Atmospheric Gravity Wave Observations from a Special Aeolus Campaign over the Southern Andes during Winter 2021

Image Credit: ESA

This presentation participates in OSPP

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What is Aeolus?

- There is an urgent need for reliable global wind-profile data
- Aeolus provides profiles of wind, aerosol and clouds measured along orbital path
- Horizontal line-of-sight (HLOS) products in the lowermost 30km of atmosphere
- **Approved**: 1999; **Launched**: 2018
- **Cost**: €481 million
- **Mission Duration**: 3 years (initially)
- **Altitude**: 320 km (200 miles)
- **Orbit**: Sun-synchronous
- **Instrument**: ALADIN (**A**tmospheric **La**ser **D**oppler **In**strument)
- First wind lidar in space!

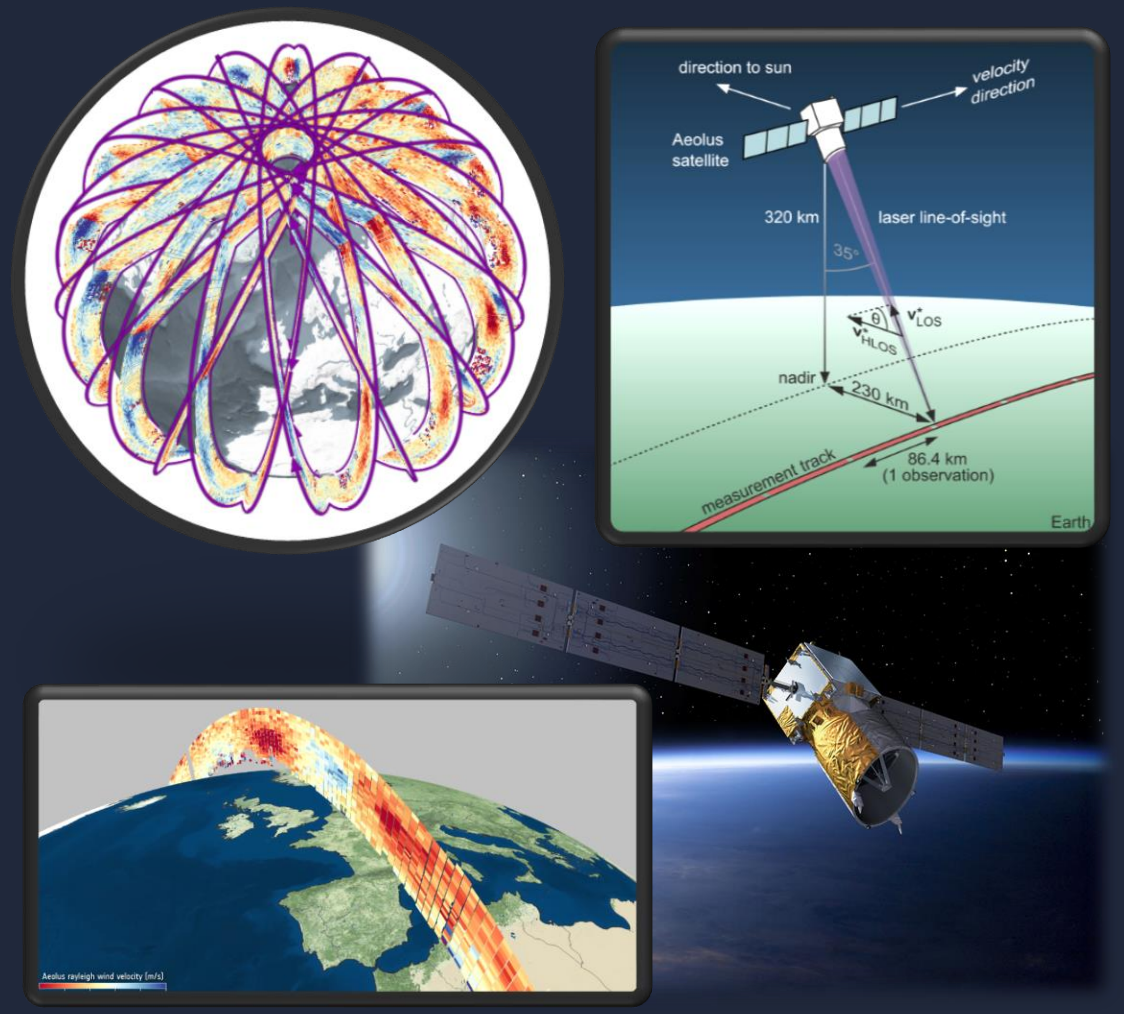
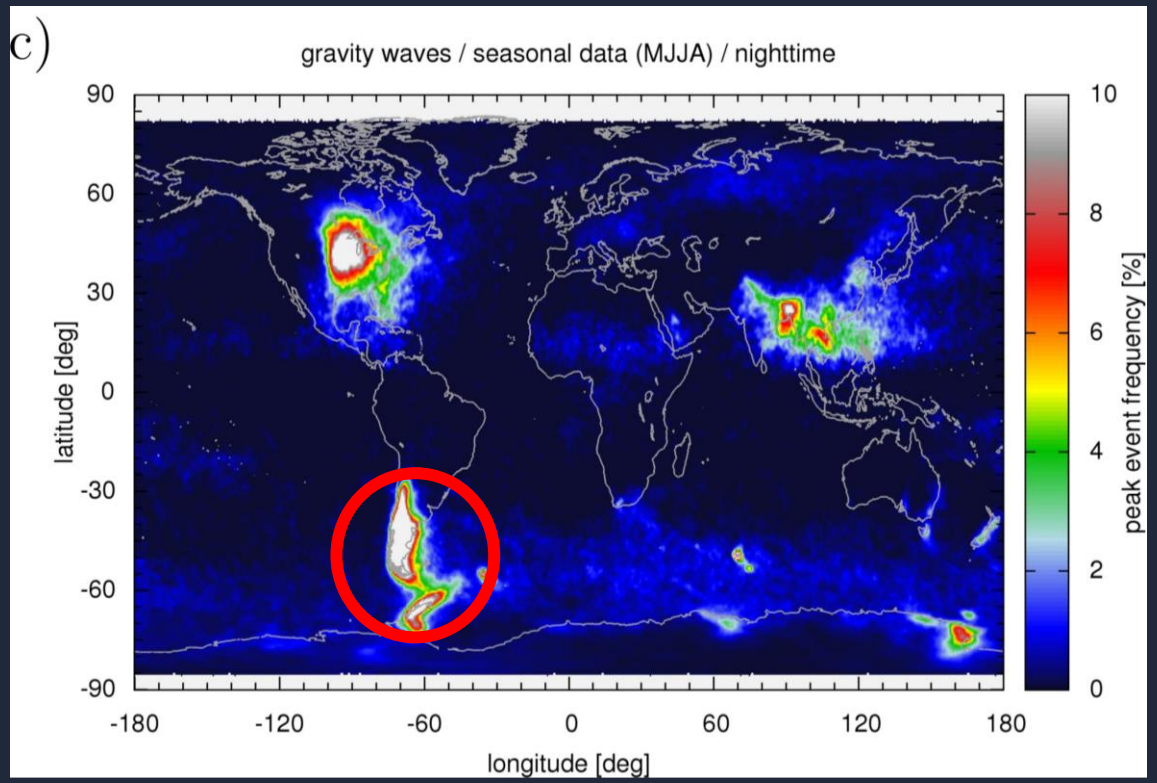
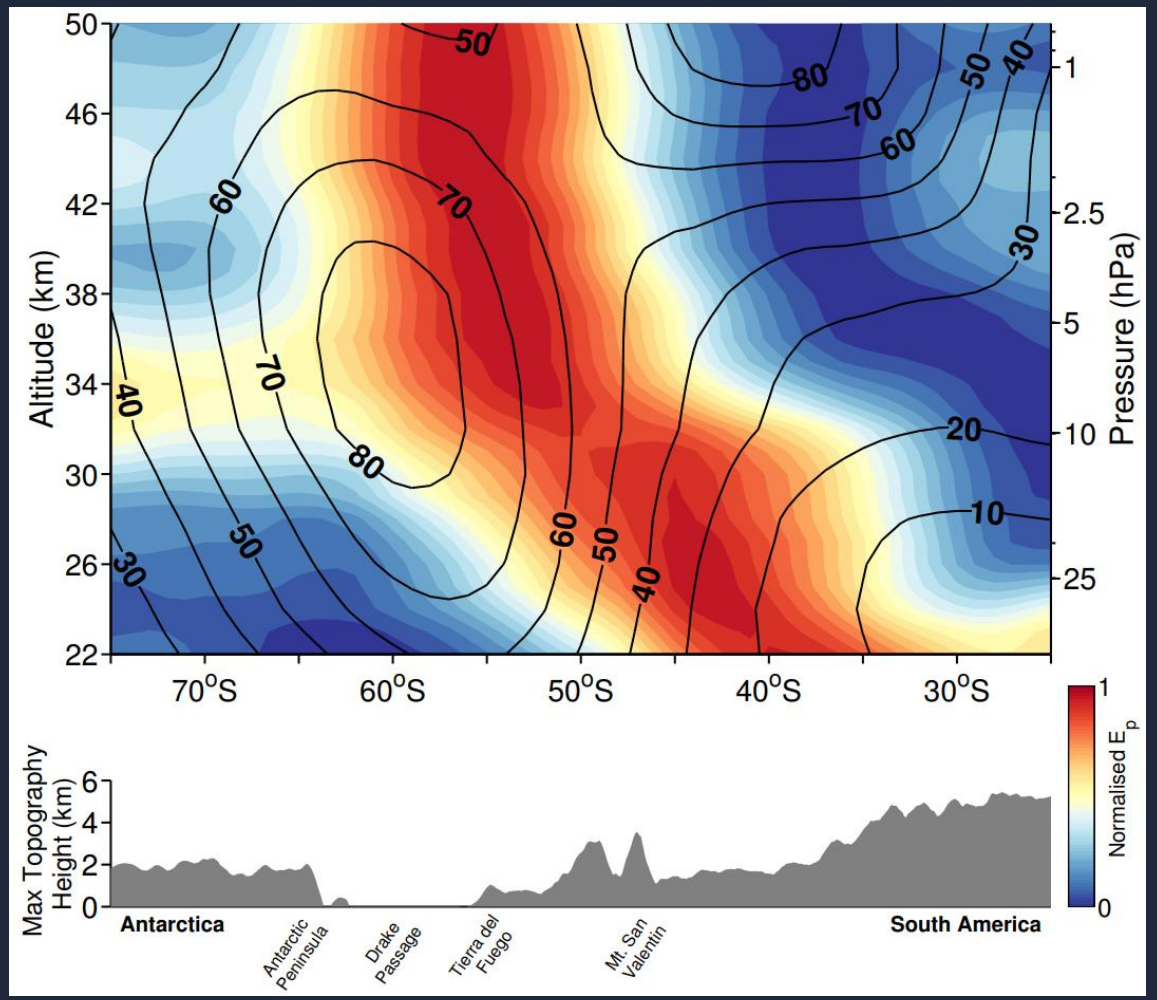


