National Aeronautics and Space Administration

Optimal Strategies for Storing Earth Science Datasets in the Commercial Cloud

Goddard
SPACE FLIGHT CENTER

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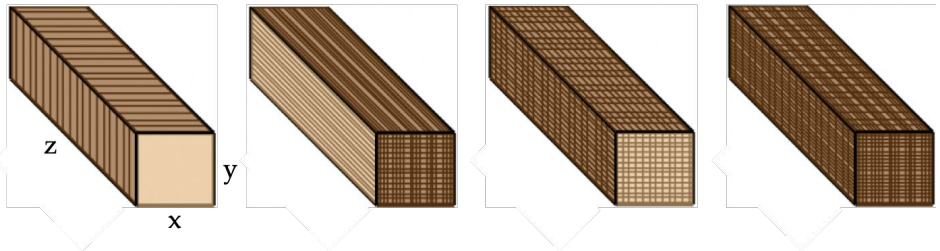
Problem & goal

- Part of EIS Fire Portal project
- How does the chunking scheme affect usage and analysis of multi-dimensional datasets in Zarr format?
- What are the optimal chunking strategies for storing datasets on the cloud?

--- Test performance of different chunking strategies ---

Data cube



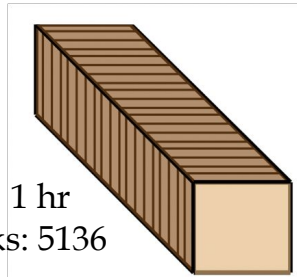
Dataset & chunking strategies

GEOS-FP
dataset in Zarr format

From GEOS - high resolution global atmospheric model

Analyses and forecasts produced in real time

Default chunking scheme

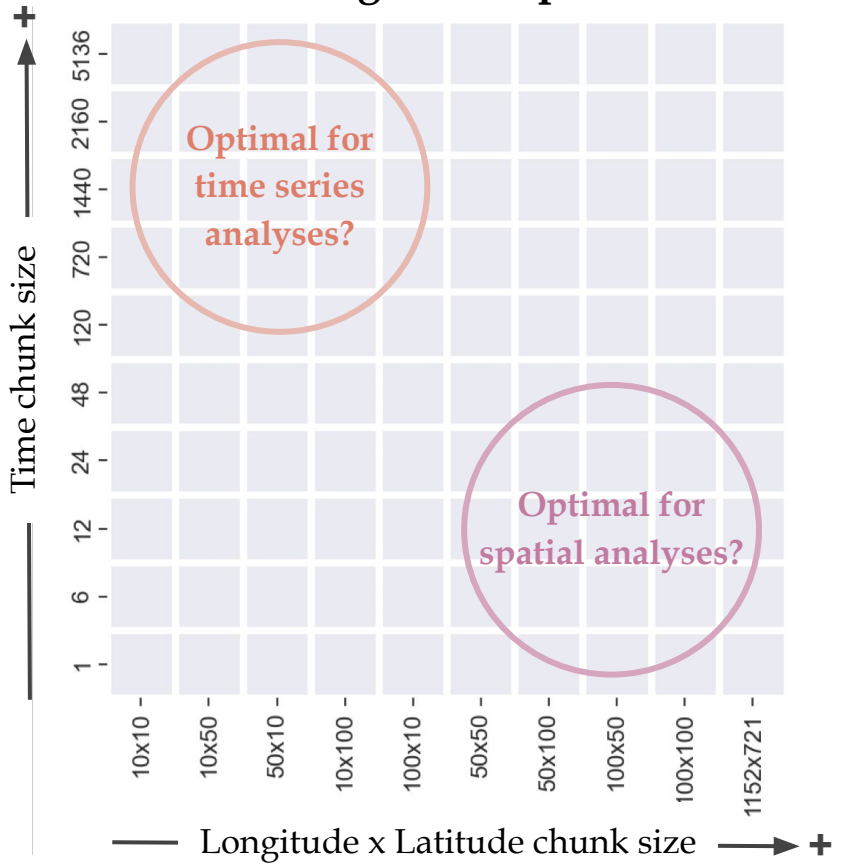


Time
Chunk size: 1 hr
Num chunks: 5136

Latitude
Chunk size: 721 deg
Num chunks: 1

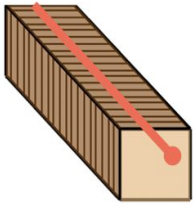
Longitude
Chunk size: 1152 deg
Num chunks: 1

Strategies to explore



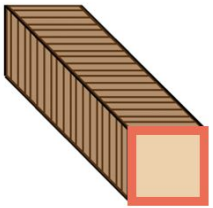
Trade-off between time series and map in CPU time

