Expanding Vapor’s Data Handling Capabilities

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Introduction

- Handle data from Weather Research and Forecasting (WRF) model
  - Non-uniform, non-rectangular grid
- Direct output to Vapor’s format
  - Parallel wavelet transformation
Evaluating Vapor and WRF

- Weather data rarely seen in 3D
- Preliminary tests: WRF data looks interesting in 3D
WRF User’s Requirements

Vapor should:
- Handle odd grids
- Deal with invalid data points
- Add certain derived variables
- Handle time steps
And do this all quickly
WRF Data Conversion

- Correctly handles staggered grids
- Efficiently adds derived quantities
- Uses WRF-specific metadata to automate process
Vapor and Large Data Sets

- Wavelet transforms
  - “Smooth” and “detail” parts
- Data conversion
  - Time consuming
  - Redundant
- Goal: simulations output Vapor’s format
Parallel Vapor Output

- Communication
  - Move data points into blocks
- Transformation
  - Readily parallelized
- Output
  - Parallel netCDF
  - netCDF 4
  - HDF5
Initial Tests

- Simplified situation
  - Data already arranged properly
  - Haar wavelets
- Code for transformation of block on single node
  - 8 processors, $2^{18}$ points: ~5x speed-up
Conclusion

- Vapor’s improved data handling
  - Vapor useful to WRF users
  - Direct output to Vapor’s format is viable