Image Credits: P. Carril / ESA / dpa / VirES for Aeolus

Looking for GWs with Aeolus

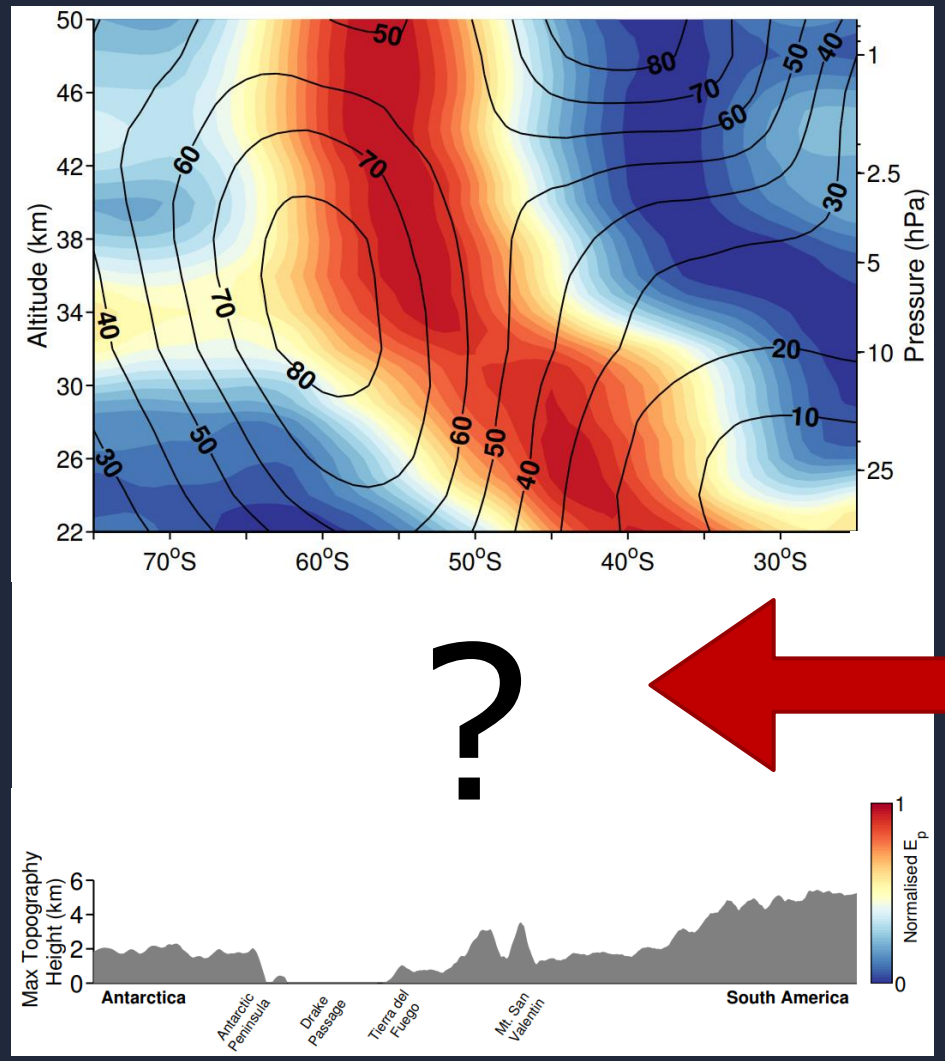


Hoffmann, L., X. Xue and M. J. Alexander (2013)



Hindley, N. P., C. J. Wright, N. D. Smith and N. J. Mitchell (2015)

Looking for GWs with Aeolus



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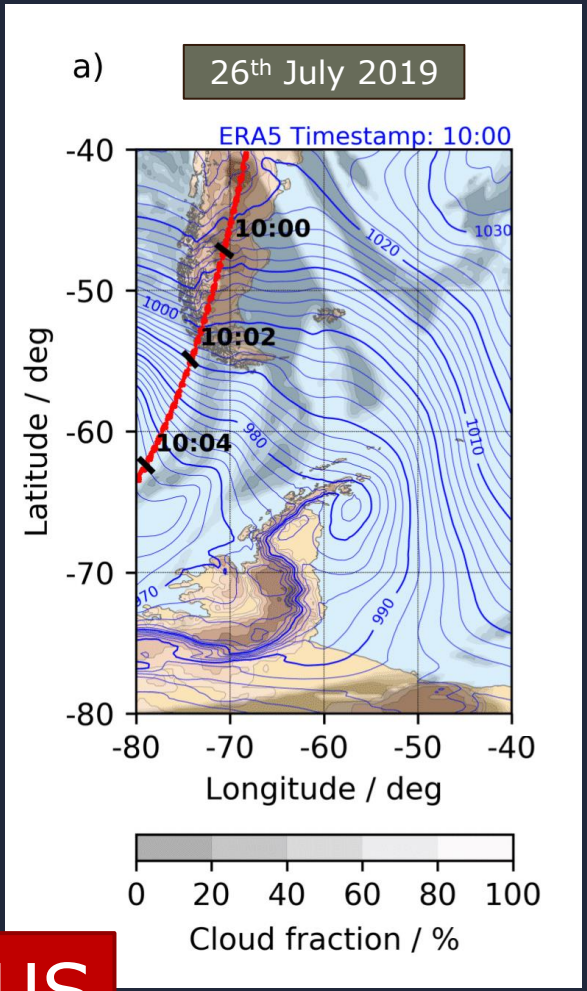
AEOLUS

