CM4 1-degree preprocessing validation

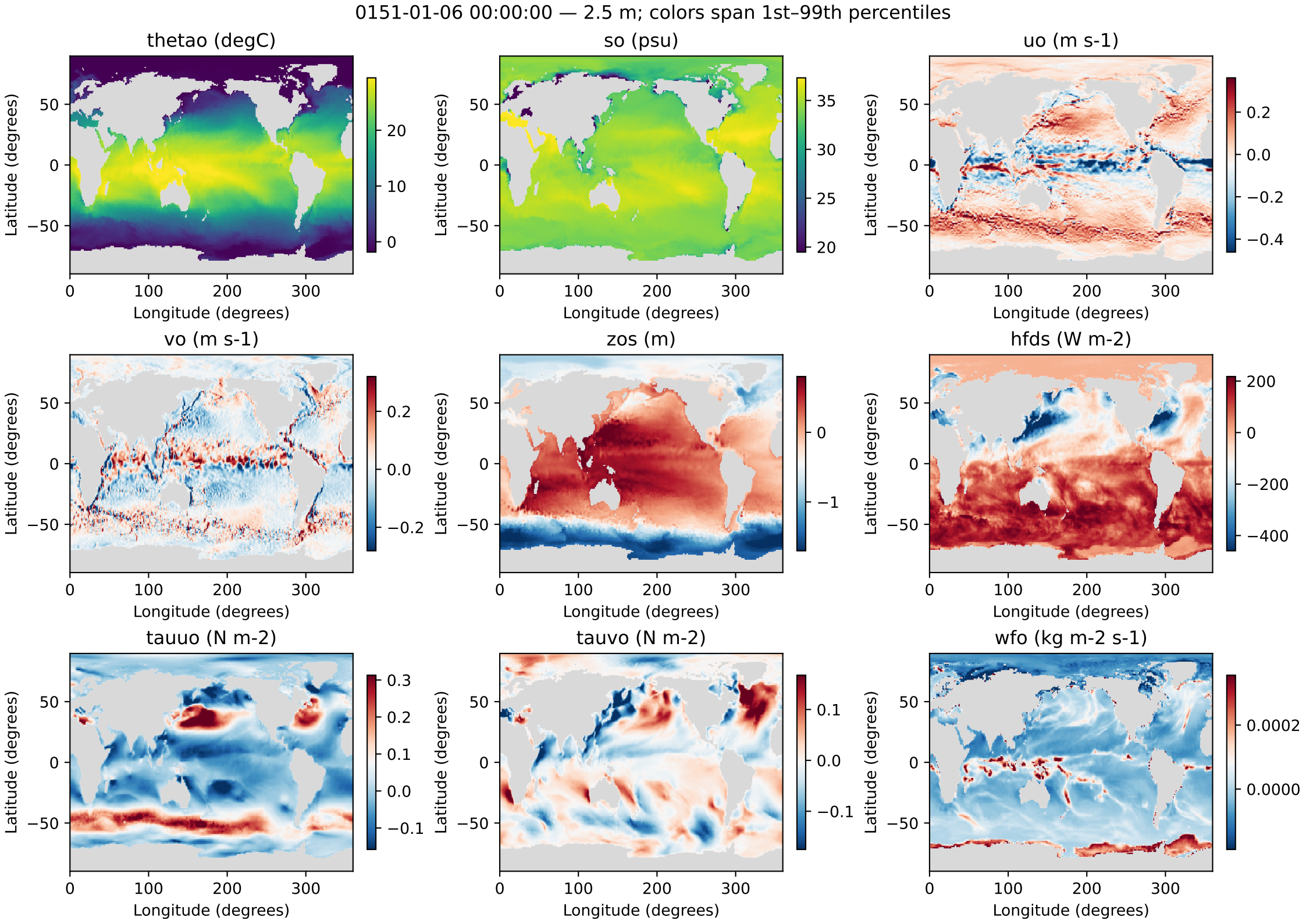
Source and processing
Raw CM4 pre-industrial control, published by Ai2 in November 2024.
Five-day means on the native tripolar grid; no-leap calendar.
Velocity/stress interpolation wraps longitude, then vectors rotate
to geographic east/north. Conservative remapping to the Gaussian
180 x 360 target; no spatial filtering, clipping or hfds anomalies.