Task 1. Drawing time series at single location

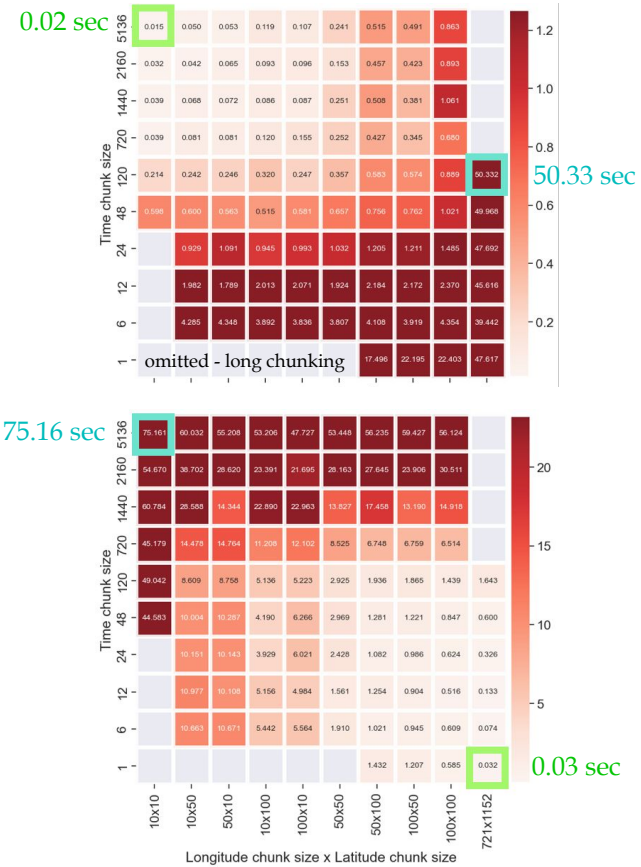


longitude: -122.19
latitude: 47.61

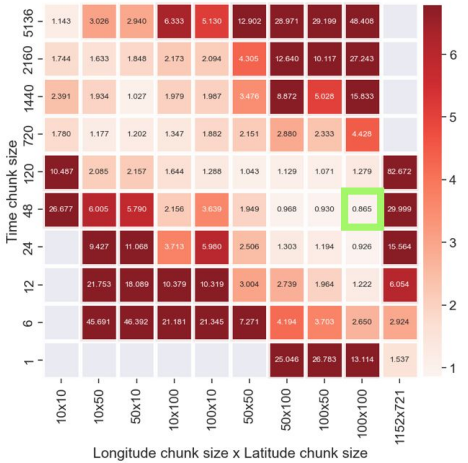
Task 2. Drawing map at 1 time step



time: 2020-06-01
T00:00:00

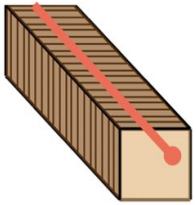


Product of task 1 and task 2



Trade-off between time series and map in peak memory

Task 1. Drawing time series at single location



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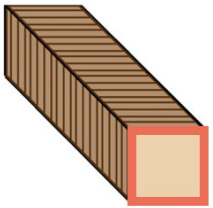

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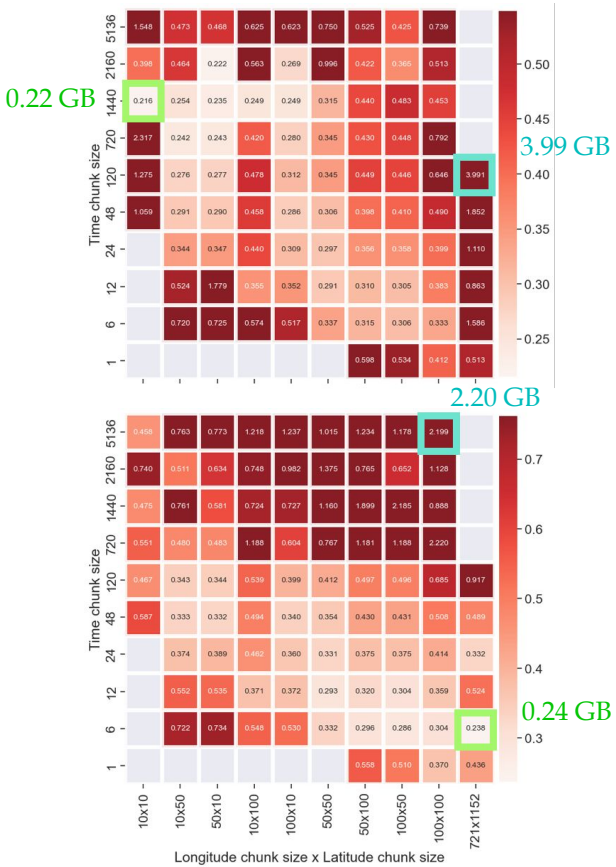