Case Study: Southern Andes 2019



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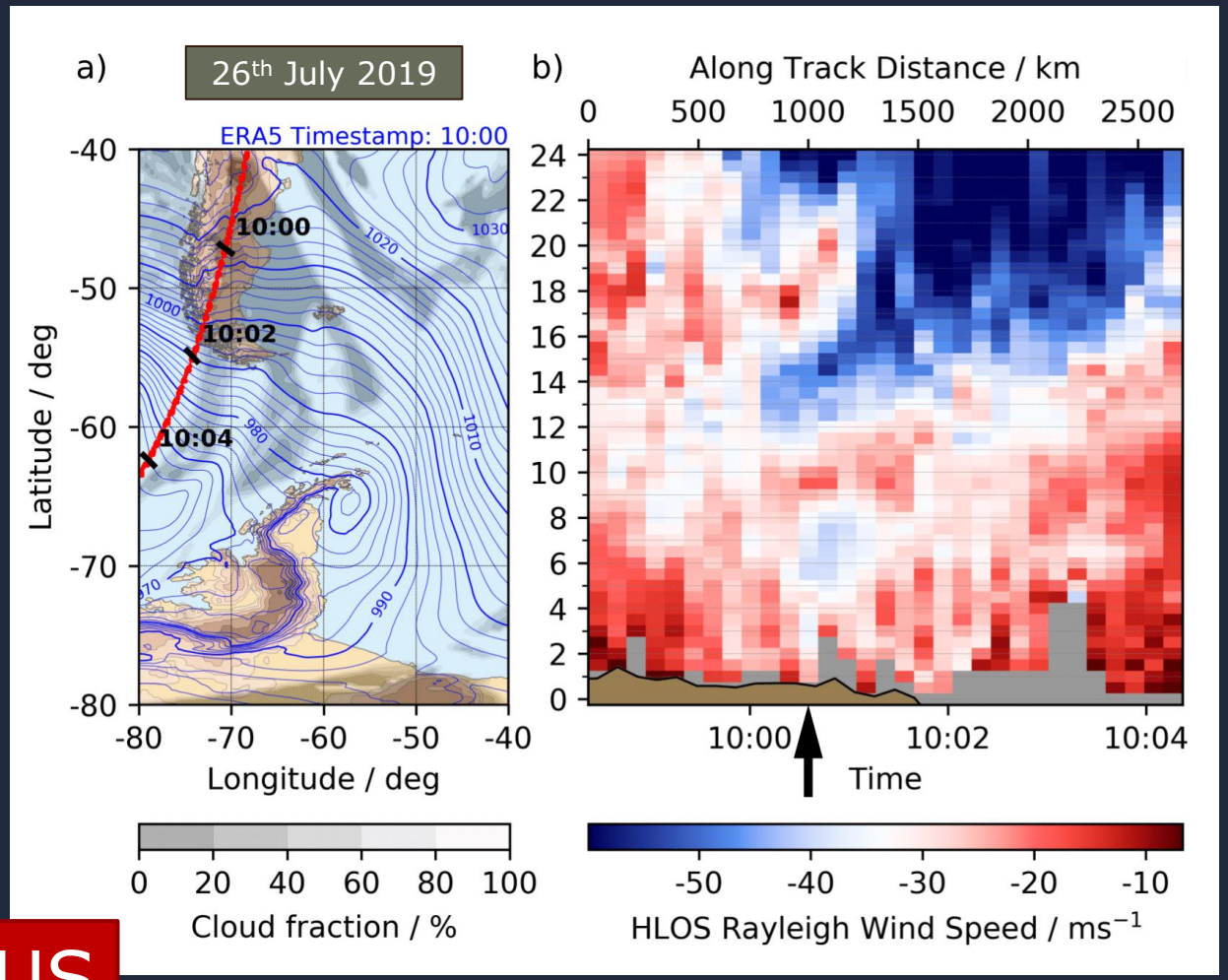
Case Study: Southern Andes 2019



