DEEPWAVE Model Summary

Model	Type	Org.	Horizon Res.	Vertical Levels	Top	Fcst Length	Freq./day	Purpose
GFS	Global	NCAR	27km	64?	50km?	240 h	4x	Medium range
IFS	Global	DLR	16km	137	100km	240 h	4x	Medium range – high alt GWs
NAVGEM	Global	NRL	37km	50	70 km	120 h	4x	Medium range
UM	Global	NIWA	17km	70	80 km	144 h	4x	Medium range – high alt GWs
NZLAM	Meso	NIWA	12km	70	80 km	72 h?	4x	GWs, meso
NZCSM	Meso	NIWA	1.5km	70	40 km	36 h?	4x	Fine scale GWs, local mesoscale
COAMPS	Meso	NRL	15km	86	60 km	48h	2x	GWs, meso
WRF	Meso	Inns.	6 km	89	35 km	72h	2x	GWs, meso
Cosmo	Meso	BGS	2.8			48h	2x	Fine scale GWs,
COAMPS Adjoint	Meso	NRL	20	60	30 km	48h	4x	Targeting
Ray Tracing	Linear	NRL						Ray Tracing

Standard Products

| Variables	Levels	Time Frequency	Forecast Length
SLP, 3-h rain fall hPa, mm	Sea level	Every 3 h	120 h global 48 h mesoscale
Heights-Winds Meters, m/s vectors	850, 700, 500, 300, 200, 100, 50, 10, 5 mb	Every 3 h	120 h global 48 h mesoscale
Vertical velocity m/s	850, 700, 500, 300, 200, 100, 50, 10, 5 mb	Every 3 h	120 h global 48 h mesoscale
Divergence 10**3 /s?	850, 700, 500, 300, 200, 100, 50, 10, 5 mb	Every 3 h	120 h global 48 h mesoscale
Theta, vertical velocity, horizontal winds	Cross barrier sections i) Across S. Island (3 sections) ii)Across Tasmania Section in height coord. Top at 40 km	Every 3 h	48 h
Wind speed, potential temperature	Meridional cross section	Every 3 h	48 h
Vertical flux of wave energy and zonal momentum flux.	850, 700, 500, 300, 200, 100, 50, 10, 5 mb	Every 3 h	48 h
Targeting products (NRL only so far)	Vertically integrated energy, sensitivity for 850, 700mb	Every 3-6 h	24 h sensitivity with various lead times
Profiles of zonal wind speed (or cross mtn) for all targets	Vertical profile – SI NZ (N and S), TAS, AI, MI, several S. Ocean Pts	Every 3-6 h	120 h Global
Cloud Top	Top in height	Every 3 h	48 h
Turbulence	Flight Level	Every 3 h	48 h

DeepWave Products

- Can we standardize products with same projections, same graphics
    - or at least similar color table
    - Challenge – some models use Grads, NCAR, Matlab
    - Challenge – need to start this soon
- Plot model profiles of zonal wind on one graph?

Momentum and Energy Flux Calculation (suggestion from R. Smith)

To compute this diagnostic, apply a 300km high pass filter to p, u and w on the desired level. Compute the products pw and uw point by point. Apply a 300km smoother (i.e. low pass filter)

Here is an example of wave energy flux at the 8km level.
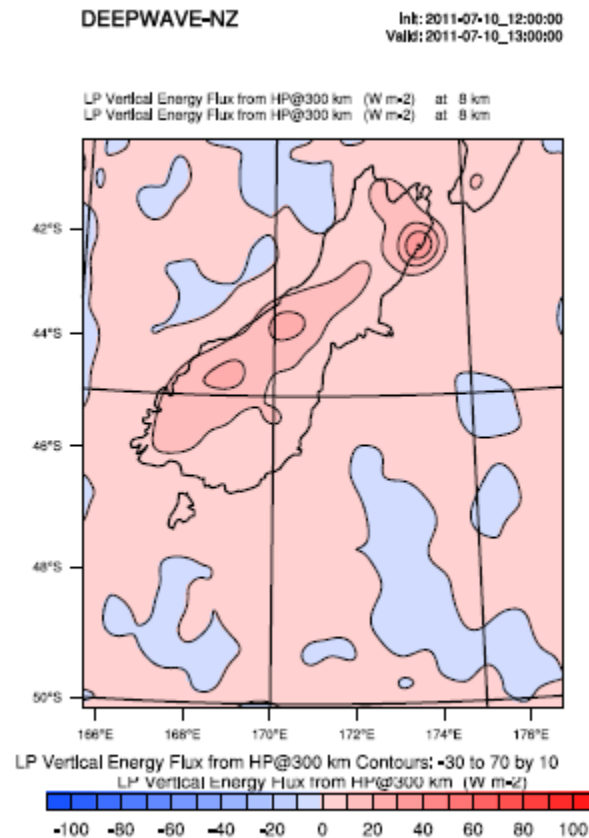
Mountain Wave Criteria (tracks 1-5, 7)