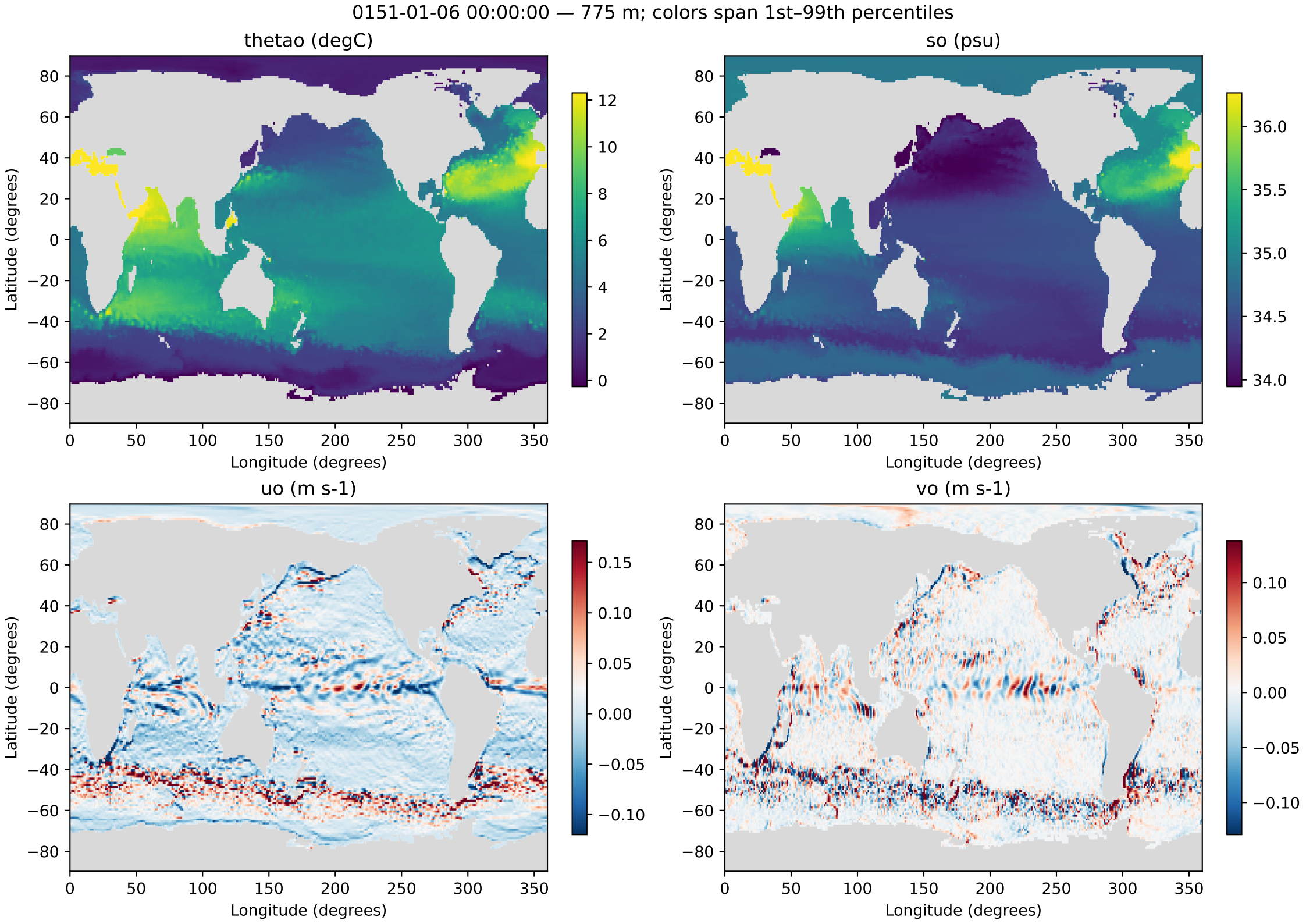
Coverage and storage
Time labels: 0151-01-06 00:00:00 to 0351-01-01 00:00:00
Timestamps: 14,600; depths: 19; horizontal shape: 180 x 360.
Nine float32 fields: thetao, so, uo, vo, zos, hfds, tauuo, tauvo, wfo.
Chunks: (1,19,180,360) for depth fields, (1,180,360) for surface.
All non-scalar arrays: Blosc Zstd, level 5, byte shuffle.
Logical array bytes: 306,543,956,656
Stored dataset bytes: 140,827,879,002; objects: 131,466