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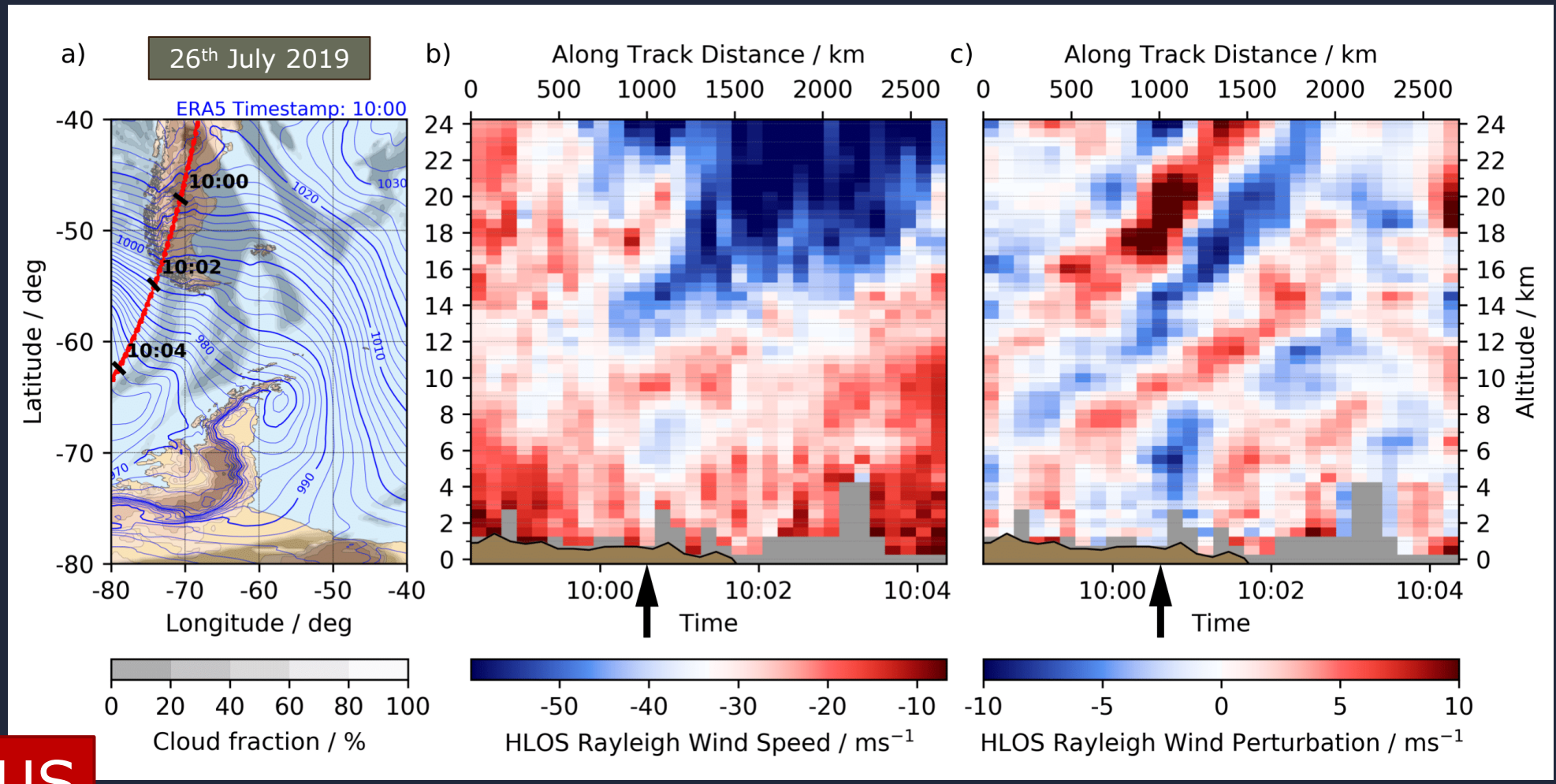
Case Study: Southern Andes 2019

From Banyard et al. 2021 (GRL)



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Case Study: Southern Andes 2019

