OBSERVATIONS OF MESOSPHERIC GRAVITY WAVES OVER THE ANDES

Jonathan Pugmire
Center for Atmospheric and Space Sciences
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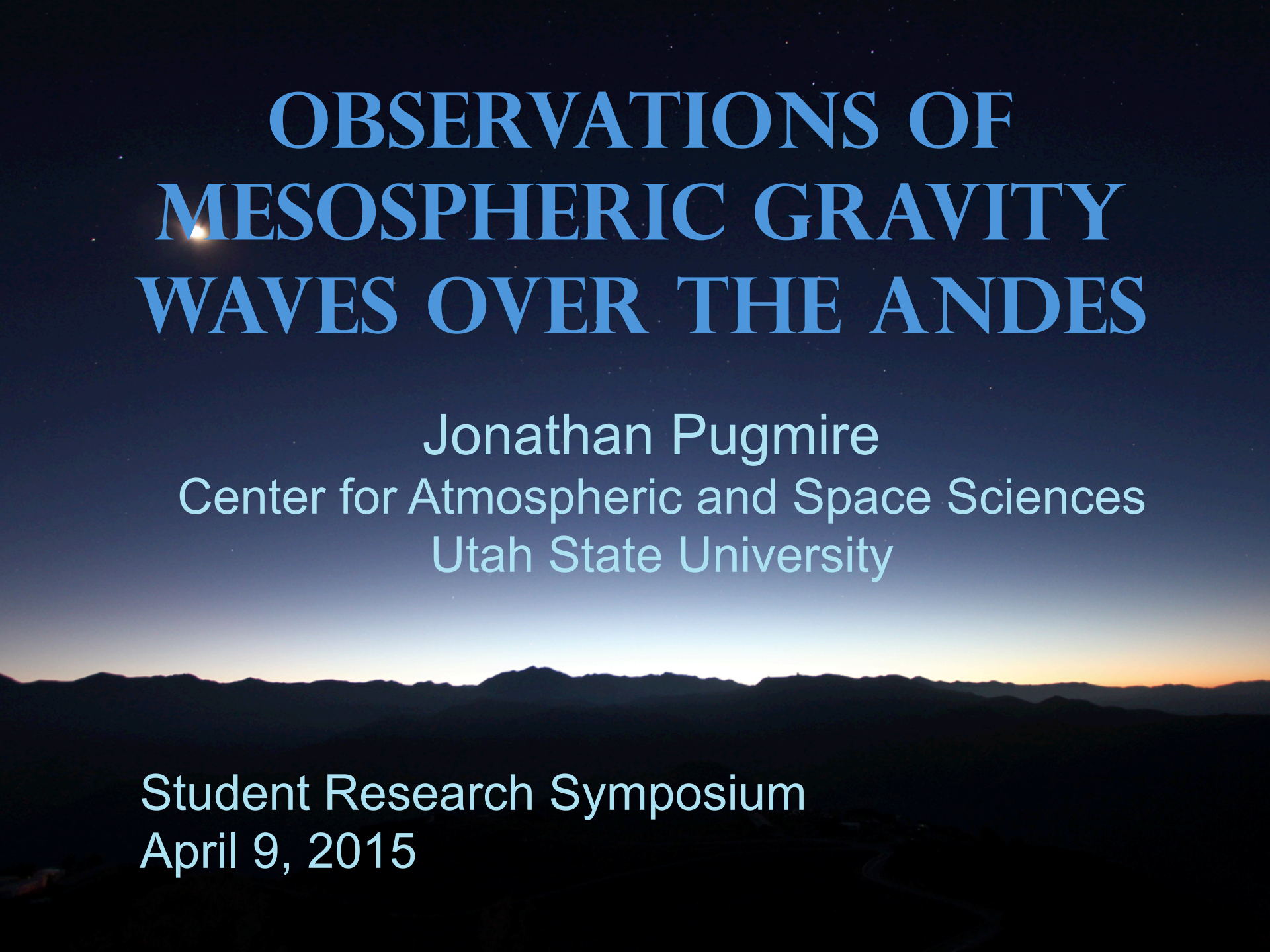
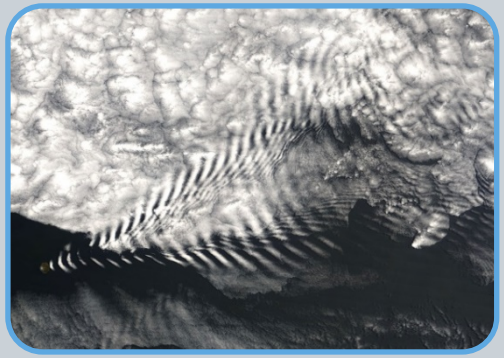


