Title: 6-km WRF Long Run

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1.0 Data Set Overview

Abstract

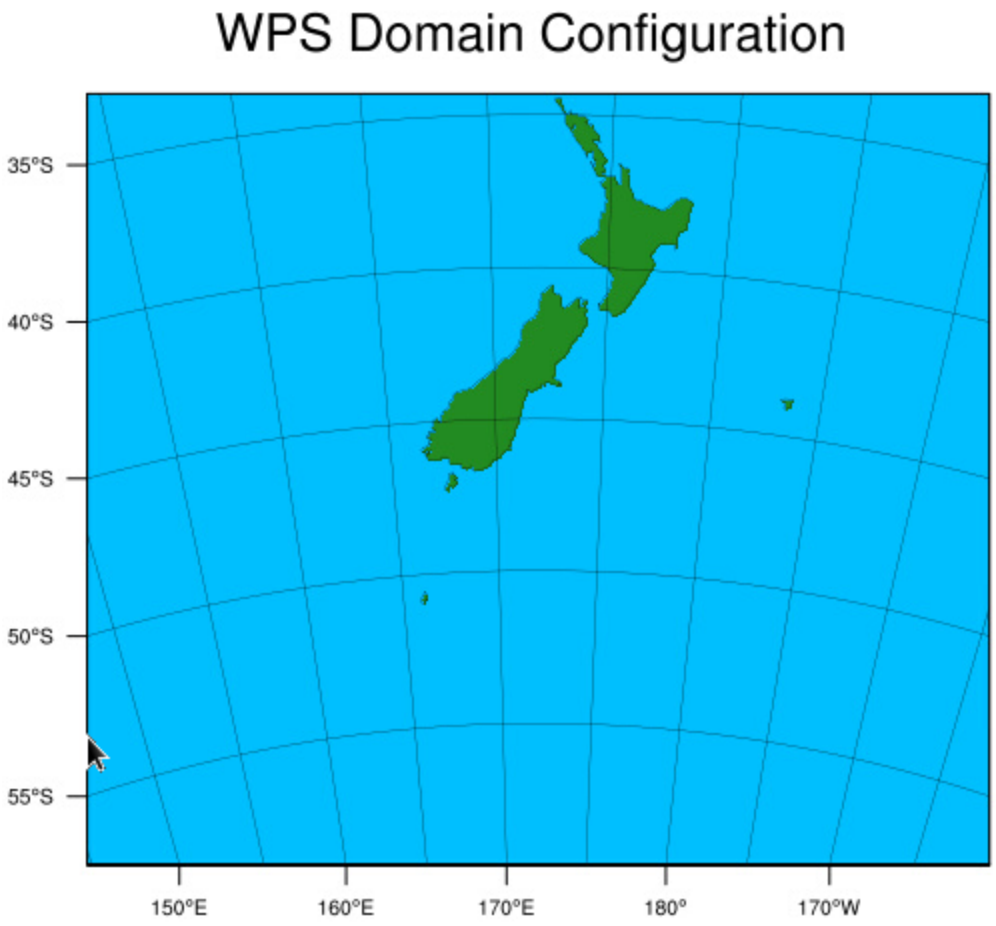
This dataset is made up of standard Weather Research and Forecasting (WRF, v3.6) model output for the entire DEEPWAVE period. The model domain is centered on the New Zealand region, covering the entire country and a portion of the Southern Ocean. The simulation was forced by ECMWF analysis grids, providing initial and boundary conditions. Initial conditions were only supplied twice, while boundary conditions were supplied every three hours. This produced two long, continuous simulations over the DEEPWAVE period.

Time Period

The model was initialized at 24 May 2014 at 00 UTC. Adaptive time stepping was used, allowing stable integration until 19 June 2014 at 21 UTC, where numerical instabilities occurred. The model was restarted on 19 June 2014 at 09 UTC after reducing the number of vertical levels from 126 to 111 and integrated successfully through 31 July 2014 at 21 UTC. The “spin up” grids from the first 12 hours of the second simulation were discarded. WRF fields were saved every three hours from 24 May 2014 at 00 UTC through 31 July 2014 at 21 UTC.

Domain Details

The model was run at 6-km resolution, with a domain top at 100 Pa (~45-km). In the first simulation, 126 vertical levels were specified. The number of vertical levels was reduced to 111 in the second simulation. In both simulations, the vertical resolution continuously decreased with height, reaching a maximum vertical spacing of ~550 m (~650 m) in the first (second) simulation. A 10-km damping layer was specified relative to the domain top. The domain location is illustrated in the following figure.



Parameterization Selections

Physics	**Scheme**	**WRF Namelist Option**
Microphysics	Thompson	mp_physics = 8
Long-wave Radiation	RRTMG	ra_lw_physics = 4
Short-wave Radiation	RRTMG	ra_sw_physics = 4
Surface Layer	Pliem-Xiu	sf_sfclay_physics = 7
Land Surface	Pliem-Xiu	sf_surface_physics = 7
PBL	ACM2 (Pliem) PBL	bl_pbl_physics = 7
Cumulus	NONE	cu_physics = 0

2.0 Model Description

WRF is a widely used full physics, non-linear, and non-hydrostatic mesoscale numerical model. For general details on this model, please see http://www.wrf-model.org/index.php. For technical details, please see http://www2.mmm.ucar.edu/wrf/users/docs/arw_v3.pdf.

3.0 Data Collection and Processing

Model output was written using the "102" output option in the WRF namelist. This option enables the model to output one file per processor, increasing the write speed by orders of magnitude. Each processor is assigned a "patch" of the entire domain, and each file contains data from a particular patch. These patches were pieced together using a version of the "joinwrfh" software, which can be found at https://github.com/OpenMeteoData/joinwrfh. The resulting joined files are the standard WRF output files containing standard variables on the terrain following coordinate.

4.0 Data Format

All output files are in NetCDF format and contain standard variables on the model grid at a single time. Each file contains extensive metadata for both the included variables and the model configuration. To view this metadata, run "ncdump -h wrfout_d01_2014-??-??_??-??-??" or "ncl_filedump wrfout_d01_2014-??-??_??-??-??".

5.0 Data Remarks

Limited validation analysis has been performed on this simulation dataset. As noted during the 23-24 October 2014 DEEPWAVE meeting, this simulation is unconventional in that it is primarily forced at the boundaries. Conventionally, simulations would be periodically restarted in order to incorporate initial conditions, which would better constrain the flow evolution in the interior of the domain. It is possible atmospheric phenomena might drift in space or time relative to the boundary condition grids within this simulation. Currently, it is unclear if this "interior drift" exists or is significant within this simulation dataset.