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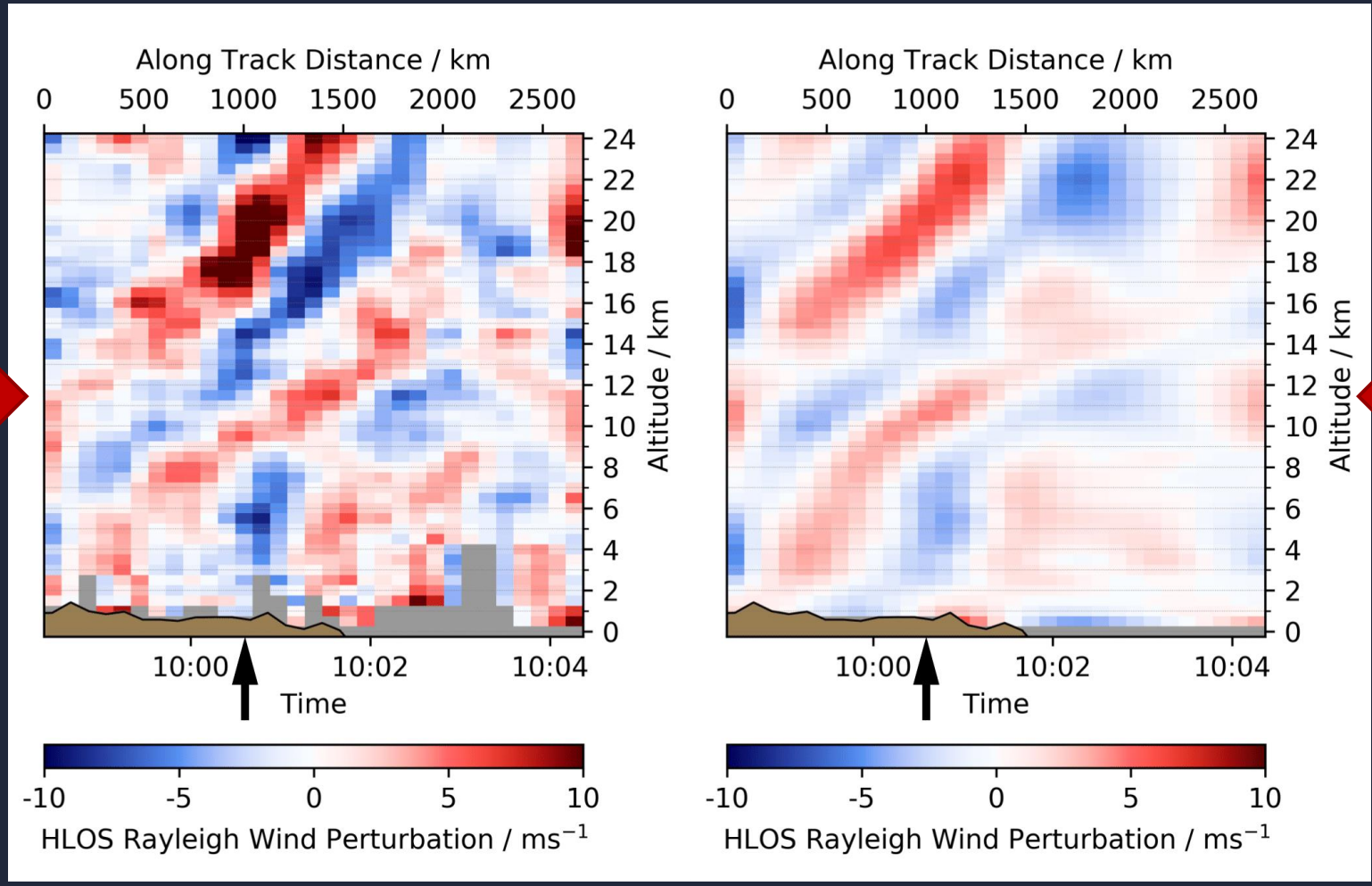

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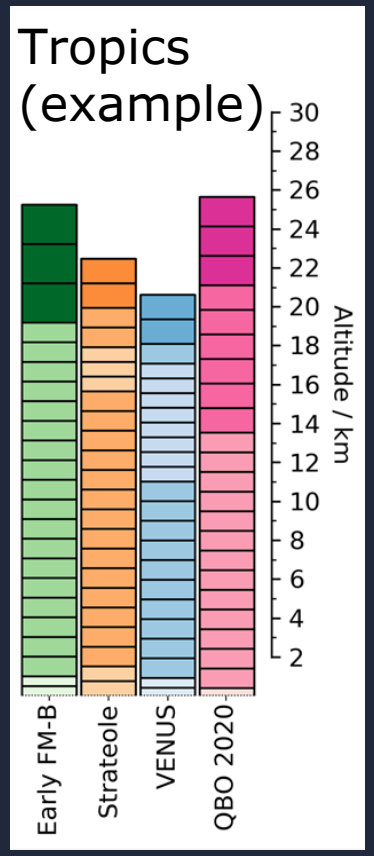
Aeolus Range Bin Settings (RBS)