Student Research Symposium
April 9, 2015

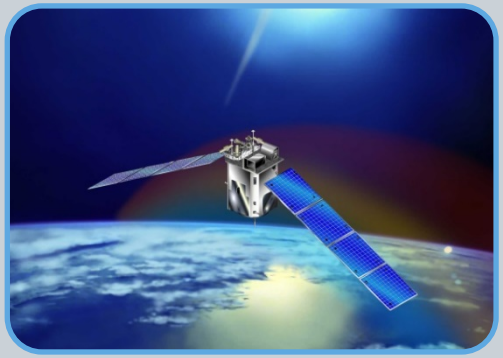


Atmospheric Gravity Waves

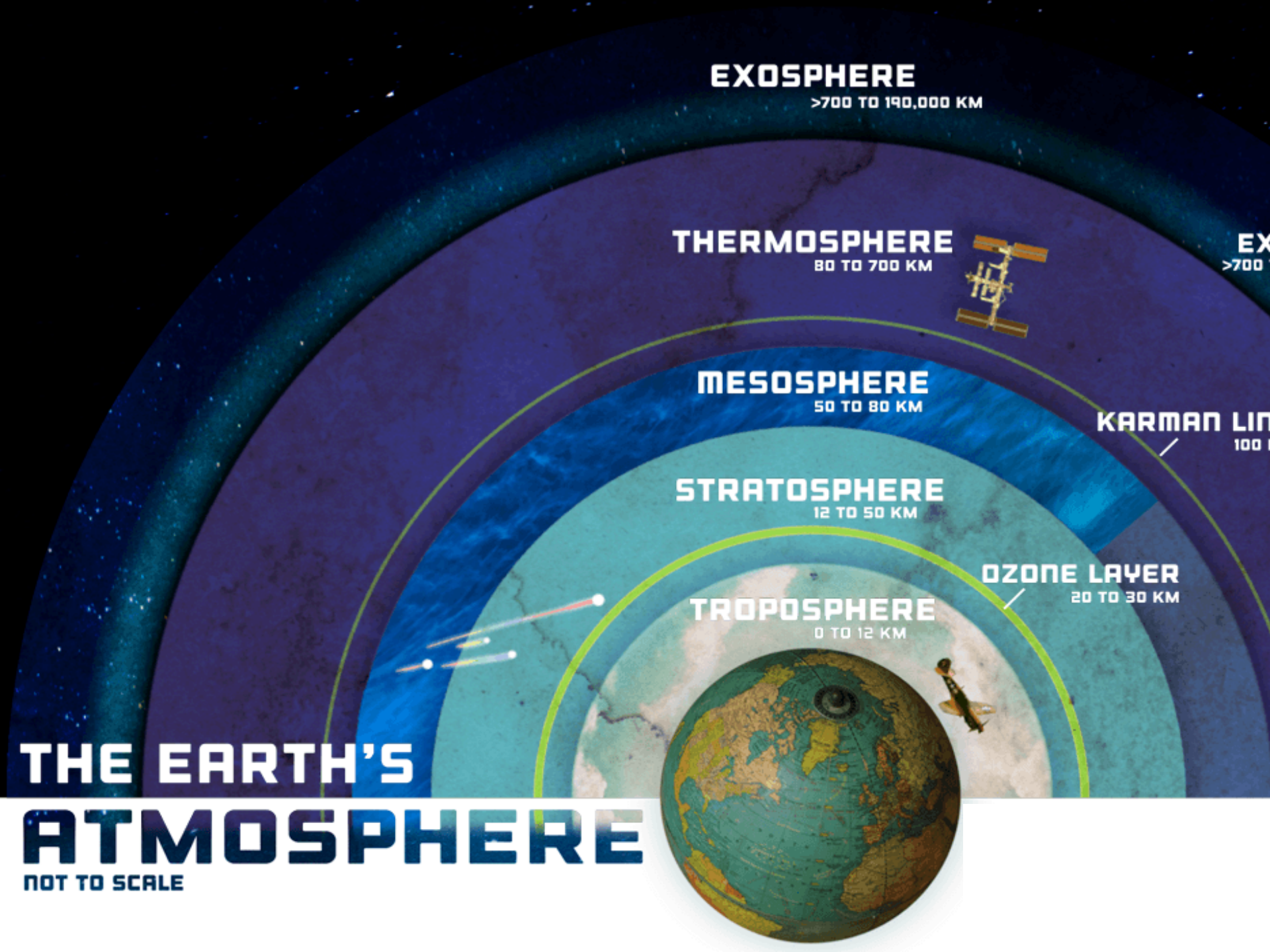
- Mountain Waves

Andes Lidar Observatory

- Ground measurements



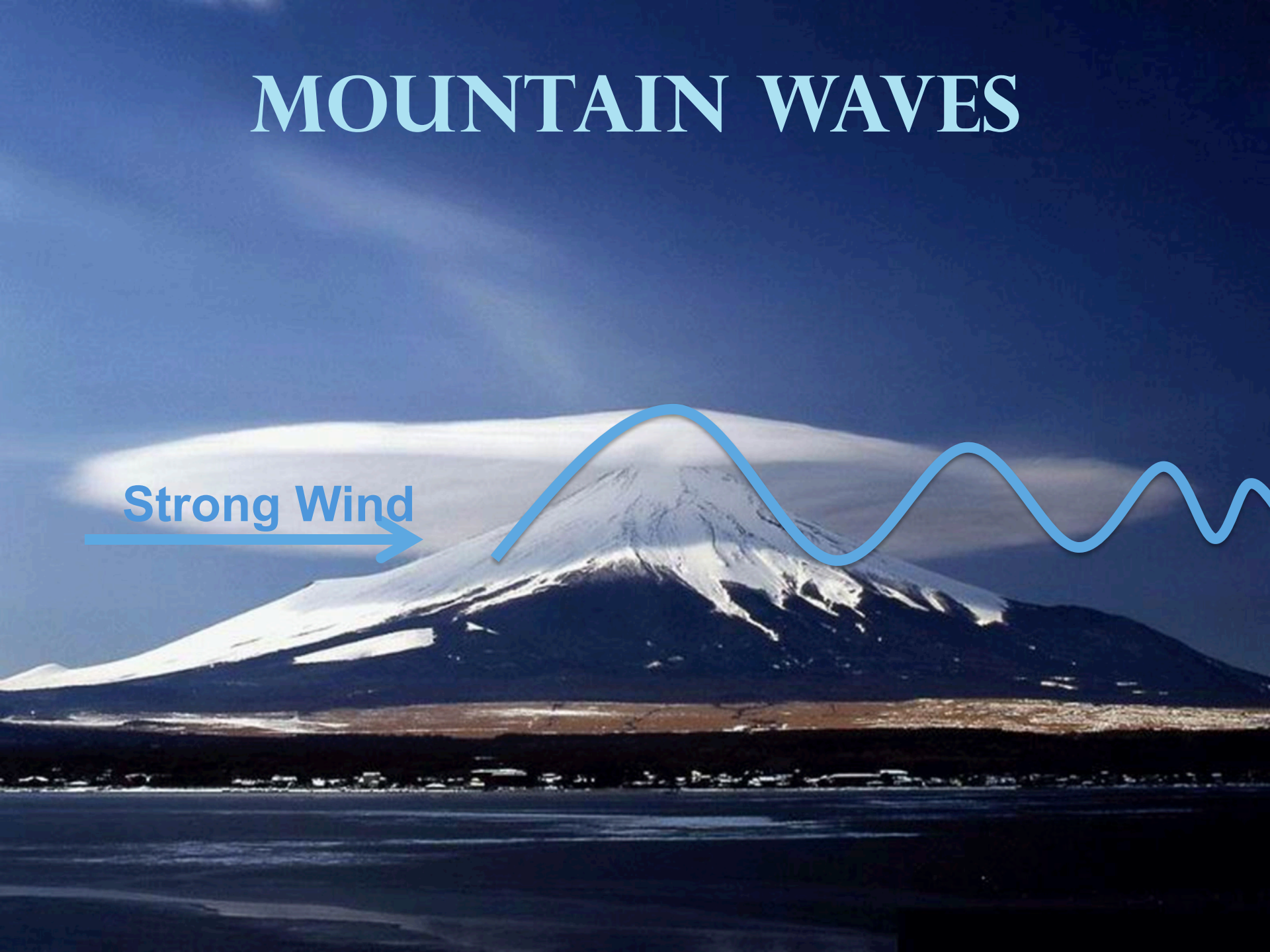
SABER measurements

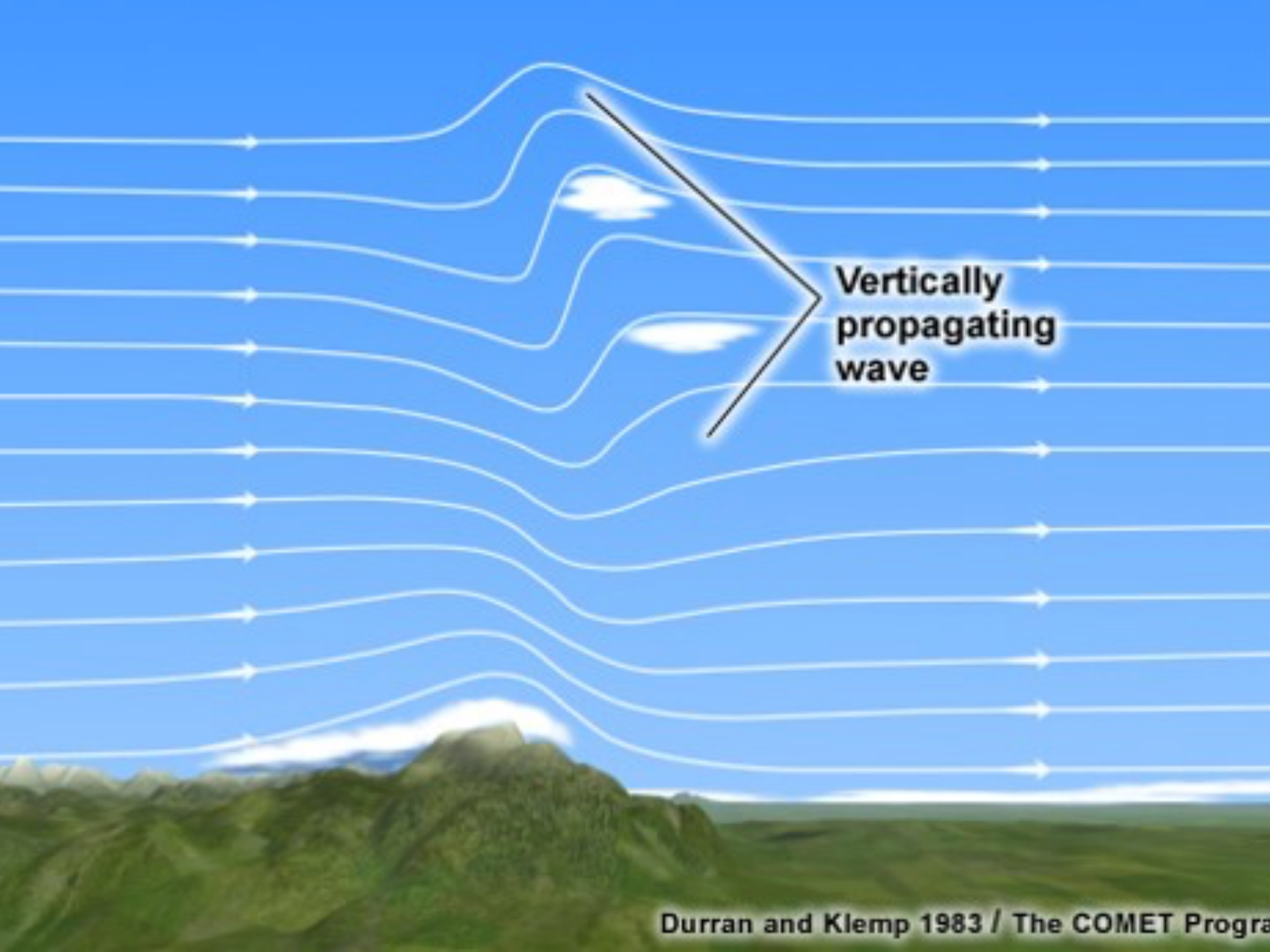


THE EARTH'S ATMOSPHERE

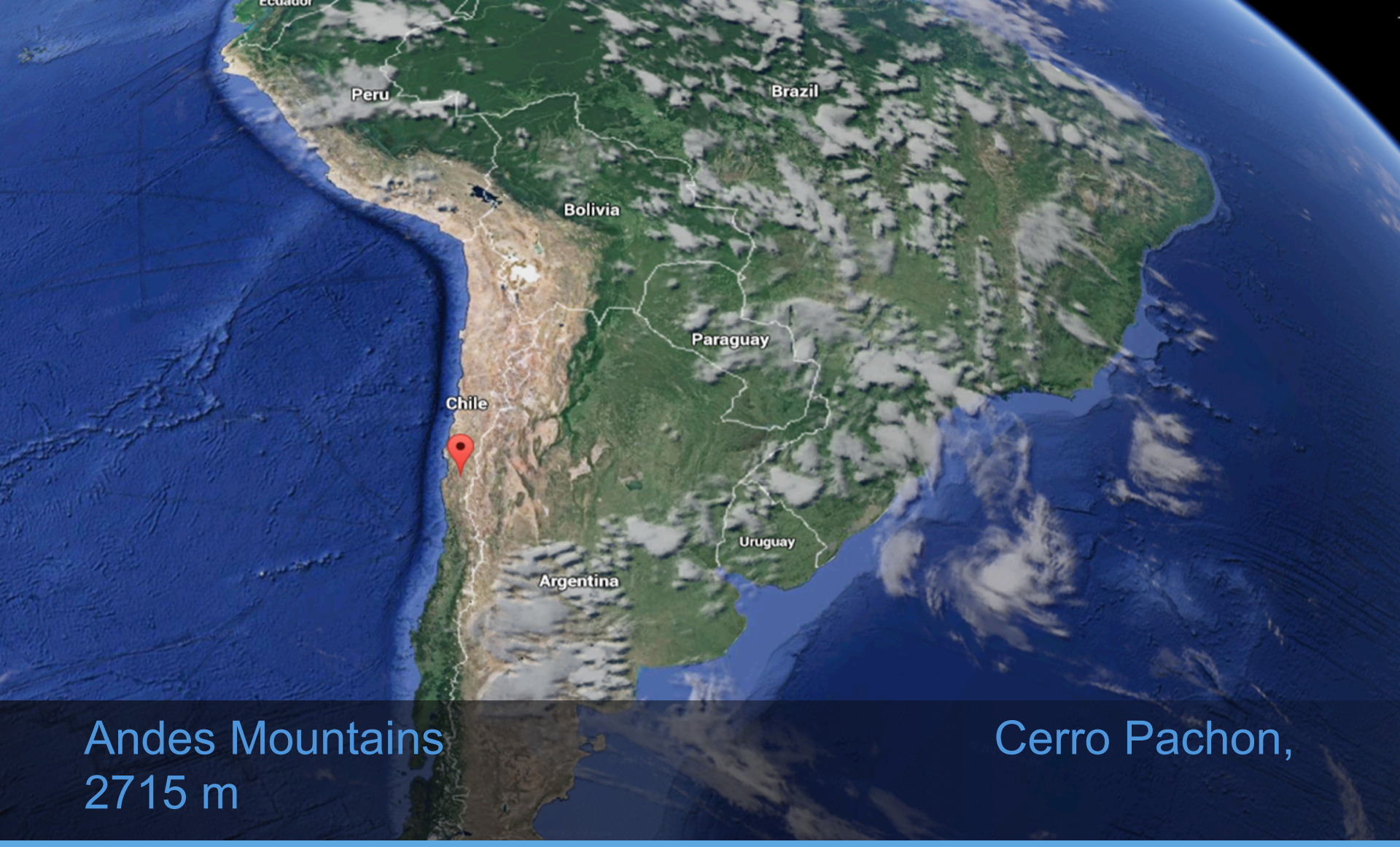
