DEEPWAVE Science Meeting
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DLR Lidar at Lauder

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German Aerospace Center (DLR)
Mean Temperature

- 94 observations
- 500 hours

Planetary waves?
Tides

- Up to 20 K in amplitude at 80 km
- Phase of semi-diurnal tide variable, vertical wavelength 25-35 km
GW Extraction

Polynomial Fit

6 July 10:05 UT

4 h Mean
6 July

Polynomial Fit

Mean 3h

Mean 2h
7 July (IOP 12, RF 18)
29 July (GB 21)
1 August (GB 21)
1 August (GB 21)

Contour lines: ECMWF
Color: Lidar

ECMWF horizontal (black) and vertical wind (red/blue) at 170°E, 12 UTC
Position relative to polar vortex

- Lauder outside southern polar vortex
- Different propagation conditions for GW

Zonal mean temperature (K) and horizontal wind (m/s) from ECMWF (July 2014)
Correlation of lower stratosphere GWPED with tropospheric wind

- GWPED 28-38 km, polynom method
- Days with rotation of wind vector between 1-30 km smaller than 90 deg (GW are not filtered)
- Correlation between ECMWF wind at 1 km and 12 km perp. to NZ Alps

1.0 km, $r = 0.87$
12.0 km, $r = 0.79$

![Graph showing correlation between GWPED and wind](image)

![Graph showing monthly data from June to November 2014](image)
Correlation of lower stratosphere GW PED with tropospheric wind

- Polynom method gives best correlation with tropospheric wind

- Better extraction of GW
Case study 4 July

Wave extraction: Polynom method, 3h and 4h means

Windowing spectral bands

2D FFT
Reconstruct significant waves
Case study 4 July: Significant GW

 Contributions from different parts of the GW spectrum

 Observed periods and vertical wavelengths:

- 2.2 h, ~18 km
- 6 h, ~8 km
- > 10 h, ~8 km
Strong mountain wave event during GB21

Polynom method, stratosphere
Strong mountain wave event during GB21

Polynom method, MW

3h Mean up, < 3h
### GW statistics for New Zealand

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mesosphere</th>
<th>Stratosphere</th>
<th>Davis stratosphere</th>
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</thead>
<tbody>
<tr>
<td>Temp. pert.</td>
<td>3 – 5 K</td>
<td>1 – 2.5 K</td>
<td>2 – 3 K</td>
</tr>
<tr>
<td>Period</td>
<td>2.5 – 6 h</td>
<td>3 – 9 h Mountain waves</td>
<td>1 – 4 h</td>
</tr>
<tr>
<td>Vert. wavelength</td>
<td>5 – 8 km</td>
<td>4 – 8 km</td>
<td>3 – 6 km</td>
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<tr>
<td>Phase speed</td>
<td>-0.8 km/h</td>
<td>-0.3 km/h</td>
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<td></td>
<td>70 % upward</td>
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