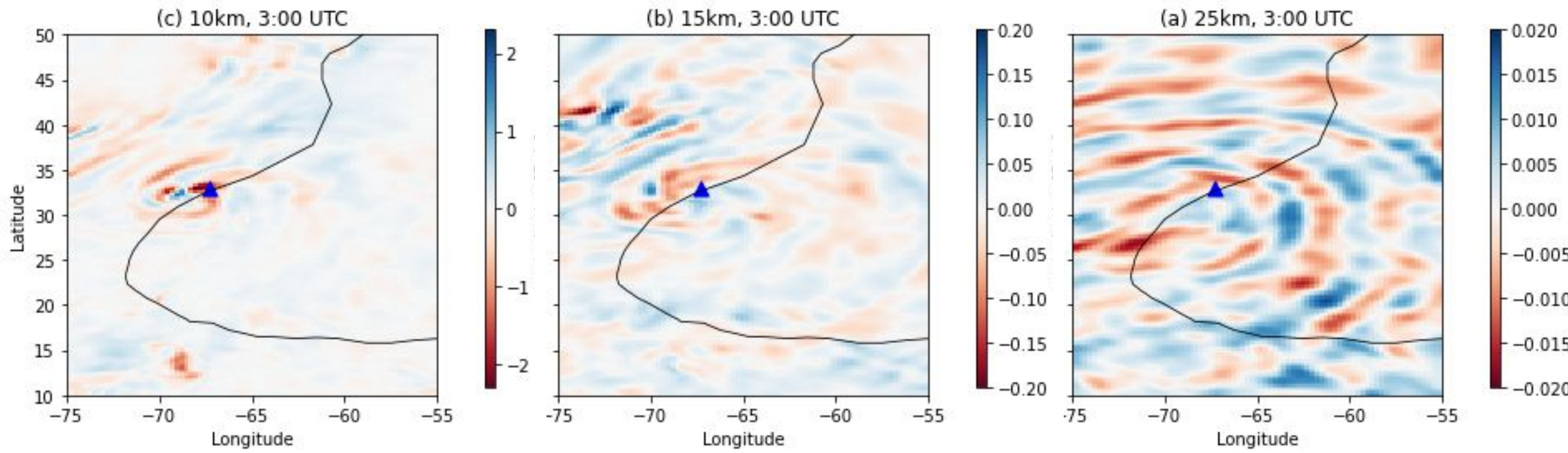
Best Track of Hurricane Fiona
(2022)



D = radial distance from eye



More about Fiona (ERA5)



More about Dora

Best Track of Hurricane Dora