GW Grades

- At flight level (i.e. 13 km AMSL or 200 to 150hPa)
    - Threshold |w|>3m/s
    - Efz> (with 150 km smoother*)
        - A grade 50 W/m2
        - B grade 40 W/m2
        - C grade 30 W/m2
    - |MFx|> (with 150 km smoother*)
        - A grade 1 Pascal
        - B grade 0.8 Pascal
        - C grade 0.6 Pascal
- At 2hPa (i.e. about 40km AMSL)
    - Threshold |w|>4 m/s
    - EFz>1 (with 150 km smoother*)
        - A grade 10 W/m2
        - B grade 5 W/m2
        - C grade 2 W/m2
    - |MFx|> (with 150 km smoother*)
        - A grade 0.2 Pascals
        - B grade 0.1 Pascals
        - C grade 0.05 Pascals

Divide all values in half if a 300 km smoother is used.

Mountain Wave Criteria (tracks 1-5, 7)

Environmental Conditions Grades

- At 700 hPa (i.e. 3 to 4 km AMSL)
    - A grade, U>20 m/s
    - B grade, U>15 m/s
    - C grade, U>10 m/s
    - D grade, U<10 m/s

- At 10 hPa (i.e. 30 km AMSL)
    - A grade, U>20 m/s
    - B grade, U>15 m/s
    - C grade, U>10 m/s<15 m/s
    - D grade, U<10 m/s

Overall Average GW Grade

Predictability Criteria

COAMPS Adjoint and Nonlinear Output

- 700 hPa wind speed grade or NZ GW grade for final time (lead time+24 h)
- Spatial Extent of Total Energy
  - A grade, TBD
  - B grade, TBD
  - C grade, TBD
  - D grade, TBD
- Ratio of the [total energy within GV range (1800 nm?) / TE]
  - A grade, TE Ratio >90%
  - B grade, TE Ratio >80%
  - C grade, TE Ratio >70%
  - D grade, TE Ratio >60%

Overall Average Predictability Grade

Forecasting in Support of Deepwave

1. Multiple Mission Types and Targets
   - New Zealand, Tasmania, S. Ocean, Auckland Is., Macquarie Is., Predictability Targets
2. Multiple Aircraft: G-V, Falcon
3. Multiple Ground Based Instruments
   - ISS, Radiosondes (Hokatika, Lauder, Haast, Tasmania)
   - MLT sites (will the operate differently in IOPs?)
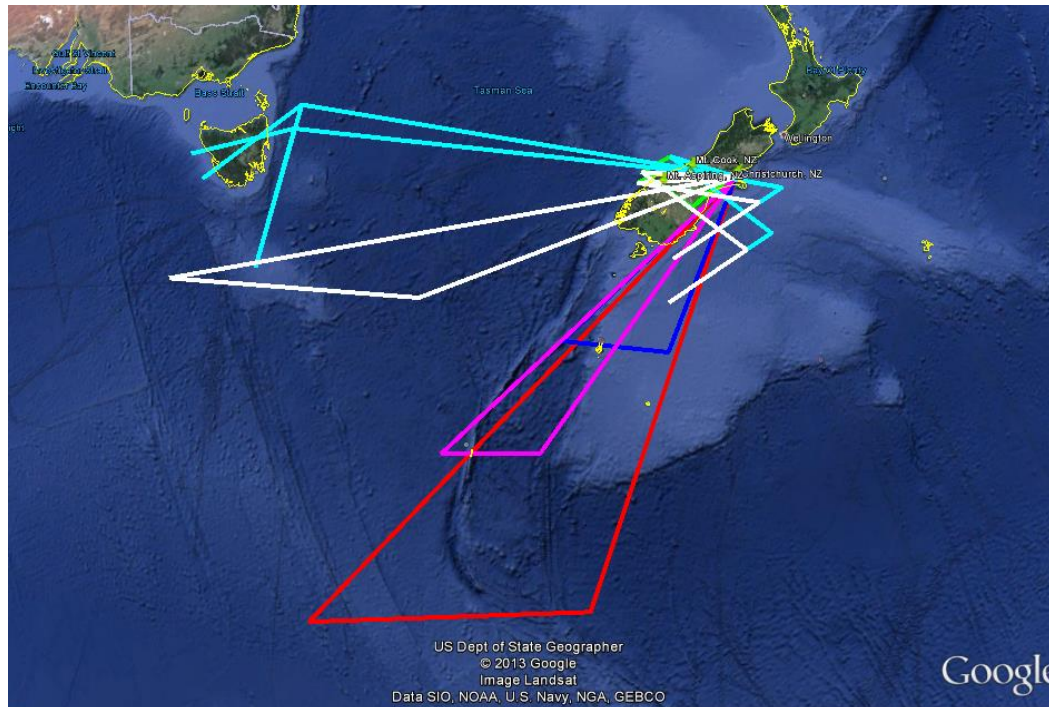
Forecasting in Support of Deepwave