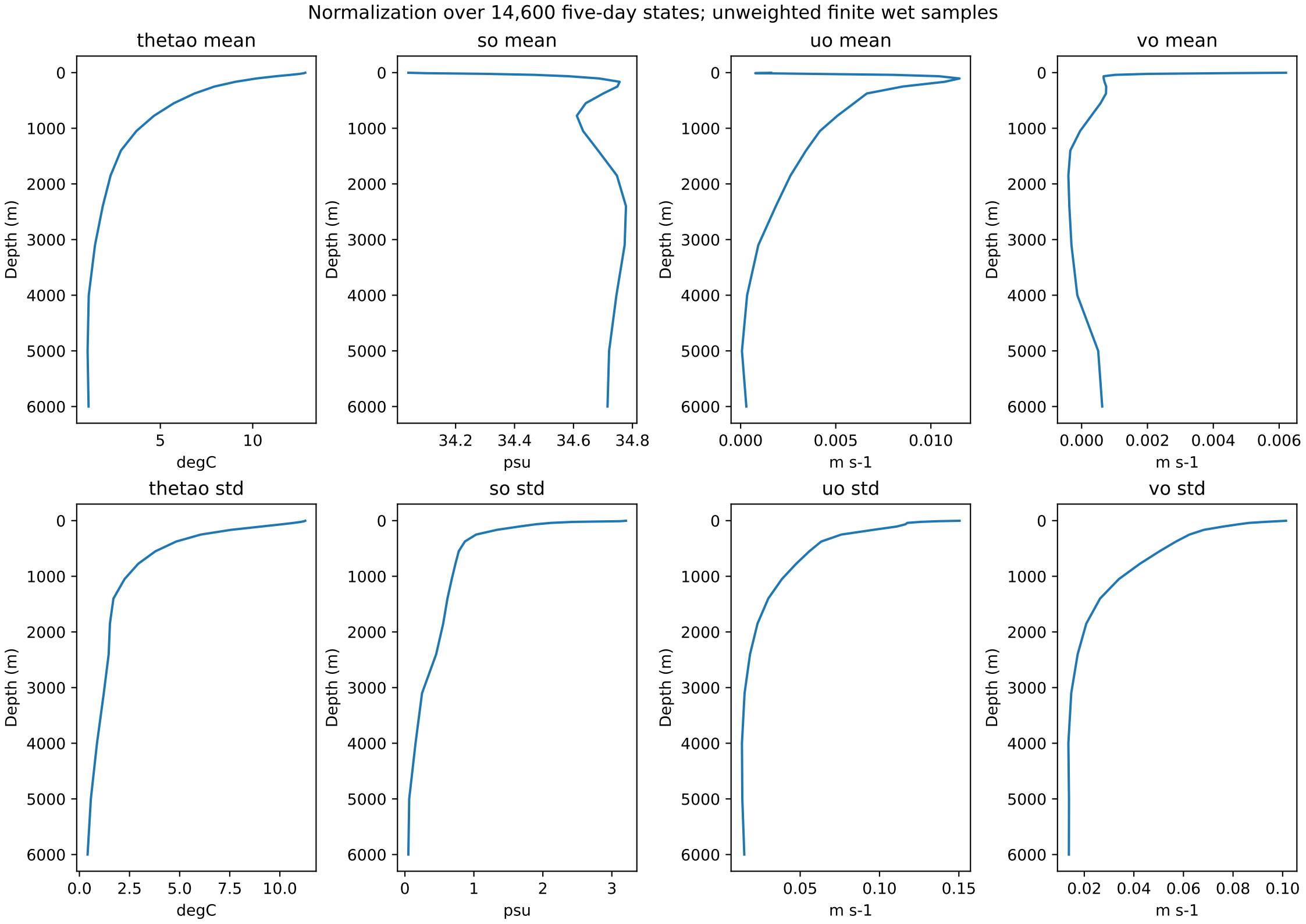
Validation
Every physical chunk was read back. Expected chunk counts, shapes,
codecs, exact dates and contiguous five-day bounds were checked.
Wet values are finite; dry cells are missing. Depth attributes and
m2 cell areas are present; geographic vector names are retained.
Means/stds are unweighted population statistics over finite wet
space/time samples, retaining depth. All 81 values were compared
with independent float64 sums and sums of squares (rtol 2e-5).
Normalization covers the entire stored interval.