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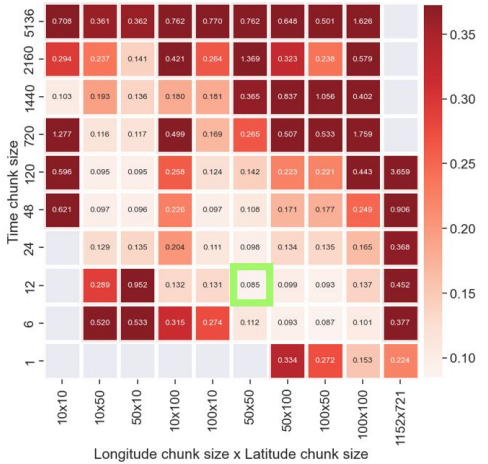
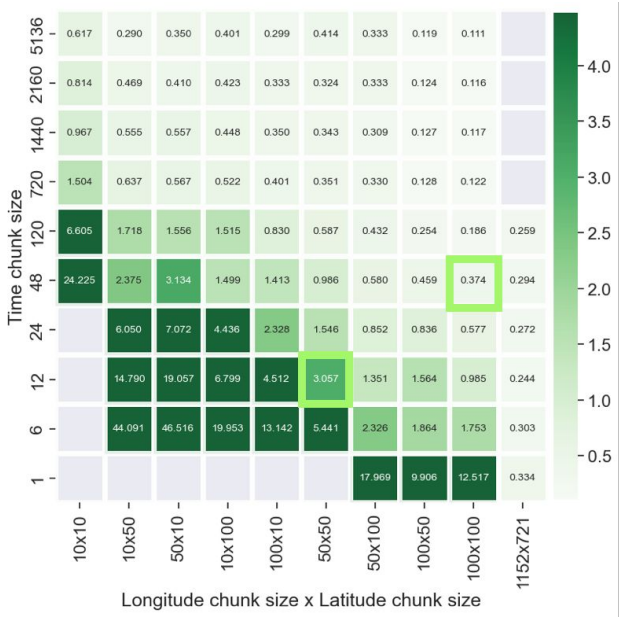
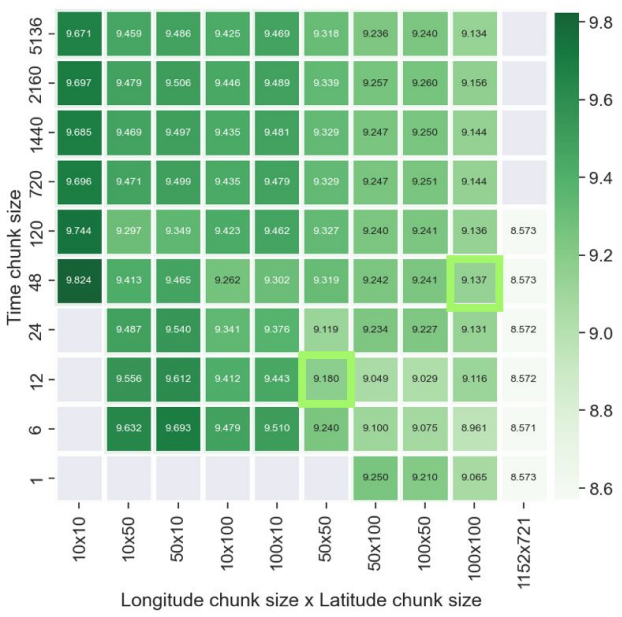


Strategy also affects rechunking time & storage size

Rechunking time (hr)



Storage size (GB)



Some compression effect

Conclusion & Future Directions

- Performance trade-off between optimizing for spatial vs. time-series analyses
- Identified a range of strategies that perform well (and poorly) for both analyses
- Higher-dimensional datasets - more significant trade-offs?
- Consider spatio-temporal analyses that span multiple dimensions simultaneously?
- Submitting manuscript soon!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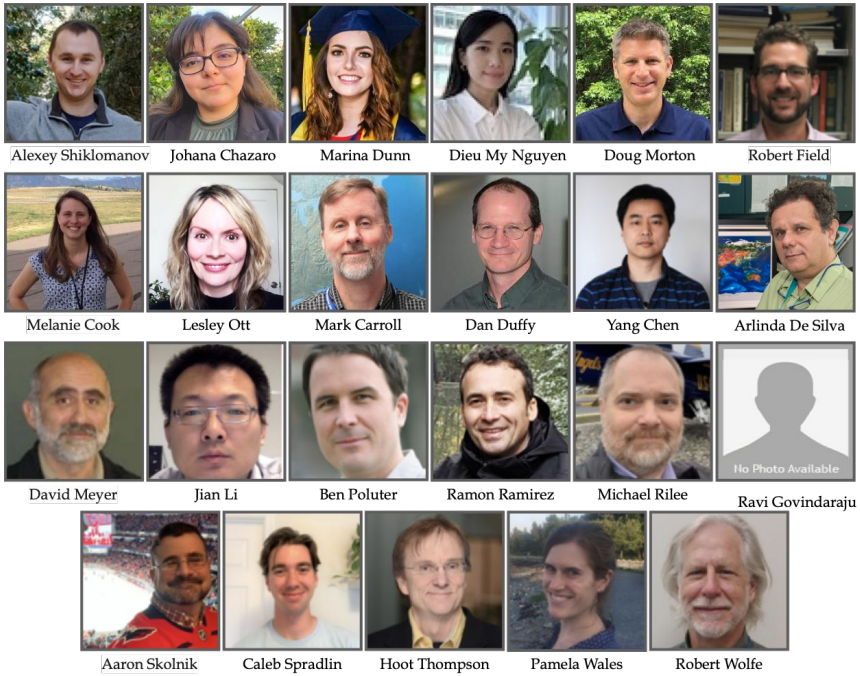
Thank you

Acknowledgements

EIS-Fire Team



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