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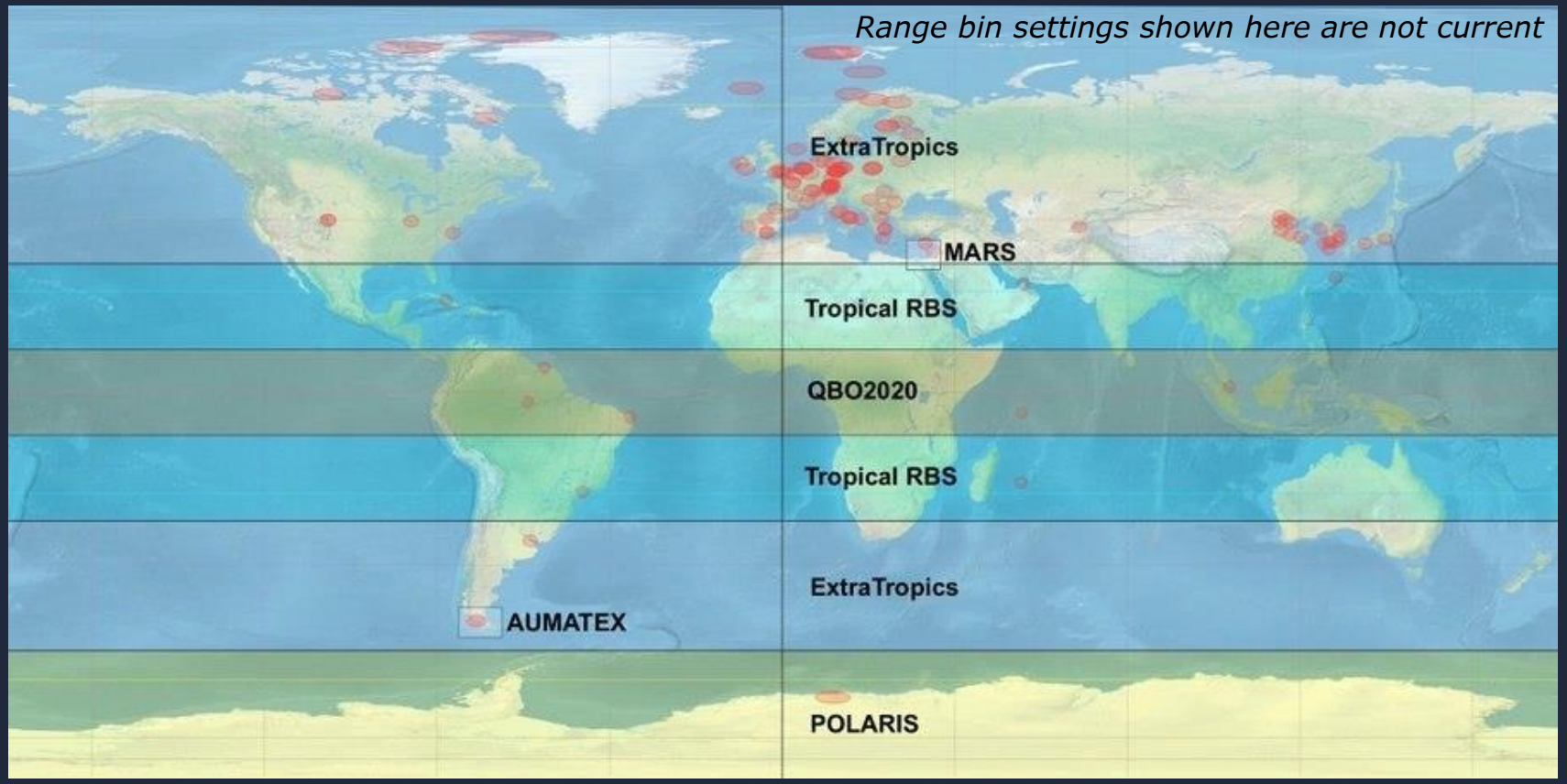
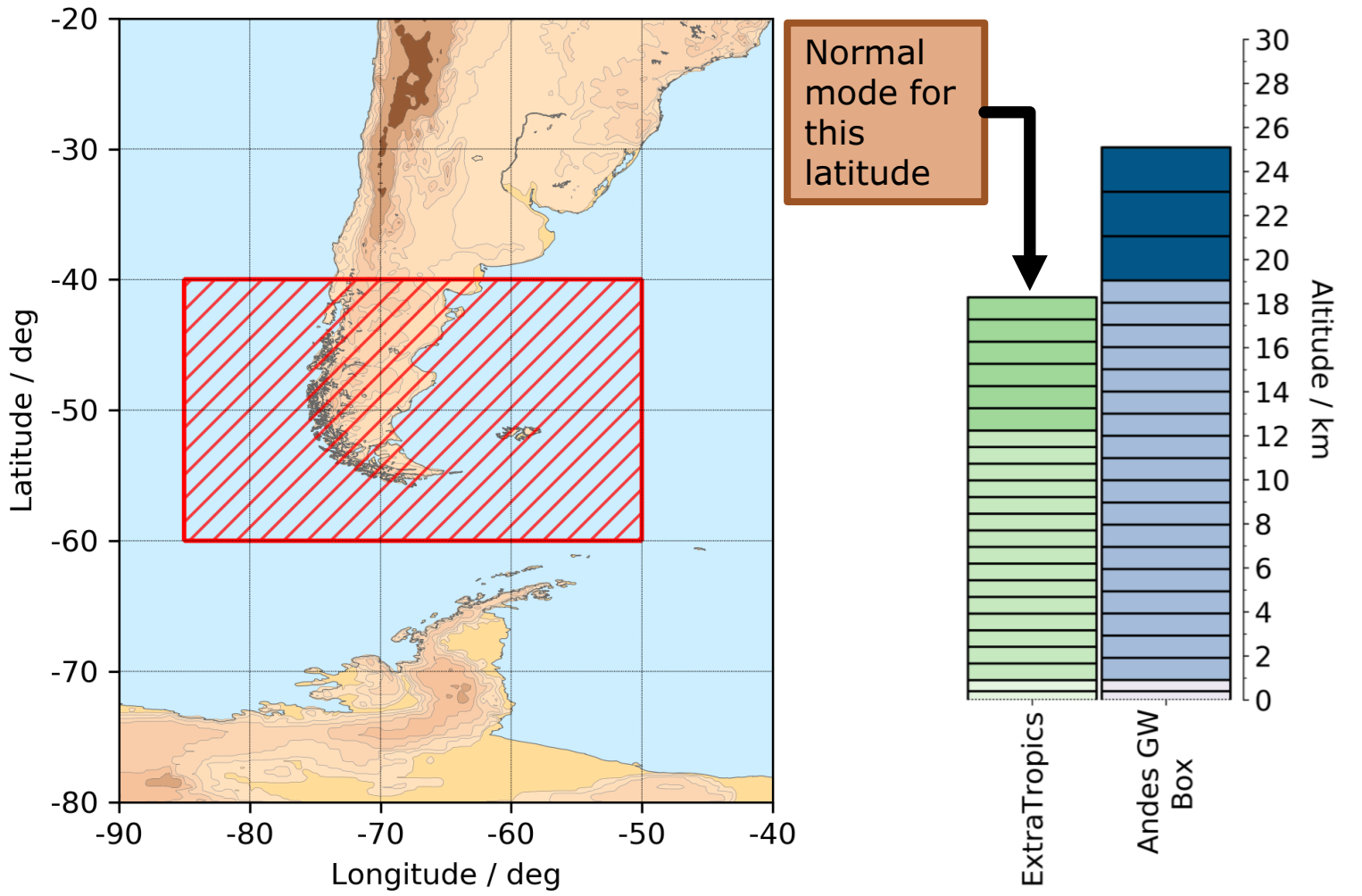


