

MODIS Level 3 Gridding The ISSCP Grid

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Science Team Presentation
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ISSCP Grid

- Grid for the International Satellite Cloud Climatology Project
- Ref: W. Rossow and L. Gardner, Journal of Climate and Applied Meteorology, 1994
- Equal Area Gridding Scheme
- Implemented for Pathfinder/SeaWiFS Ocean Products
- Proposed by University of Miami for MODIS Oceans Products
- It Really is a Map Projection - Very Similar to Sinusoidal
- Current Implementation Based on Spherical Earth Model
- Space Efficient - Store only Points On Earth

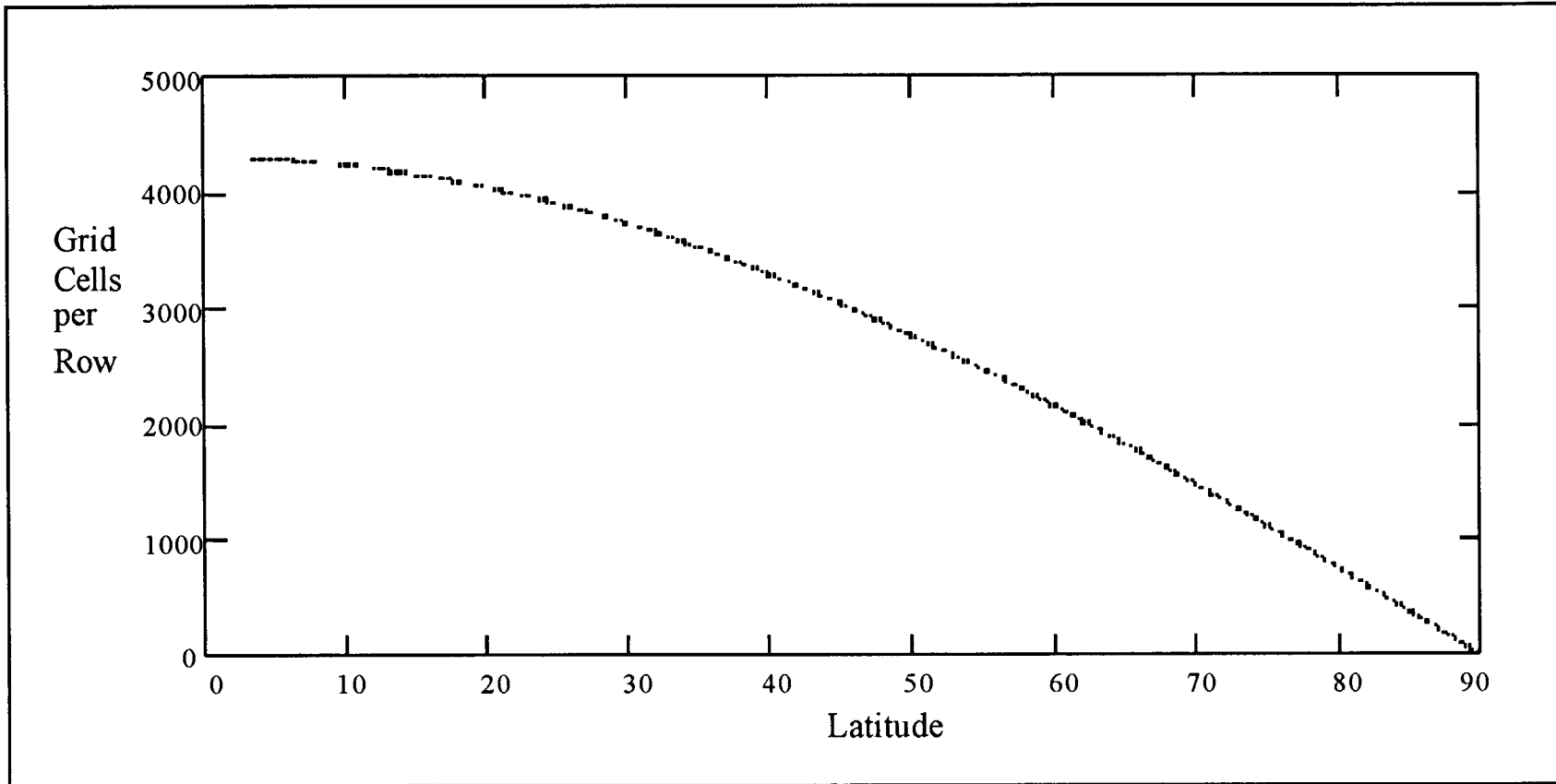
Grid Cell Sizes Recommended for the MODIS L3 Products

