# Orographic Vortex Shedding - Comparisons Using Different Nested Grid Options in ARW WRF

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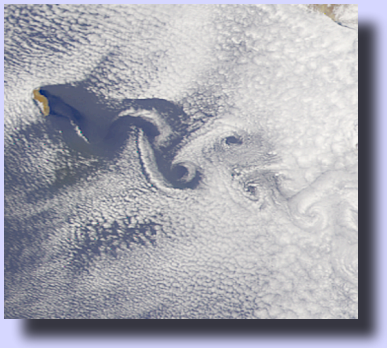
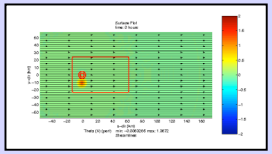
## Introduction / Motivation

- Mountains affect regional and global atmospheric circulations
- Want to capture such orographic flows at a high resolution so we can better parameterize these effects
- Gridded nesting is important because large horizontal expanse of domain is desired, and we also want to achieve high-resolution near the area of interest



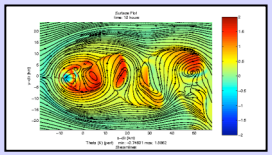
*Satellite image of island vortices*

*Parent domain and inner nest domain (red box). Initial theta' just south of mountain initiates the shedding vortices.*

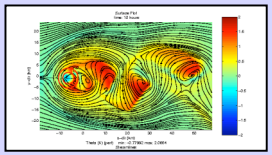


**Figures on lower left show inner nest area surface plot comparisons of a vortex shedding case for:**

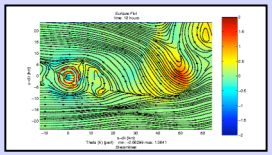
- 1-way nest
- 2-way nest
- high resolution control run covering parent domain
- low resolution parent domain from the 1-way nested run
- simulation of inner nest domain with open lateral BC's



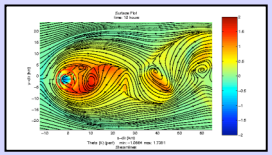
*1-way nest*



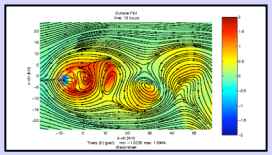
*2-way nest*



*open BC's*



*high-res control run*



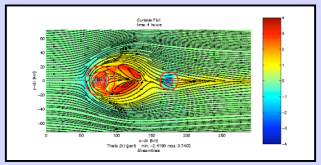
*1-way parent domain*

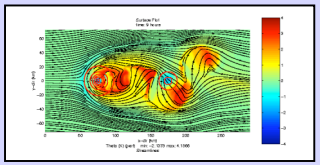
**Simulation specs:**

- Nested runs contain inner nest and parent domain
- Run time - 10 hours
- Inner nest horizontal resolution - 650 m - 1/3 that of parent domain, z_top = 6 km
- Inner nest domain: 120 x 60 x 50, parent domain: 120 x 75 x 50
- Mountain height = 1.5 km, upstream U constant 5 m/s, stability N = 0.01 $s^{-1}$
- Vortex shedding due to initial asymmetrical potential temperature perturbation

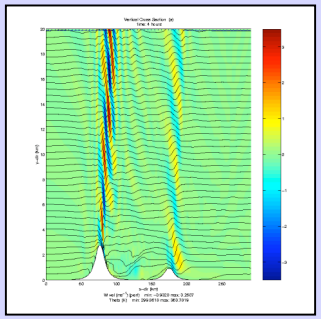
**2-way nested run of vortex shedding with 2 mountains - time sequence of plots before / after shedding impacts downstream mountain gravity waves**

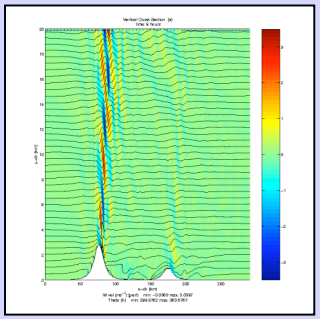
**4 hours** **9 hours**





*surface plots of theta' and streamlines*





*vertical cross-sections (x-z axes) of w and theta*

## Conclusions / Future Work

- The 2-way nested scheme works well for these simulations - much better than 1 domain only with open lateral boundaries
- Need to compile parallelized version to run on several machines