Dataset URI
s3://m2lines-pubs/Samudra/v2026-09/cm4_onedeg/CM4.zarr

Processing revision
https://github.com/m2lines/Samudra/commit/7ac1b0dd7d3f9b3c9623786ece23896280f49cb7

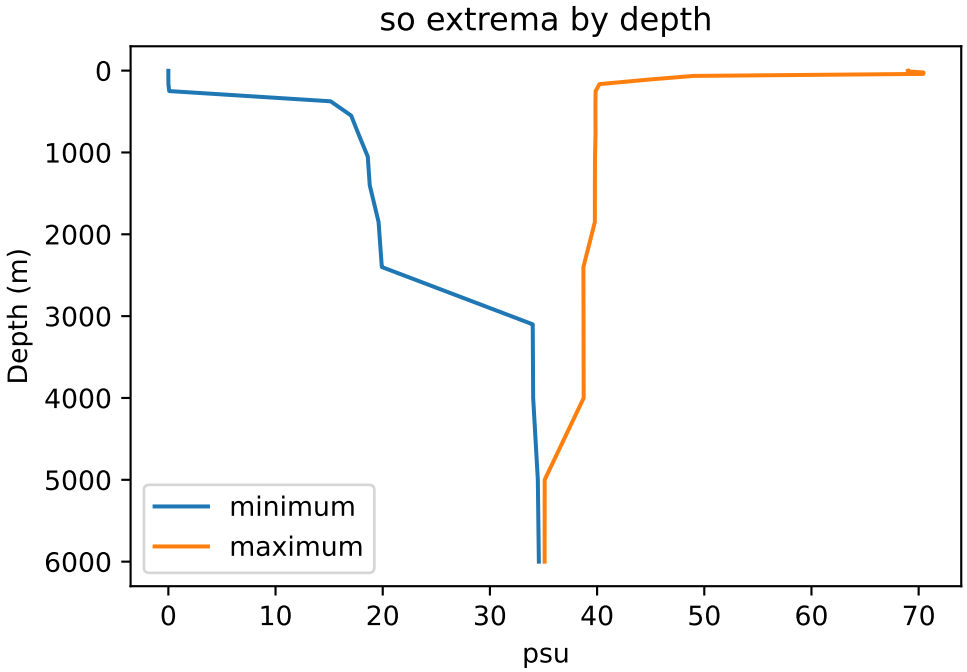

0151-01-06 00:00:00 — 2.5 m; colors span 1st–99th percentiles
thetao (degC)
so (psu)
uo (m s-1)
vo (m s-1)
zos (m)
hfds (W m-2)
tauuo (N m-2)
tauvo (N m-2)
wfo (kg m-2 s-1)
Latitude (degrees)
Longitude (degrees)