NOT TO SCALE

MOUNTAIN WAVES

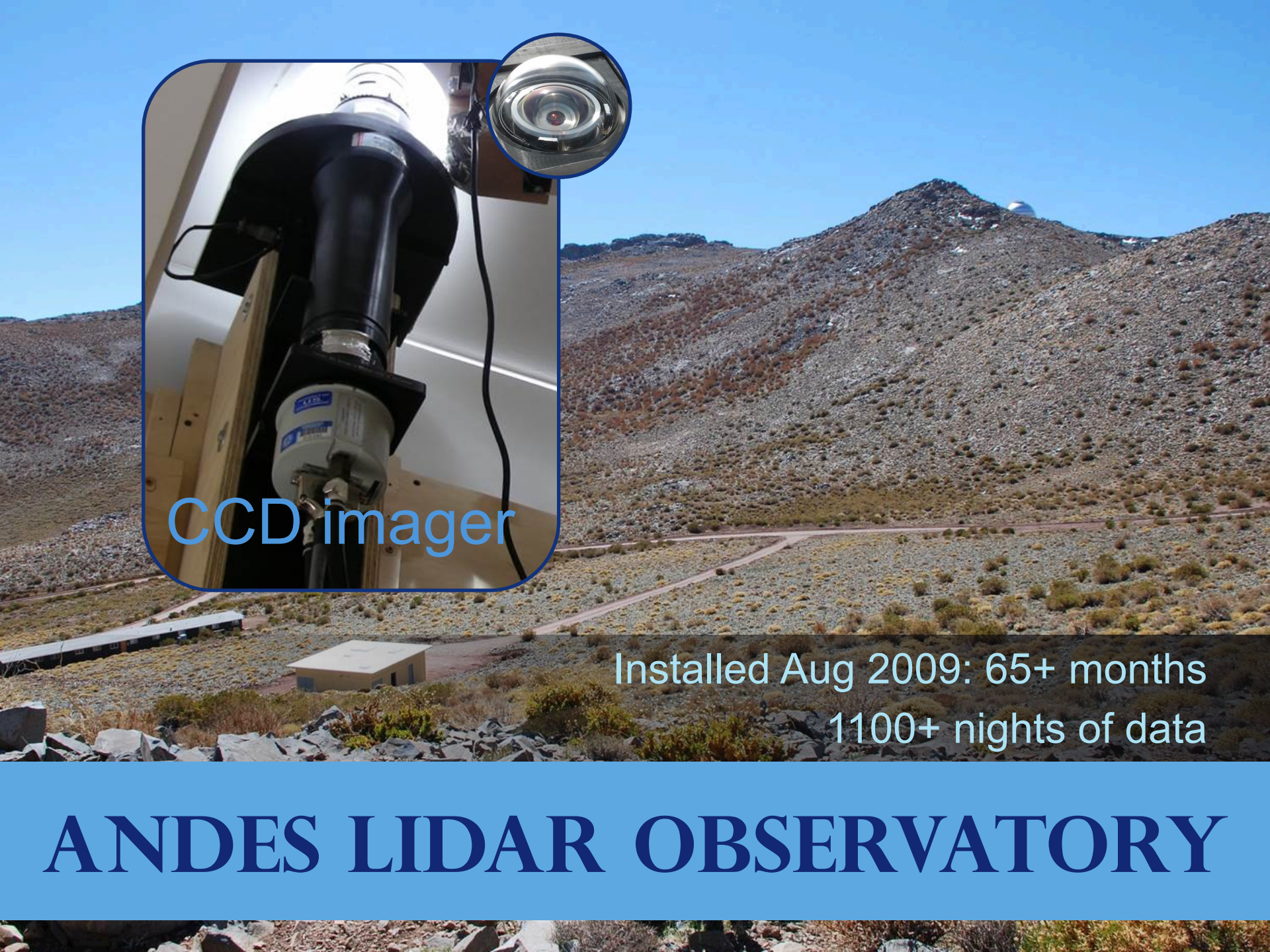



Vertically
propagating
wave
Durran and Klemp 1983 / The COMET Progra


Kim Seng



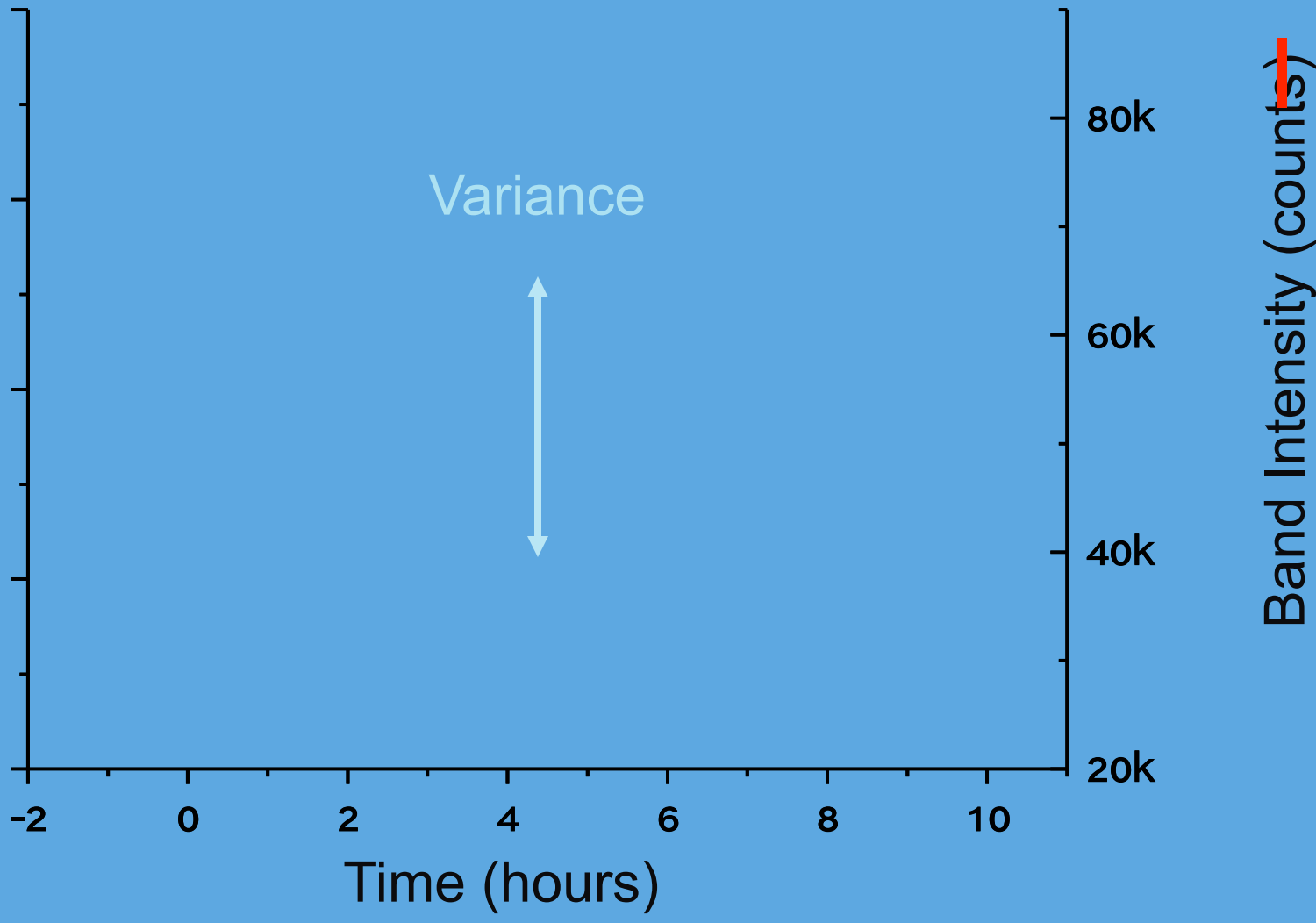
ANDES LIDAR OBSERVATORY



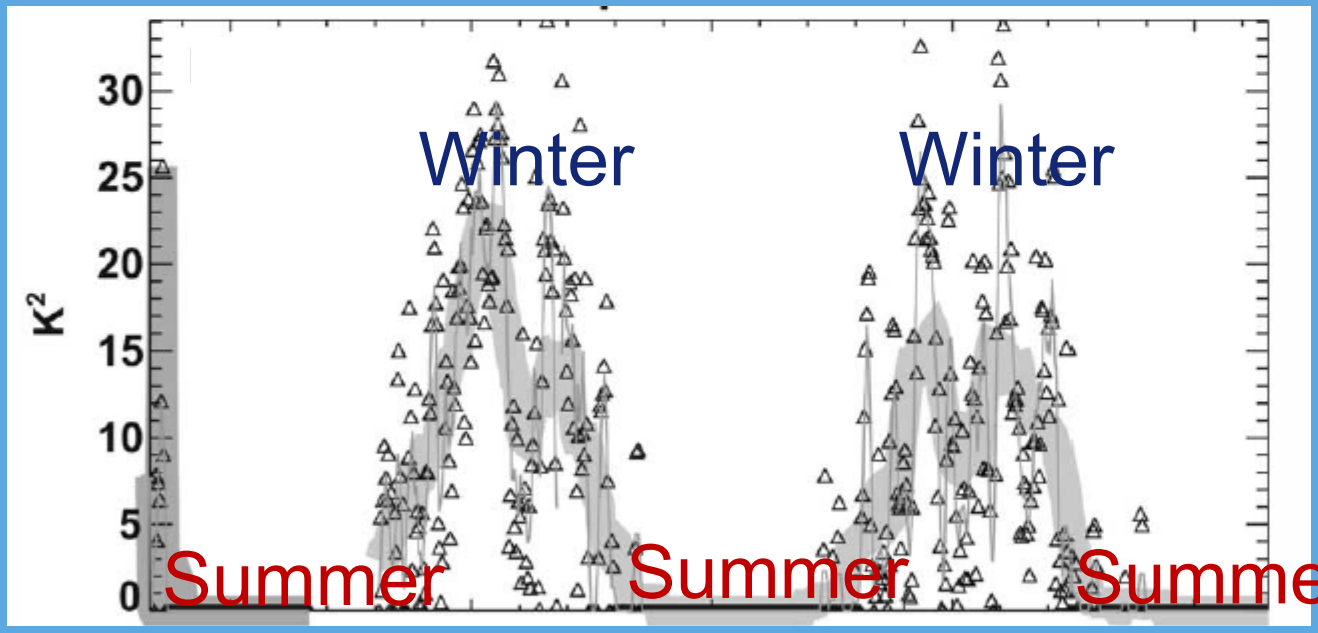
ANDES LIDAR OBSERVATORY


OH layer: ~87 km

EXAMPLE OH ANALYSIS



MOUNTAIN WAVE FORECASTING MODEL