Cell Size		Cell Area (km ²)	Number of Cells		
(km)	(arc)		North/South	East/West	Total
0.23	7.5 sec	0.054	86,400	172,800	9,510,000,000
0.46	15 sec	0.22	43,200	86,400	2,380,000,000
0.93	30 sec	0.86	21,600	43,200	594,000,000
4.64	2.5 min	22	4,320	8,640	23,800,000
9.28	5 min	86	2,160	4,320	5,940,000
18.55	10 min	340	1,080	2,160	1,490,000
56.66	1/2 deg	3,080	360	720	165,000
111.32	1 deg	12,300	180	360	41,300

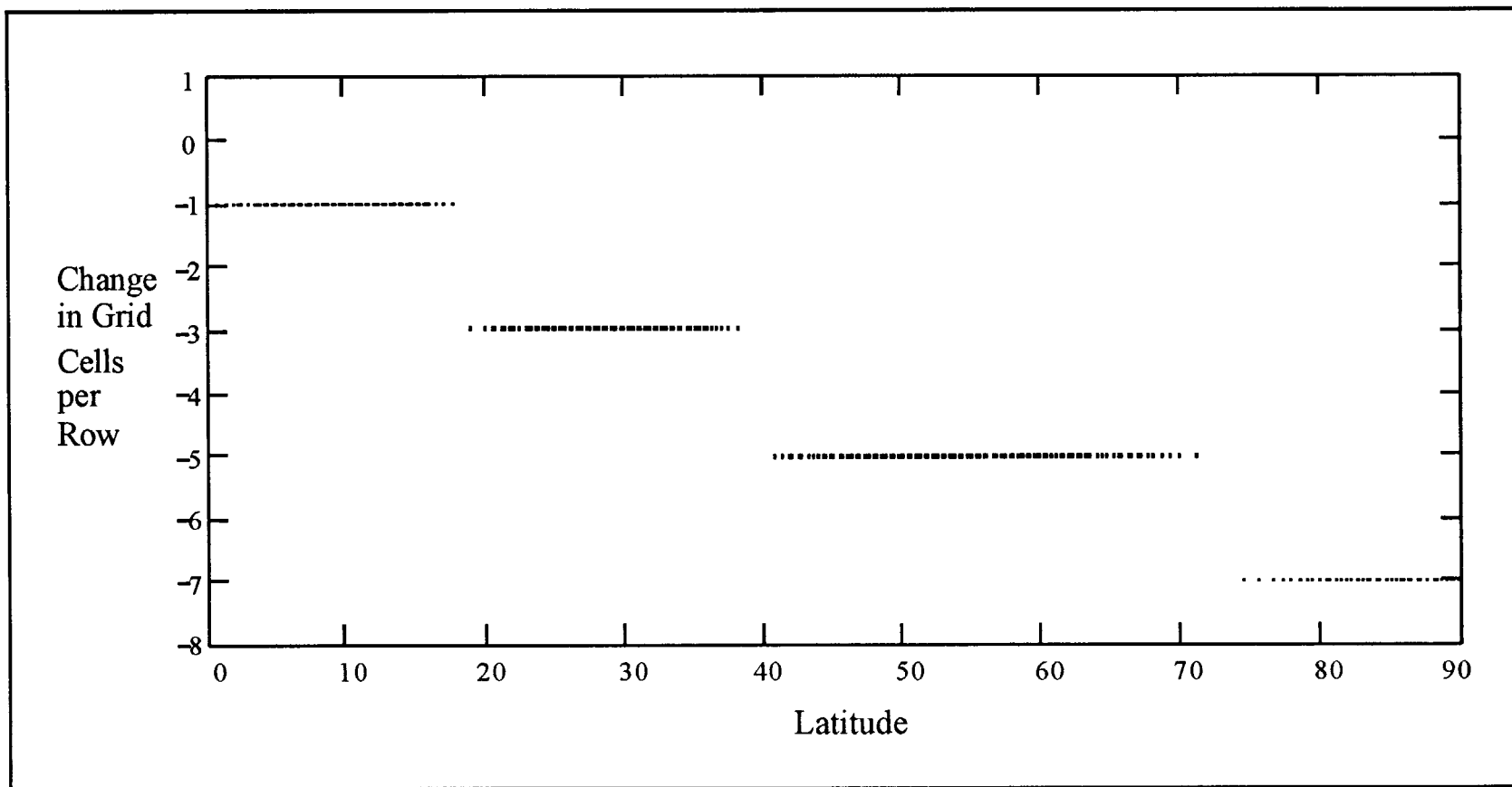
Notes:

1. Scale factor is 5 from 0.93 to 4.64 km cells.
2. Scale factor is 3 from 18.55 to 55.66 km cells.
3. Scale factor is 2 for all other cells.
4. Total cells is 63.7 % of number from square area.

