

Difference Plots for Extreme Weather Tracking & Dask Parallelism at NCAR

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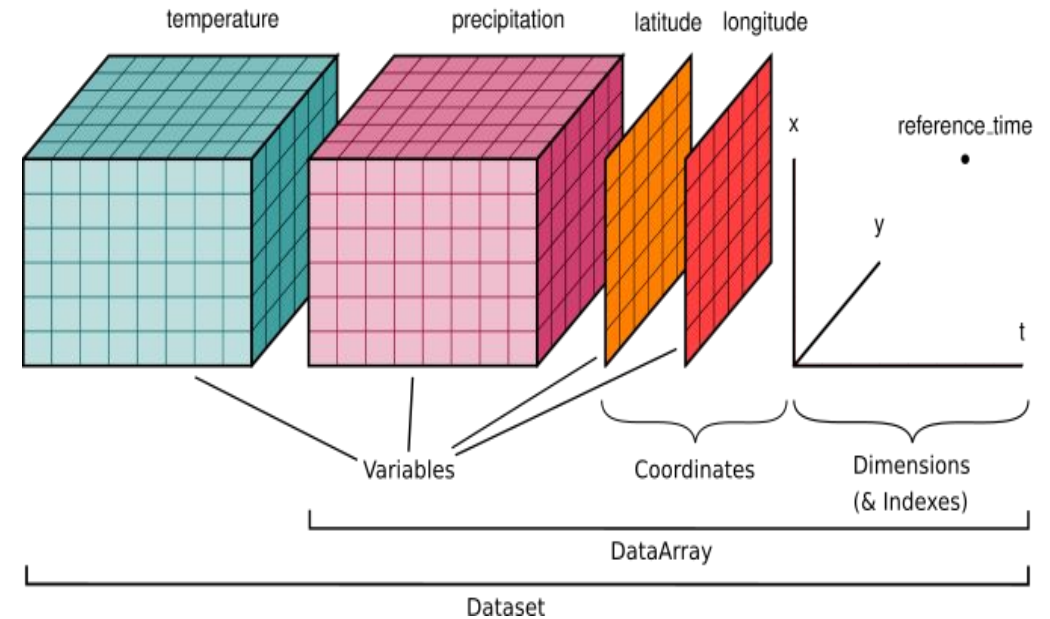
Difference Plots

Visualize the differences between two measurements with magnitude and spatial distribution

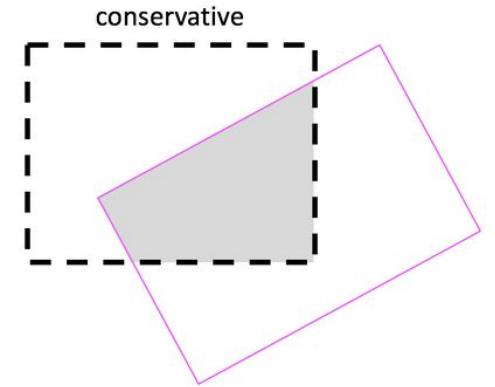
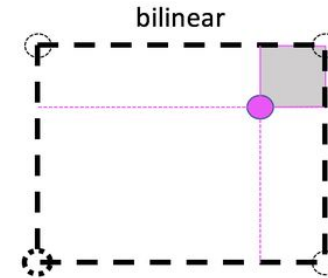
Comparing on different grids to highlight discrepancies between the two

Xarray and UXarray

- builds upon Xarray's data structures Dataset and DataArray through uxgrid accessor
- challenges with broadcasting different shapes and grids



Remapping



Bilinear

- interpolates using weighted average of surrounding grid points
- preserves smoothness, best for continuous variables (temperature)

Conservative

- preserves area-integrated quantities (precipitation)
- fluxes and conservation-critical variables (relative humidity, atmospheric pressure) for interpreting fluxes

UXarray

- ensures data compatibility between coarse and fine grids
- offers multiple algorithms

Extreme Weather Tracking Software

TempestExtremes

- designed for large-scale climate datasets
- focuses on global-scale feature tracking
- no X/UXarray, uses c++

Tracking and Object-Based Analysis of Clouds (TOBAC)

- analyzing individual clouds in gridded datasets
- tracks individual convective systems in high-resolution model outputs