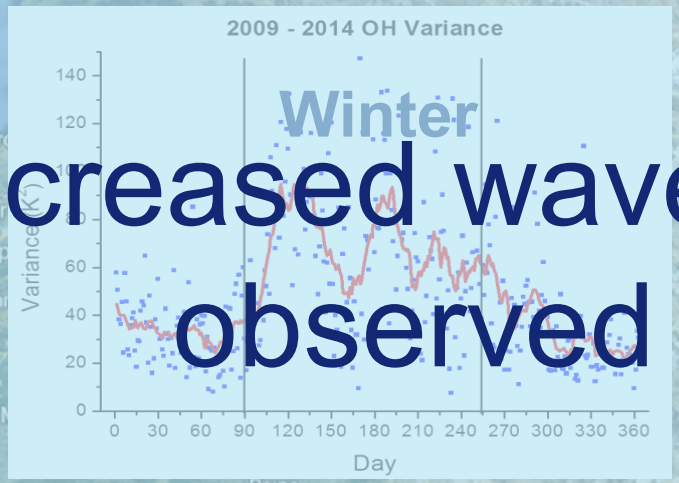
Increased temperature variance during winter months

(Jiang et al., 2002)

Andes Lidar Observatory

La Serena

El Leoncito, Argentina

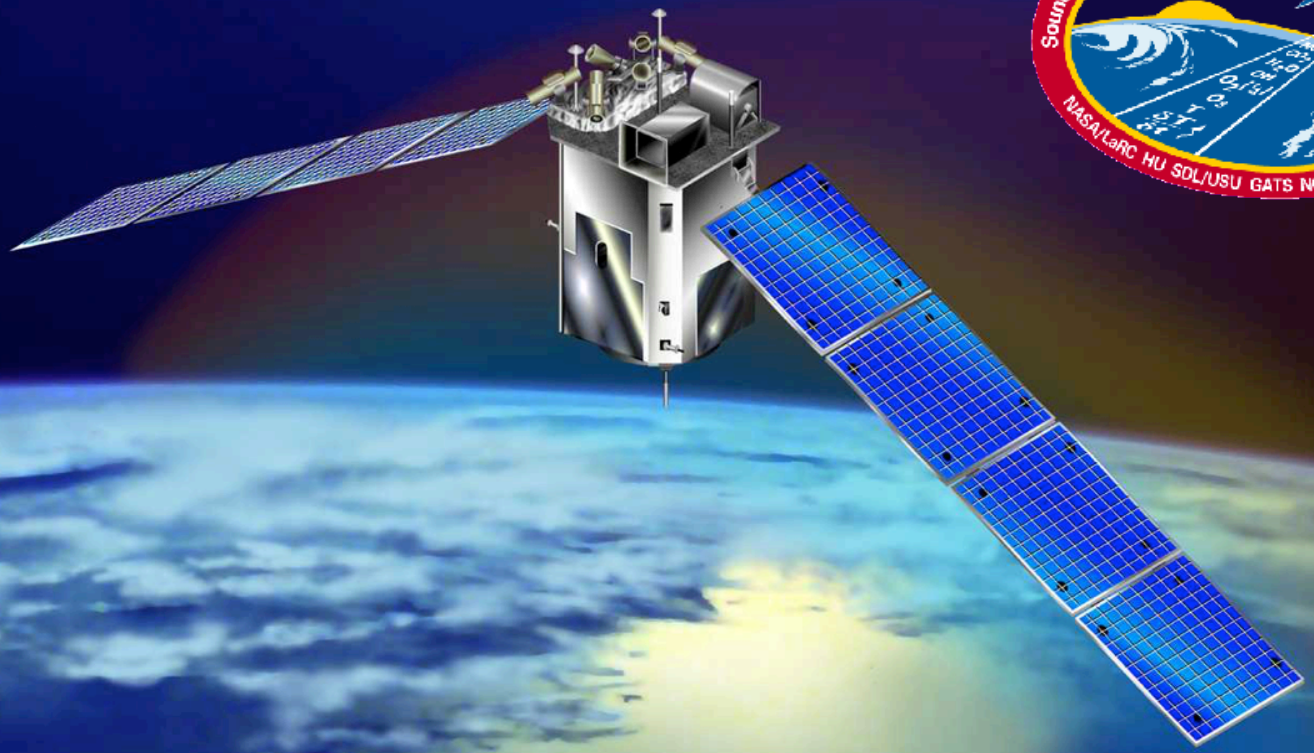


Increased wave activity in winter observed from ground

SABER INSTRUMENT

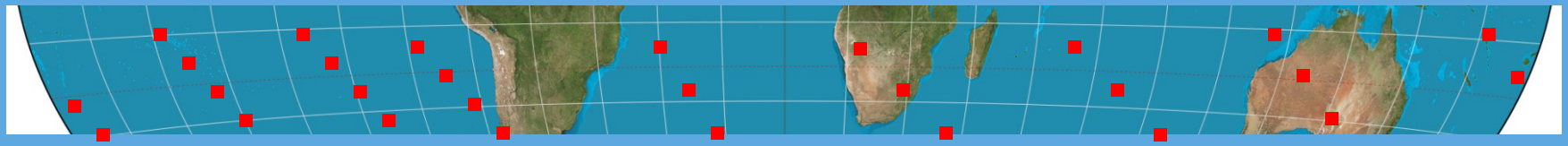
Sounding of the Atmosphere using Broadband Emission Radiometry