Forecast Discussion (enter in catalog)

A. Synoptic Discussion (Current Synopsis)

B. Synoptic Outlook

   i) Up to Day 2

   ii) Days 2-4

   iii) Extended outlook

C. Gravity Wave Outlook (for all targets)

   Consider launching conditions, moisture, clouds, conditions for deep propagation, AIRS data etc.

   i) Up to Day 2

   ii) Days 2-4

   iii) Rank top targets

D. Predictability

   Outlook for Day 2 (targets are for +24h, with 36 h lead time)

E. Outlook for airport and alternates? (Ceiling, winds etc)

G. Turbulence (Flight level) Outlook

   Up to Day 2 for most promising target

H. Fill Out Quick-Look Checklist/Spreadsheet in Catalog

Forecasting in Support of Deepwave

Some other issues/needs…

- Weather Update for Afternoon Briefing
- Preflight Briefings (same team?, perhaps second shift)
- Do we want a late afternoon Scorecard to assess previous day's forecast vs. AIRS, vs. Aircraft?
  - Evaluation team?

Forecaster Summary Spreadsheet

Mission	Summary Comments
GWs: New Zealand	Strong Cross Mtn Flow – Trailing waves Days 1-2; Not promising beyond
GWs: Tasmania	Weaker GWs than 10 Aug., with transient GWs. Back to back 9 h flights only possible w/ double crewing beginning at 72h
Auckland Island	Flow is too weak to generate much wave activity
Macquarie Island	20+ m/s NW flow increasing during 0600-1500 UTC. Shallow waves., Considering launching sondes
Non-orogr. GWs	ECMWF and COAMPS forecasts are not indicating non-orographic waves
Targeting	Targets upstream of NZ are too widespread, flow is weak. Targets upstream of Tasmania are too far.

Forecaster Grades Spreadsheet

Mission	6h	12h	18h	24h	30h	36h	42h	48h	60h	72h	84h
New Zealand	C	C	B	A	A	A	A	A	C	C	C
Tasmania	A	A	B	C	C	C	C	C	A	A	A
Auckland Island	C	C	B	A	A	A	B	B	A	A	A
Macq. Island	C	C	B	A	A	A	B	B	A	A	A
Non-orog. sources	C	C	B	A	A	A	B	B	A	A	A
Predict. Targeting	A	A	B	C	C	C	A	A	C	C	C

Mission Scientist Spreadsheet

Mission	Comments	GV Drops	Falcon Drops	IFS Sndg	Lauder Haast	Tasm. Sndg	Macq. Sndg
GWs: New Zealand	Strong Cross Mtn Flow – Trailing waves	Trk 1 20	Trk F1 20	3 h For IOP	3 h for IOP		
GWs: Tasmania	Weaker GWs than 10 Aug., with transient GWs. Back to back 9 h flights only possible w/ double crew					Not needed	
Auckland Island	Flow is too weak to generate much wave activity						
Macquarie Island	20+ m/s NW flow increasing during 0600-1500 UTC. Shallow waves.						6 h?
Non-orogr. GWs	ECMWF and COAMPS forecasts are not indicating non-orographic waves						
Targeting	Targets upstream of NZ are too widespread, flow is weak. Targets upstream of Tasmania are too far.						