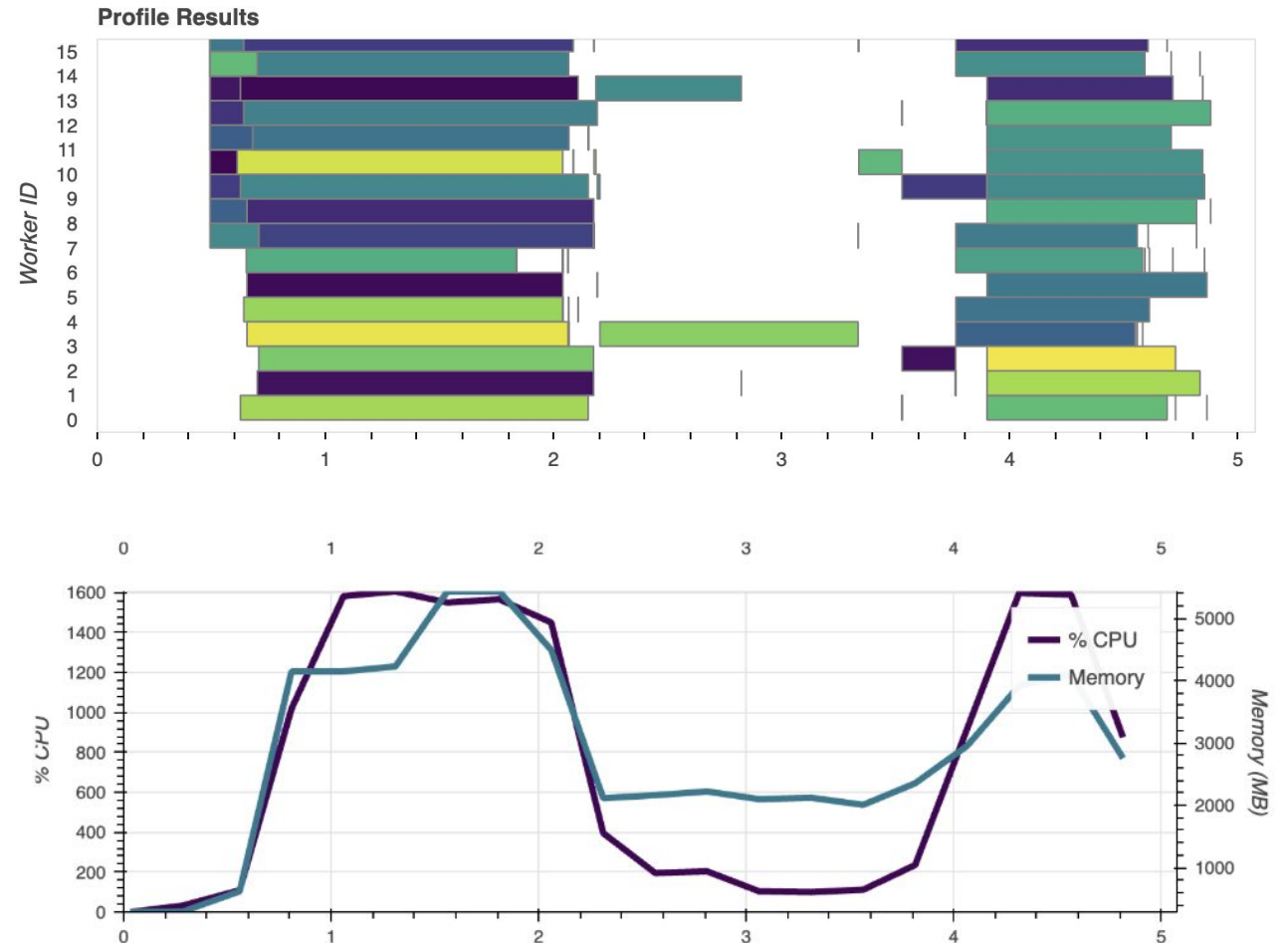
Scientific and technical considerations

- remapping, variation for types of plots, more memory usage

Dask Parallelism

Worked with Casper PBS
changes the node, cpu, and
memory

- profiler, resource, and cache profiler objects
- core dask analysis
- performance profiling



Skills Learned and Future Steps

Parallel computing and working with Xarray and Uxarray performing operations on multidimensional arrays

Extreme Weather Tracking Softwares

Working with Dask for large-scale data analysis

Applying Dask parallelism with global daily temperature dataset

Acknowledgement

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