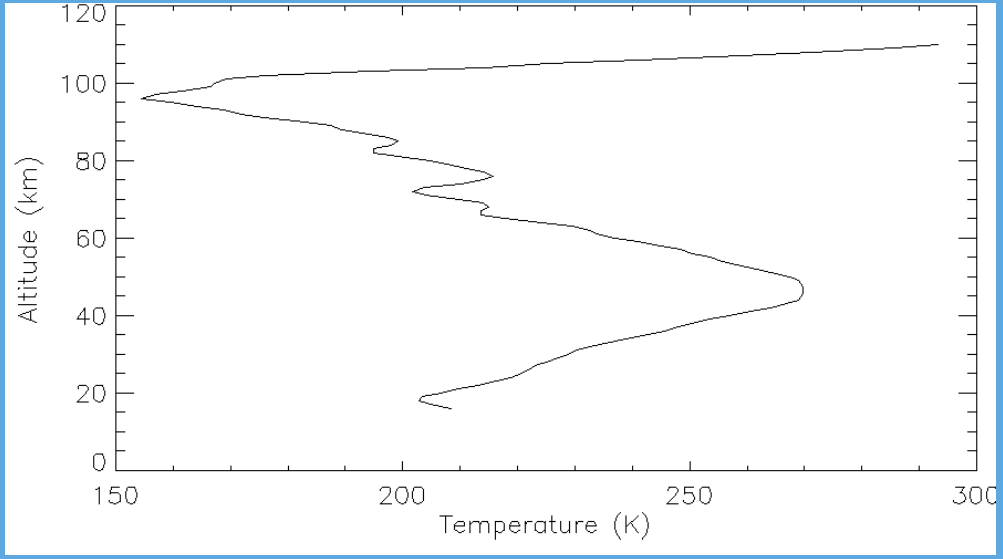
Aboard the TIMED satellite



SABER DATA

Measure temperature in zone

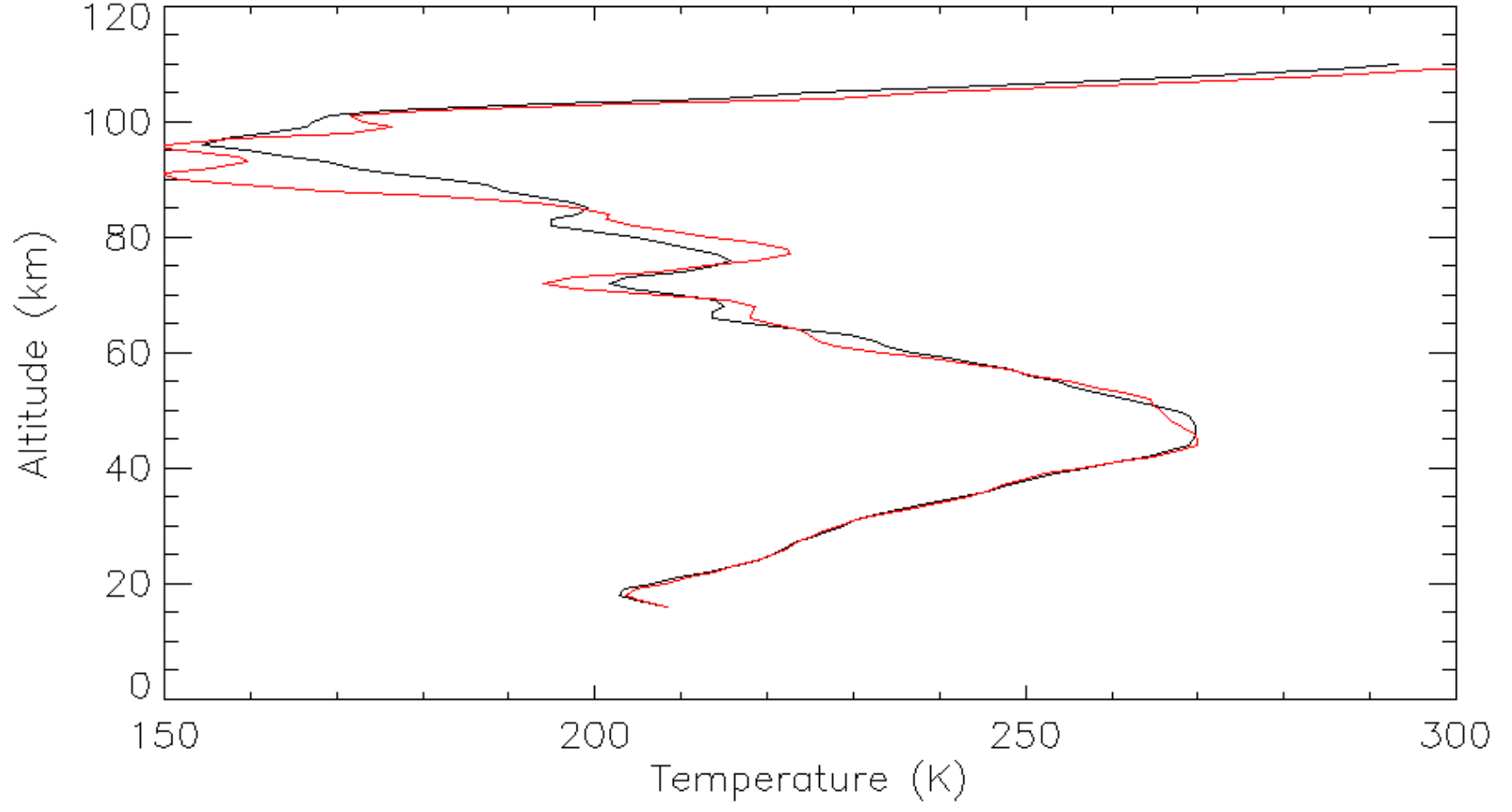




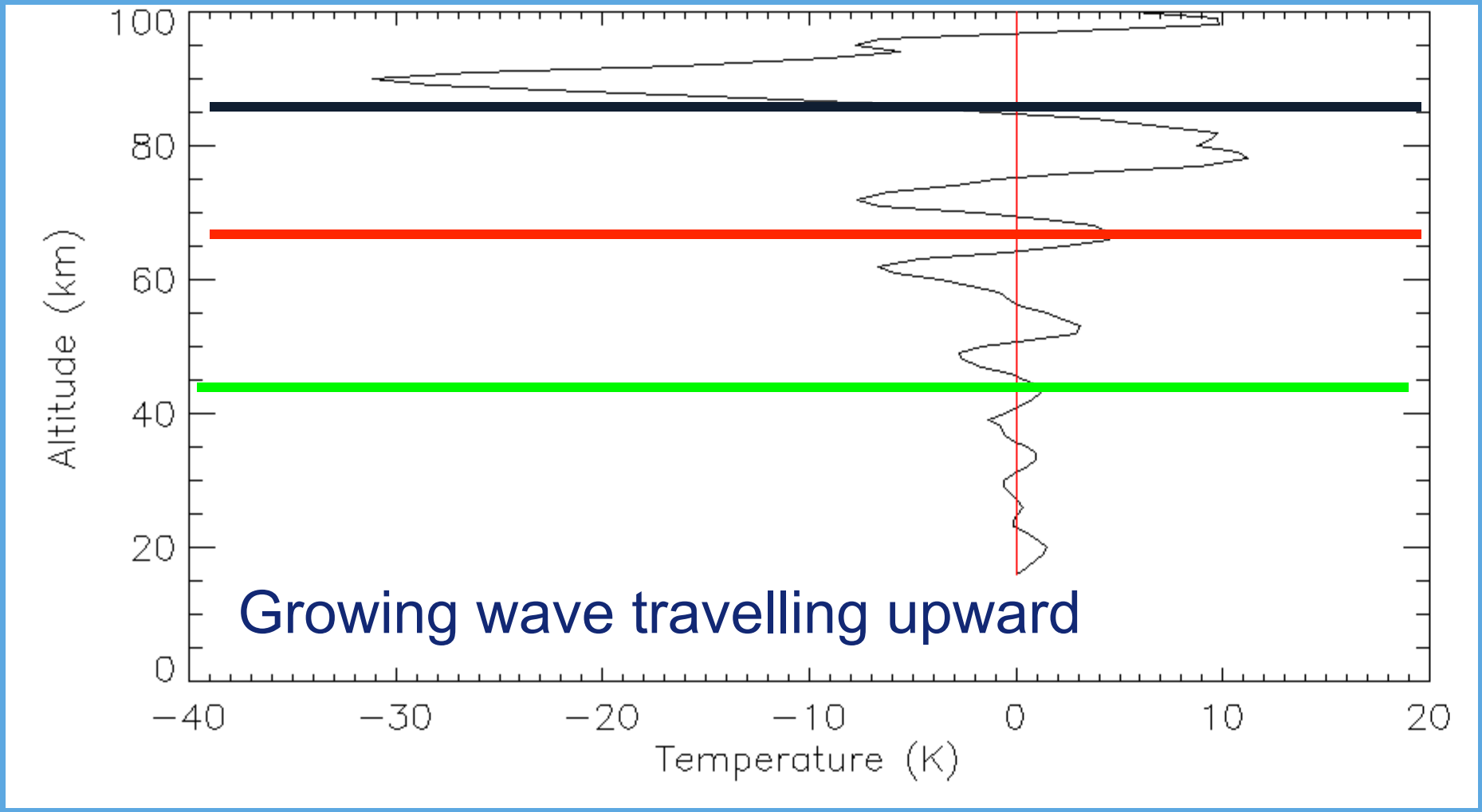
Method from John and Kumar, 2012 and Jiang, 2002