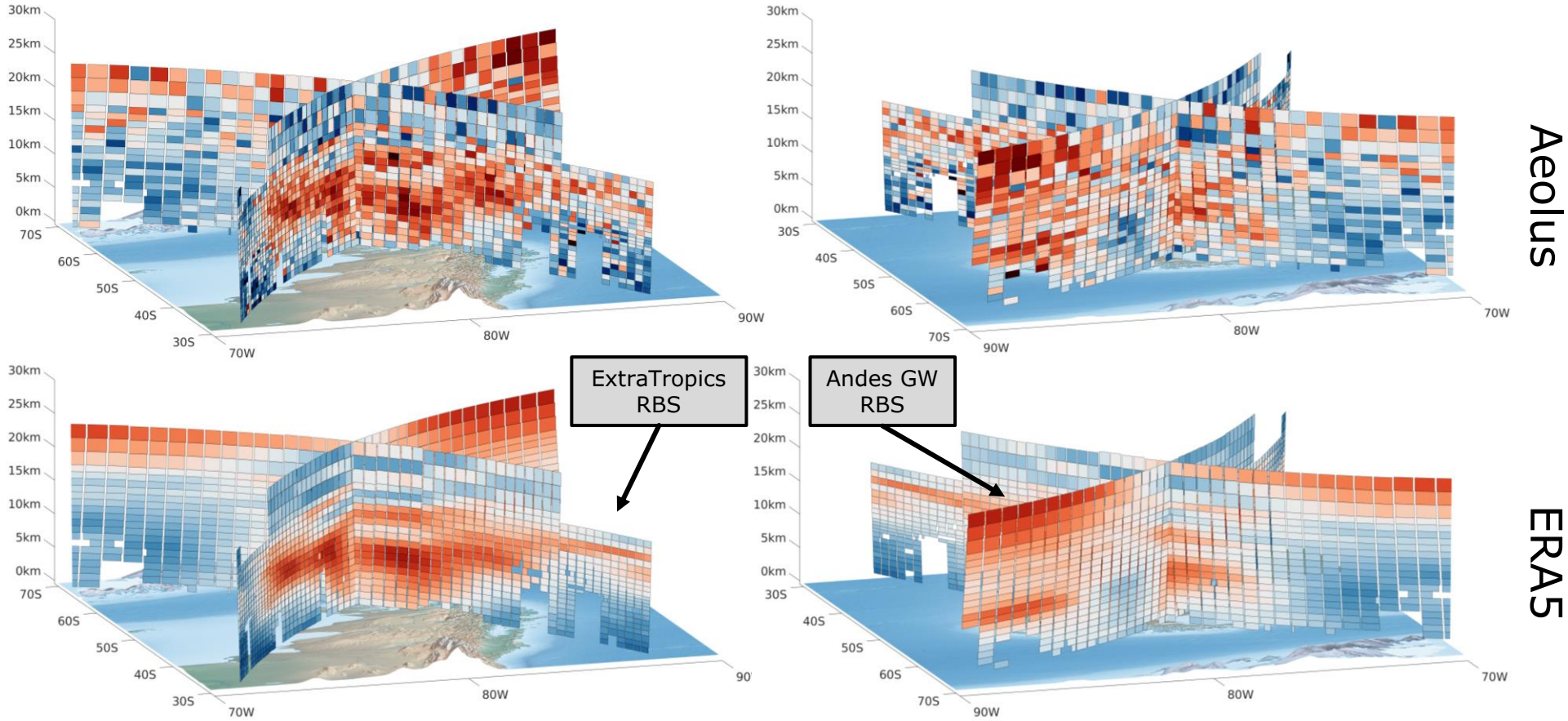
Image Credit: ESA

Andes GW during austral winter 2021



- The original RBS were capped at 18.5 km, preventing observations of GWs in the stratosphere
- New RBS for austral winter 2021 allow measurements up to 25 km over the Southern Andes
- Can we use Aeolus to extract GW momentum fluxes and construct a GW climatology?

Andes GW during austral winter 2021



- These two intersecting orbits show the effect of introducing the special RBS
- Can combining orbits like this provide additional geometric information to aid GW momentum calculations?

Summary and Future Work

- **First** satellite observations of atmospheric gravity waves using Aeolus
- Case study of an orographic gravity wave over the Southern Andes from 2019 – See Banyard et al. 2021 (GRL)
- Special RBS were introduced to observe the 2021 austral winter Andes GW season, by increasing the top altitude of Aeolus' viewing range
- Work is ongoing to:
  1. Analyse the results from the special Andes GW RBS
  2. Calculate GW momentum fluxes from these data
  3. Construct a GW climatology using Aeolus

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