

Bit Grooming Improves Precision/Storage Ratio

Objective

- Reduce dataset size while preserving numerical precision

Approach

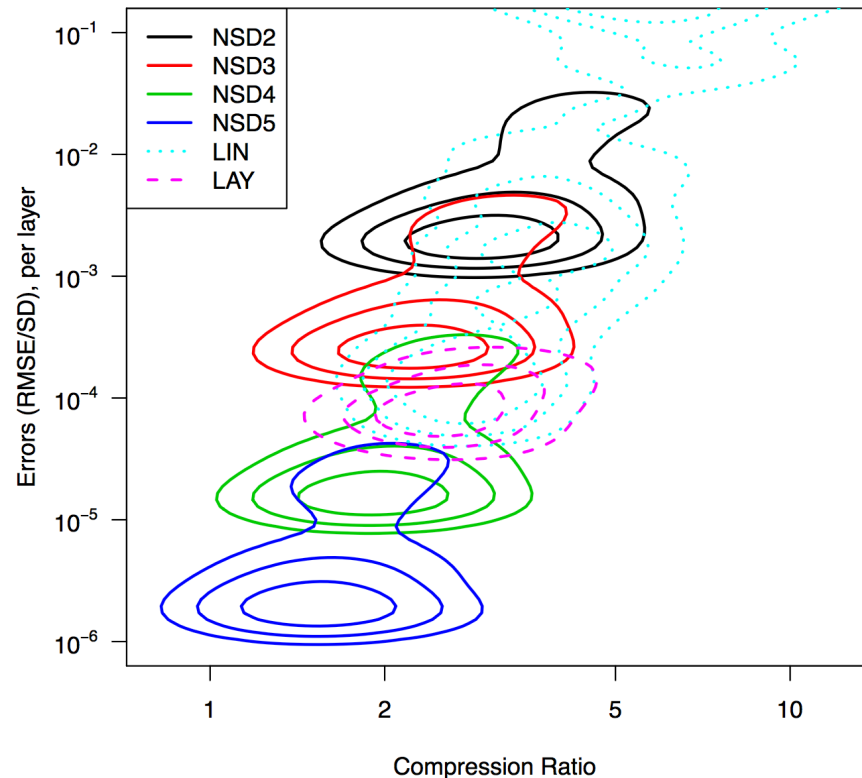
- New lossy compression algorithm
- Alternating bit adjustment
- Uses bitmasks, not FP math
- Preserves requested precision
- No statistical biases
- Relies on lossless DEFLATE
- Preserves full IEEE FP format
- Readable by all existing tools
- Single-line command:

```
ncks -L1 -ppc default=4
```

Zender, C. S. (2016), Bit Grooming: Statistically accurate precision-preserving quantization with compression, evaluated in the netCDF Operators (NCO, v4.4.8+), Geosci. Model Dev., 9, 3199-3211, doi:10.5194/gmd-9-3199-2016.

Silver, J. D. and C. S. Zender (2016), Compression-error trade-off for large gridded datasets, in revision after review, Geosci. Model Dev. Discuss., doi:10.5194/gmd-2016-177.

Error vs. compression ratio



Compression/Error tradeoff for Bit Grooming retaining 2-5 significant digits (NSD2-NSD5), compared to Linear Packing (LIN) and Layer Packing (LAY)

Impact

- Reduces data storage volume by 60-70%
- Eliminates meaningless “false precision”
- No additional software burden on users