INSTANTANEOUS PROFILES

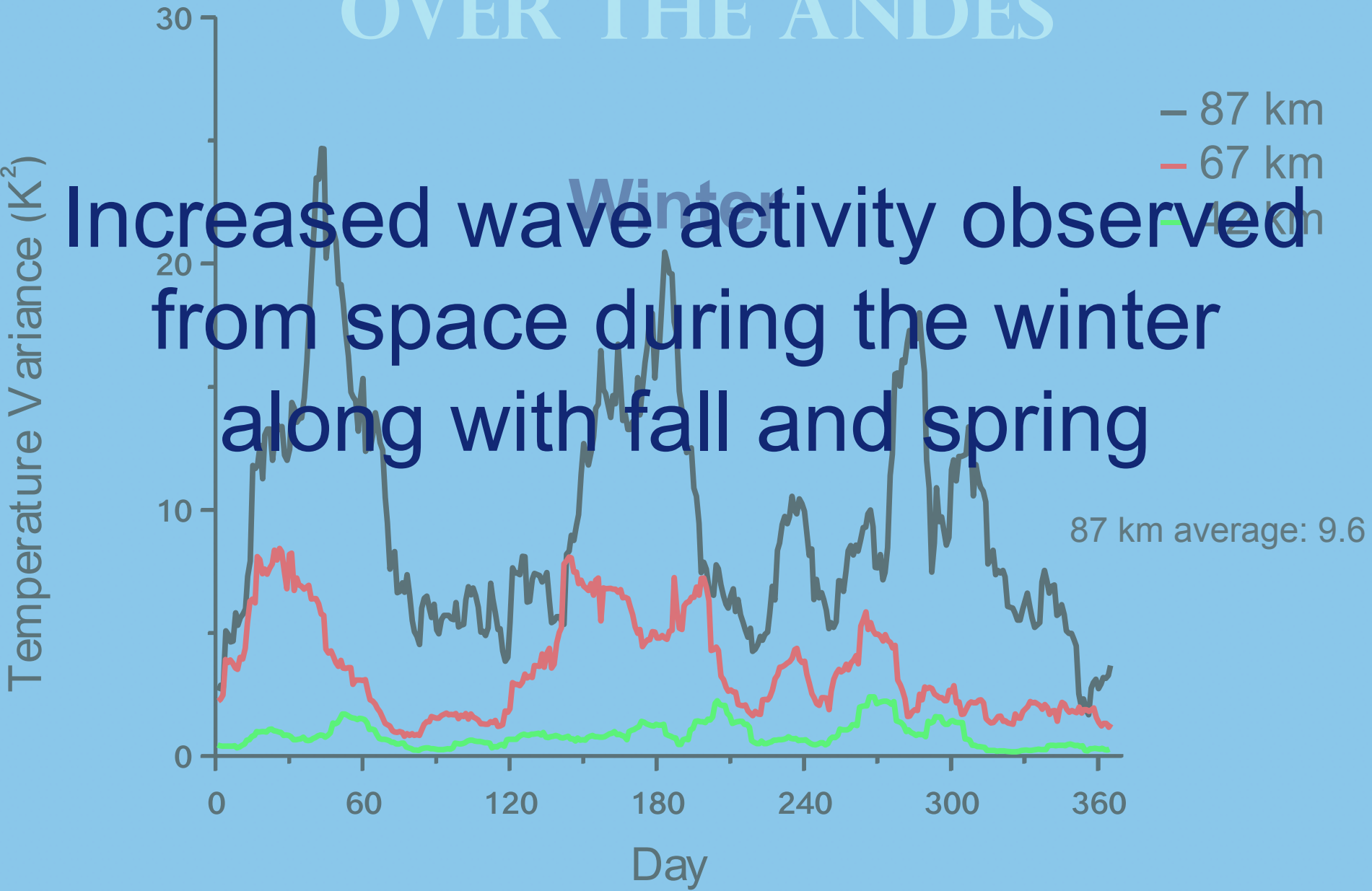
BACKGROUND TIDAL PROFILE



GRAVITY WAVE PERTURBATION REVEALED

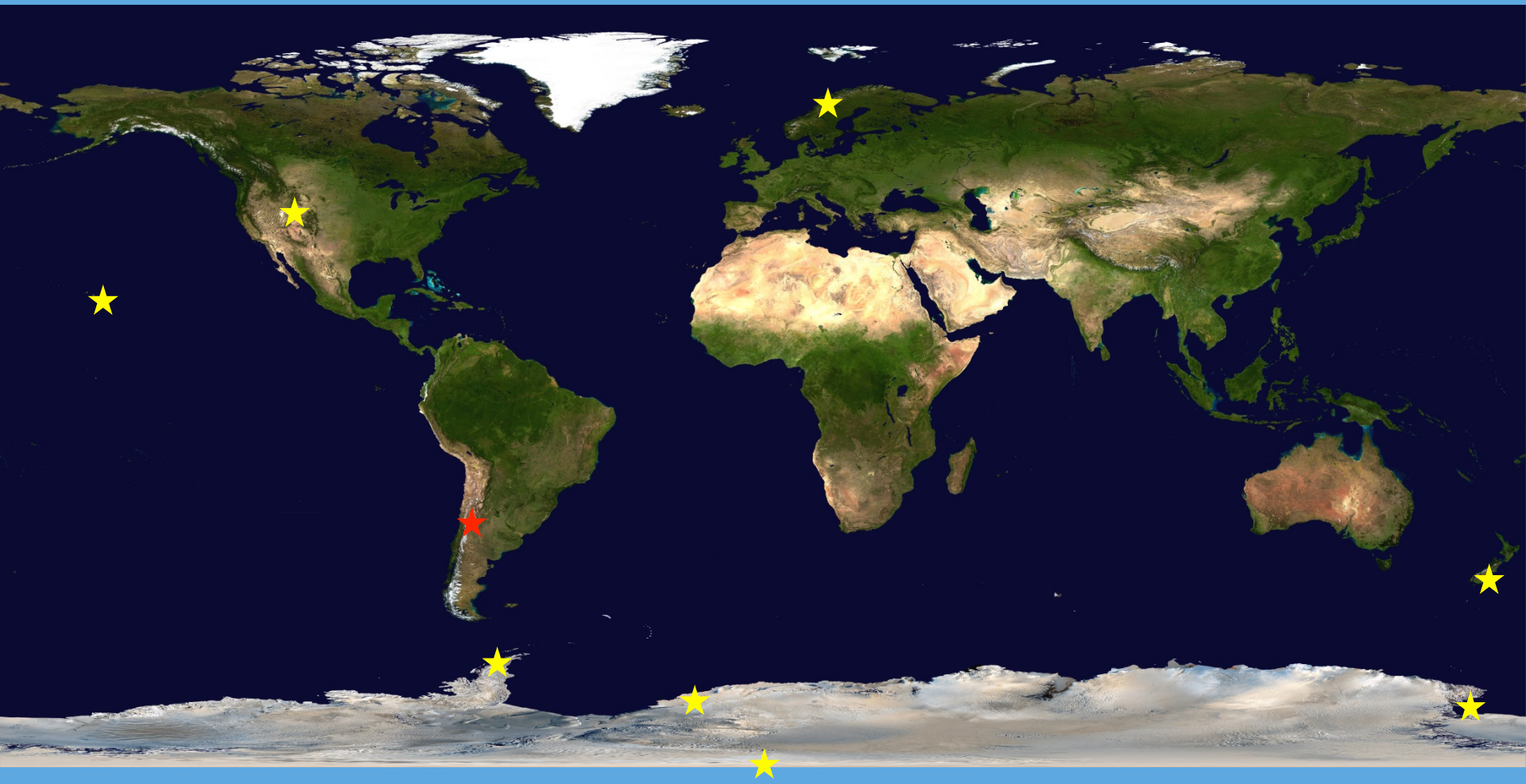


2010 TEMPERATURE VARIANCES OVER THE ANDES



Increased wave activity observed from space during the winter along with fall and spring

