Gravity Wave Characteristics from OH airglow imager at Andes Lidar Observatory, Chile(30S,71W) and Comparison with Maui

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Outline

• Observation site and data
• Brief introduction on method
• Wave characteristics and comparison with Maui, Hawaii
ALO (30S, 70W)
Total number of observation

ALO

Maui

Nights with more than 20 minutes good observation

Month 2009−09 to 2010−09

Month 2002 2003 2004 2005 2006 2007
Method

• Gravity wave spectra (horizontal wavelength and propagation direction) are identified through 2-D FFT on time-difference OH airglow images

• Phase speed and wave period are inferred from phase progression between consecutive images
Horizontal Wavelength

ALO

Maui

Horizontal wavelength (km)

Number of wave events

Horizontal wavelength (km)

Number of wave events
Intrinsic phase speed

Histogram of intrinsic phase speed (m/s)

ALO

Maui
Observed phase speed

ALO

Maui

Histogram of observed phase speed (m/s)
Intrinsic wave period

**ALO**

**Maui**
Observed wave period

**ALO**

**Maui**

![Histogram of observed wave period for ALO and Maui](image)

- **ALO**:
  - Observed wave period (minutes)
  - Number of wave events

- **Maui**:
  - Observed wave period (minutes)
  - Number of wave events
Vertical wavelength

**ALO**

**Maui**
Wave occurrence frequency

ALO

Maui
Gravity wave transmission through lower atmosphere

**ALO**

**Maui**
Wave propagation direction, ALO

Summer: dominantly toward summer Pole

Generally a preference toward SW throughout the year.
Maui, wave propagation direction

During winter/summer, preferentially propagation toward summer pole.
Wave propagation direction relative to local mean wind

ALO

Maui

Direction Difference

Observed Phase Speed (m/s)
Doppler-shift effects

Vertical Wavelength and Cancellation Factor
vs Direction Difference with Mean Wind (T=10 minute, L_x =25 km)

- Black: Vertical Wavelength (10 km)
- Red: Cancellation Factor
Summary

• Gravity waves observed over ALO, Chile have longer horizontal wavelength, longer wave period than those over Maui
• Waves at both sites tend to propagate against local mean wind demonstrating the effects of Doppler-shifting
• The difference in wave parameters in the two sites implies dominant wave sources for the two sites are different. Especially, for ALO, there seem to be a dominant source region in the NE direction.
• Wave occurrence frequencies at both sites match well with wave transmission through the mean flow.