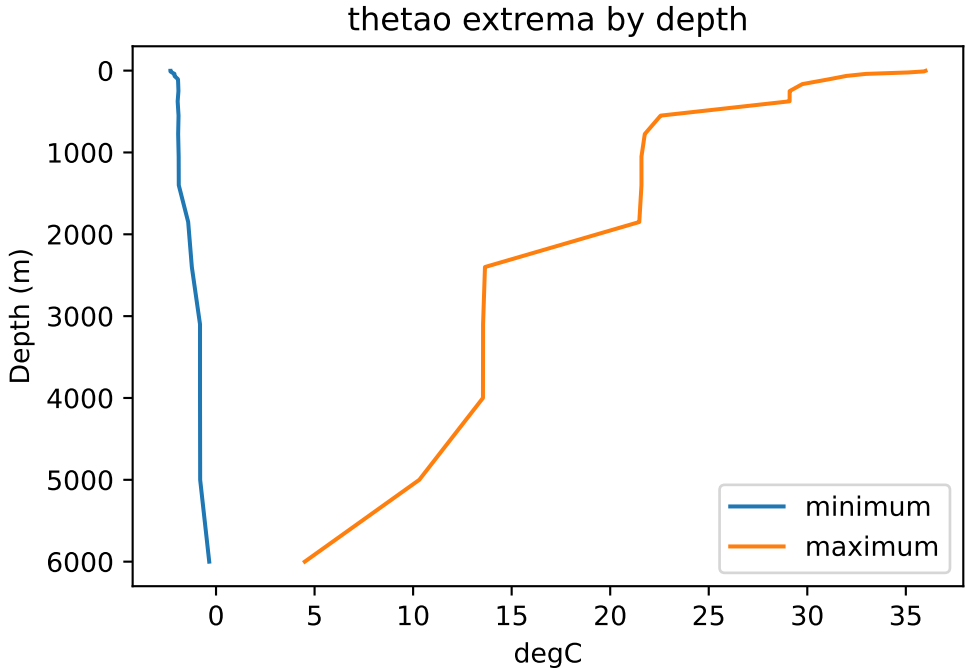

0151-01-06 00:00:00 — 775 m; colors span 1st–99th percentiles
thetao (degC)
so (psu)
uo (m s-1)
vo (m s-1)
Latitude (degrees)
Longitude (degrees)
80
60
40
20
0
−20
−40
−60
−80
0
50
100
150
200
250
300
350
12
10
8
6
4
2
0
36.0
35.5
35.0
34.5
34.0
0.15
0.10
0.05
0.00
−0.05
−0.10


Normalization over 14,600 five-day states; unweighted finite wet samples
thetao mean
so mean
uo mean
vo mean
thetao std
so std
uo std
vo std
Depth (m)
degC
psu
m s-1

Observed ranges across every stored timestamp and depth

Field	Units	Global minimum	Global maximum	Surface mean	Surface std
thetao	degC	-2.31493	36.0001	12.8422	11.2653
so	psu	0	70.4516	34.0396	3.20487
uo	m s-1	-2.33342	2.56968	0.00160305	0.150454
vo	m s-1	-2.26182	2.03019	0.00620823	0.10136
zos	m	-1.94897	2.7923	-0.209054	0.673994
hfds	W m-2	-1491.98	24485.6	-2.73891	107.62
tauuo	N m-2	-1.56466	1.34533	0.0156684	0.10285
tauvo	N m-2	-1.57728	1.78867	0.00115116	0.0613273
wfo	kg m-2 s-1	-0.00173878	0.59693	1.06453e-05	0.00055872





Ranges use all finite wet samples, without clipping. Map color limits are display choices; stored values are unchanged.