COMPARE SABER WITH GROUND MEASUREMENTS



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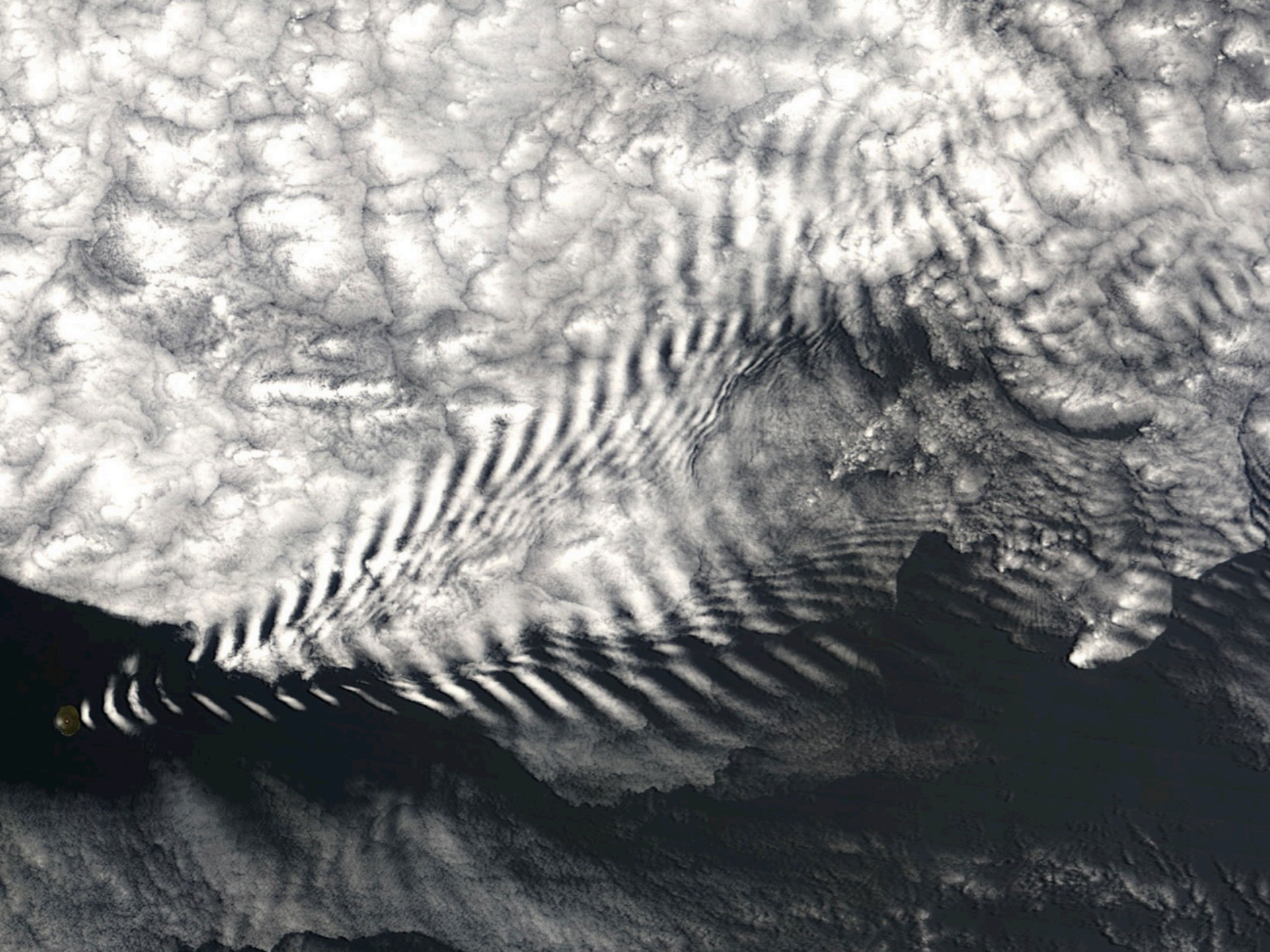
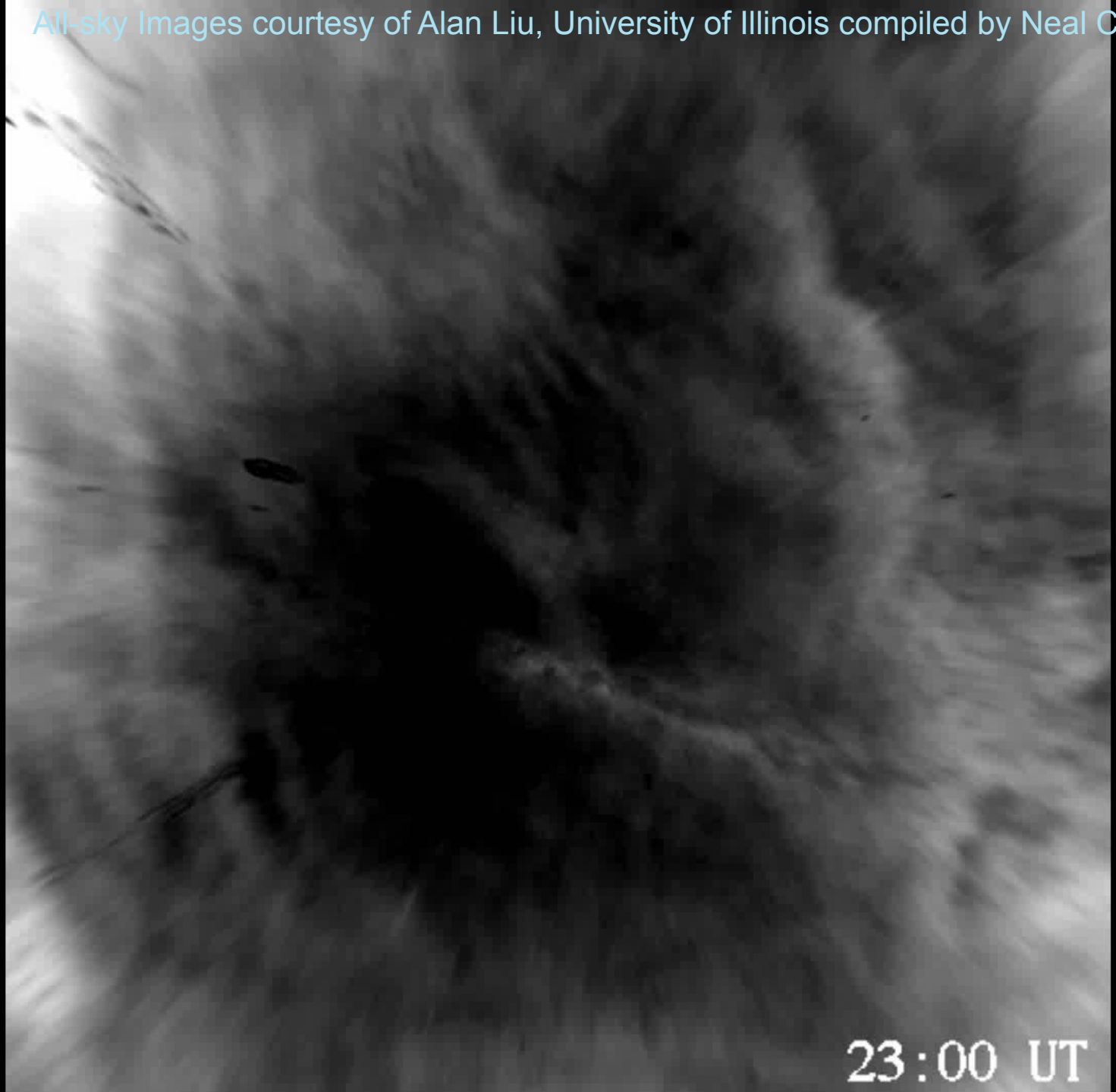
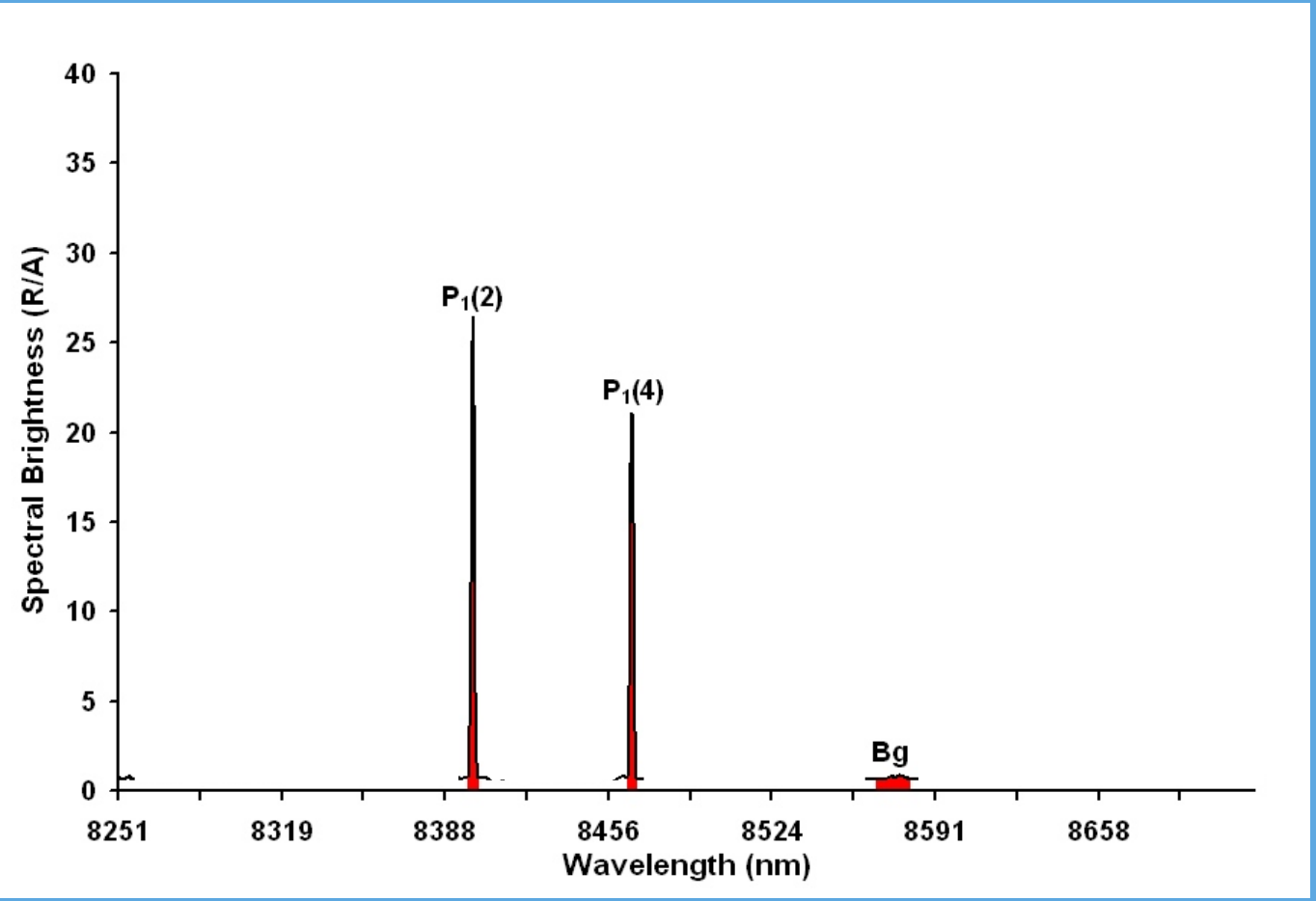
ATMOSPHERIC GRAVITY WAVES

Sergiu Bacio




All-sky Images courtesy of Alan Liu, University of Illinois compiled by Neal Criddle
23:00 UT

OH ROTATIONAL TEMPERATURE

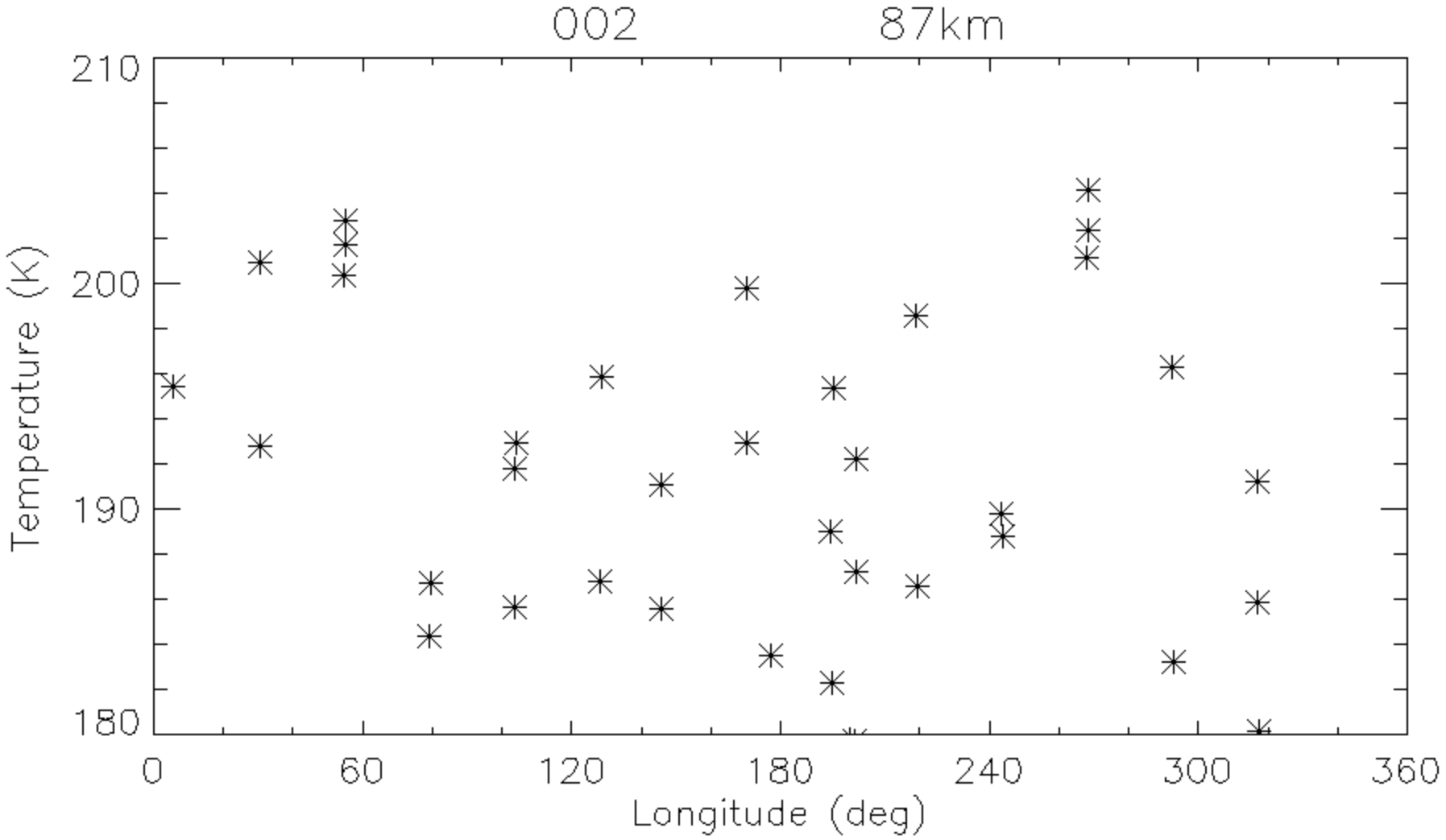


$$T_{OH} = \frac{SomeNumber}{\ln[stuff\,(P_1(2)/P_1(4))]}$$

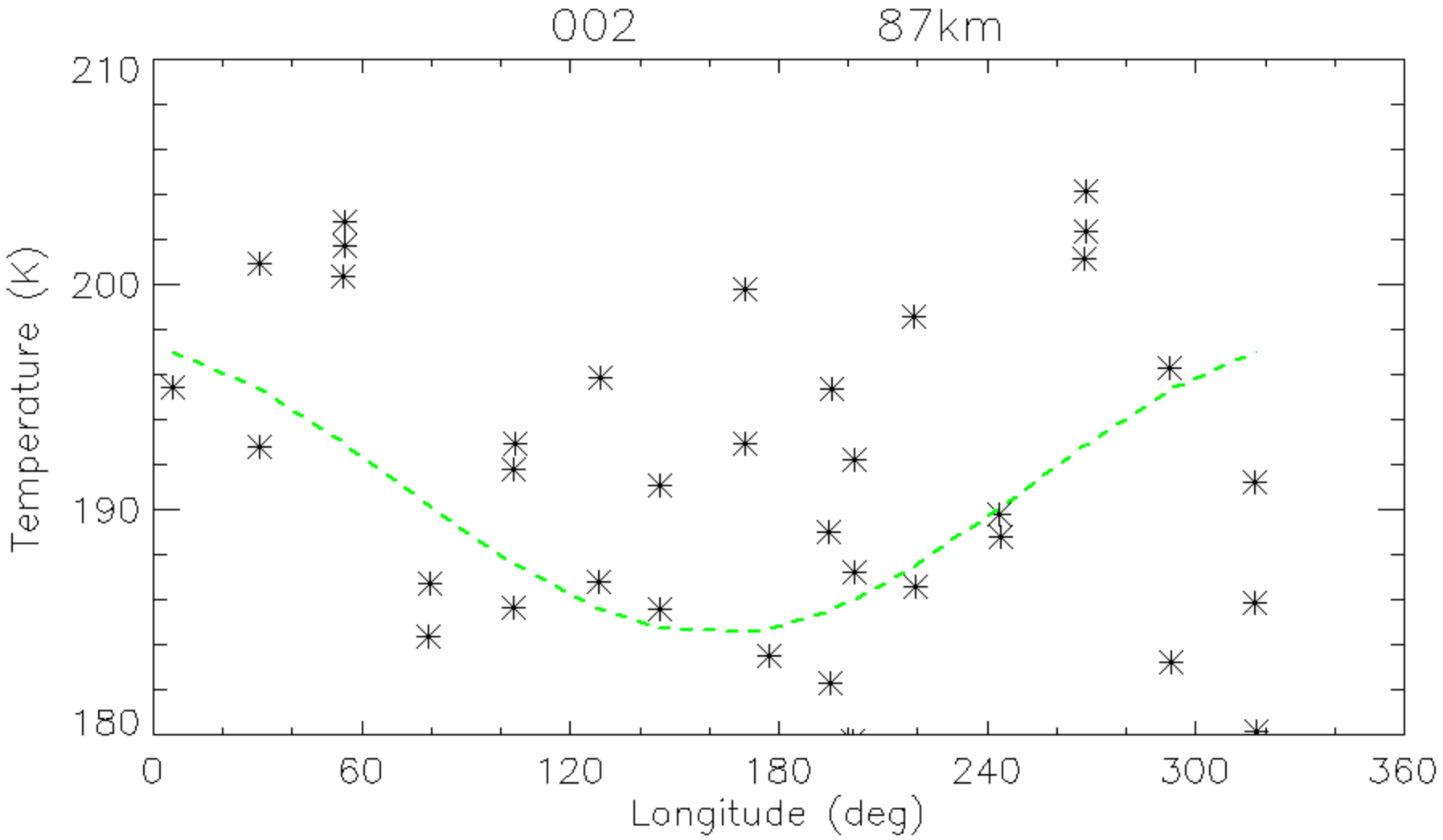
2 K Precision

Goldman et al., 1998

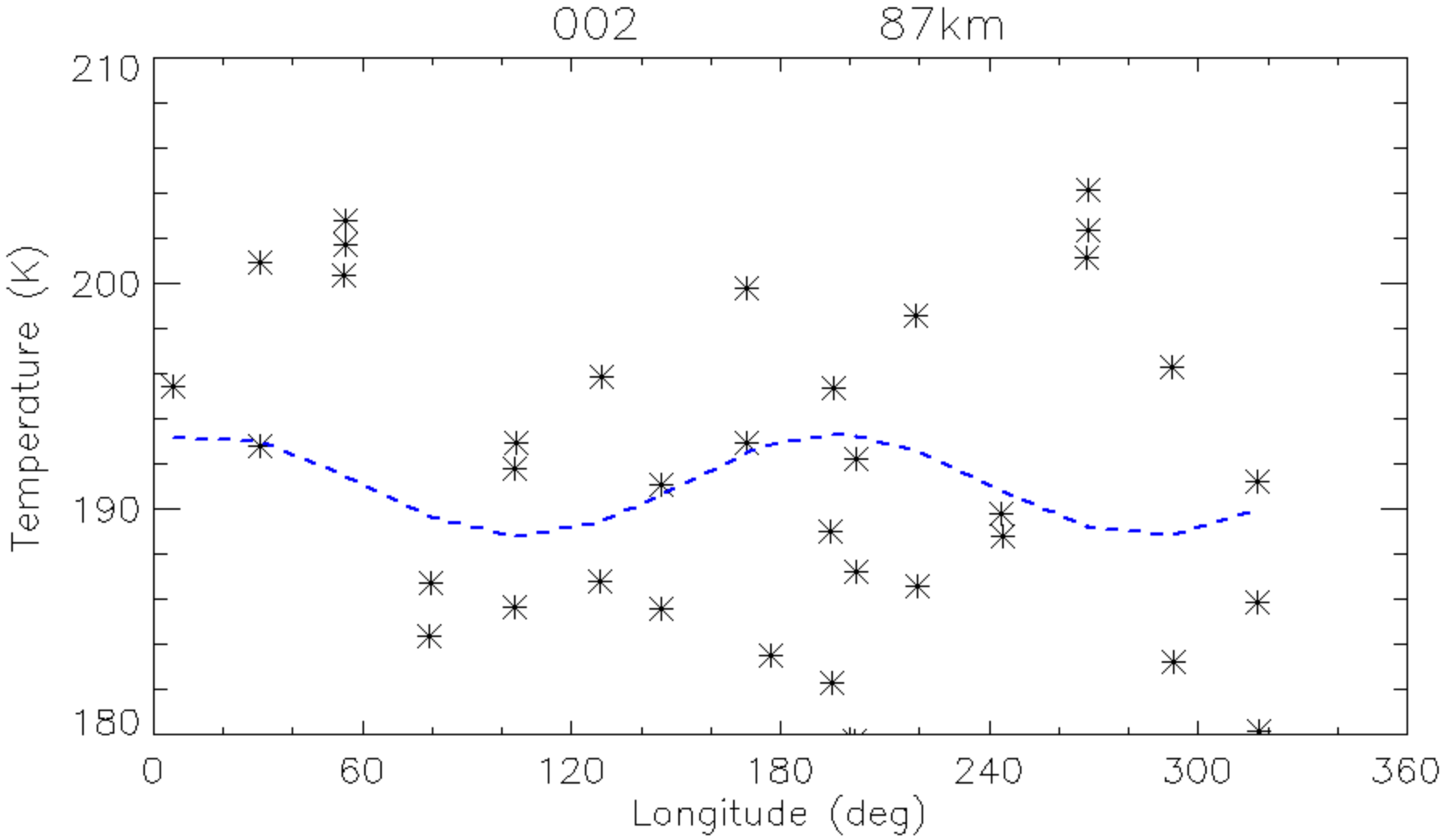
STEP 3: AT EACH HEIGHT ESTIMATE WAVES WITH WAVENUMBER 0-6.



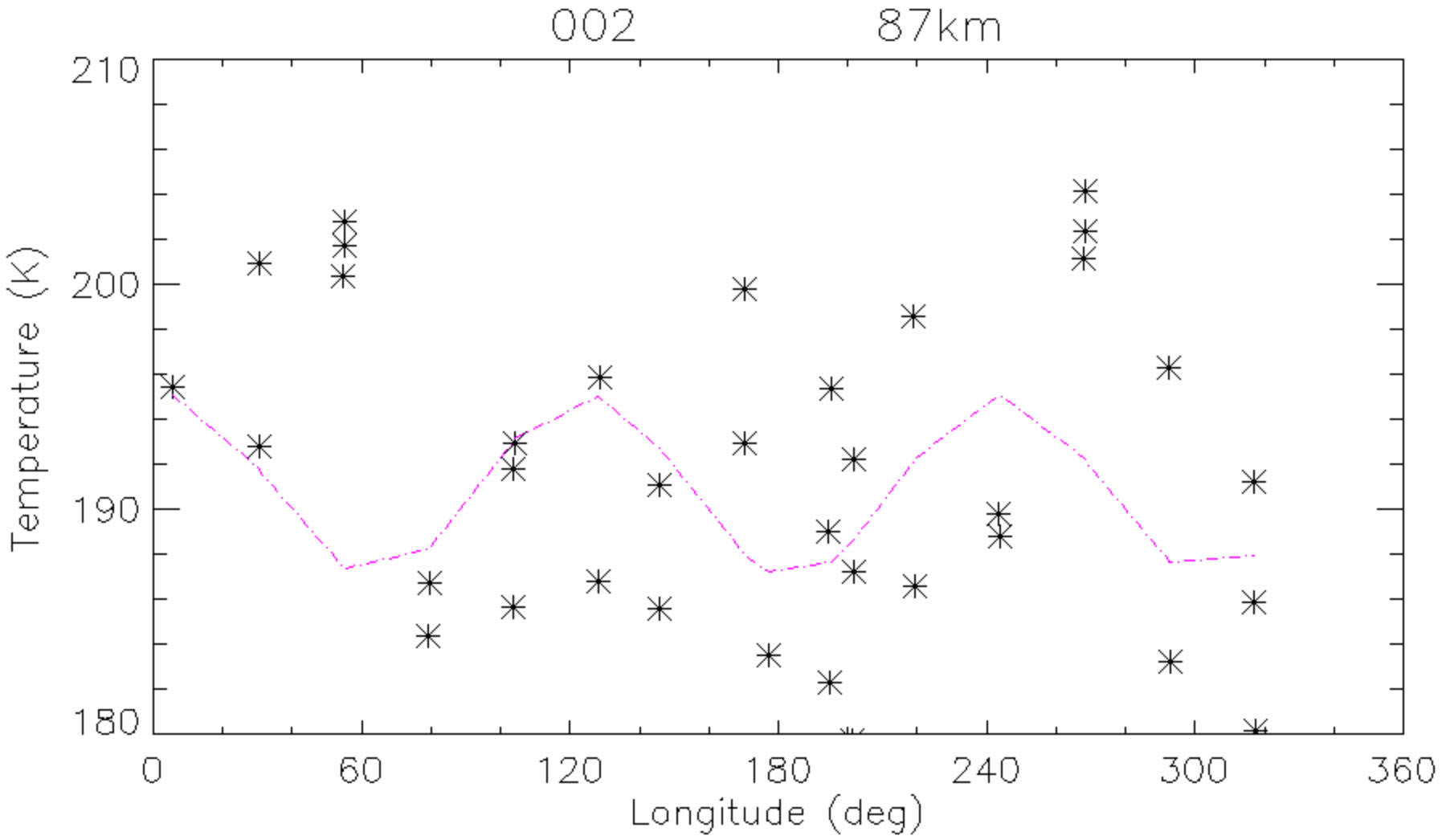
STEP 3: AT EACH HEIGHT ESTIMATE WAVES WITH WAVENUMBER 1.



STEP 3: AT EACH HEIGHT ESTIMATE WAVES WITH WAVENUMBER 2.



STEP 3: AT EACH HEIGHT ESTIMATE WAVES WITH WAVENUMBER 3.



STEP 3: AT EACH HEIGHT ESTIMATE WAVES WITH WAVENUMBER 0-6.