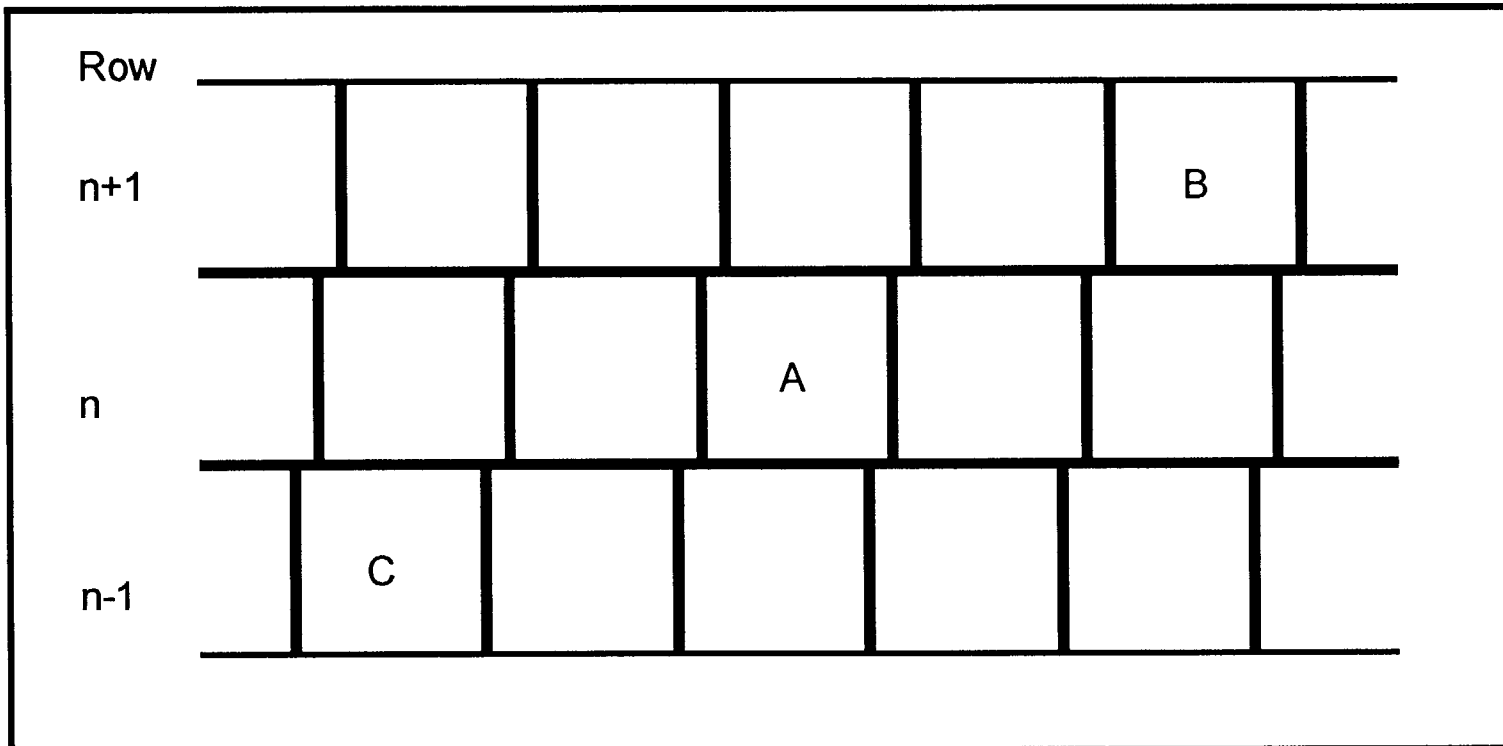
Number of Grid Cells per Row vs. Latitude



Change in Number of Grid Cells per Row vs. Latitude

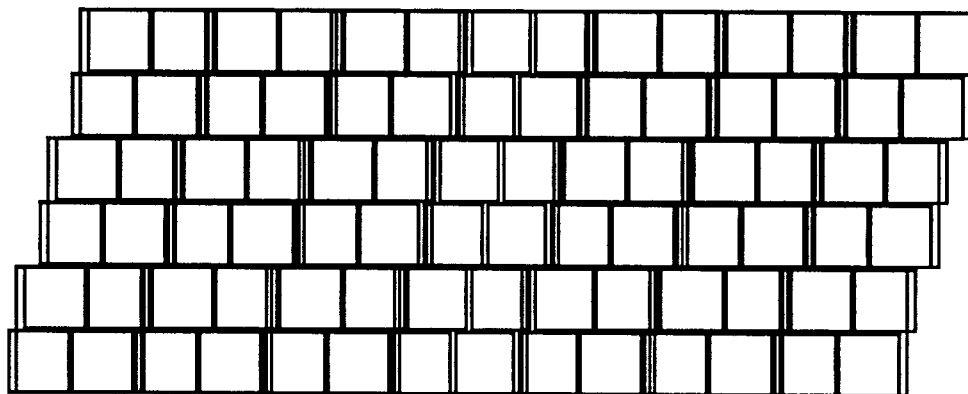


Adjacent Columns

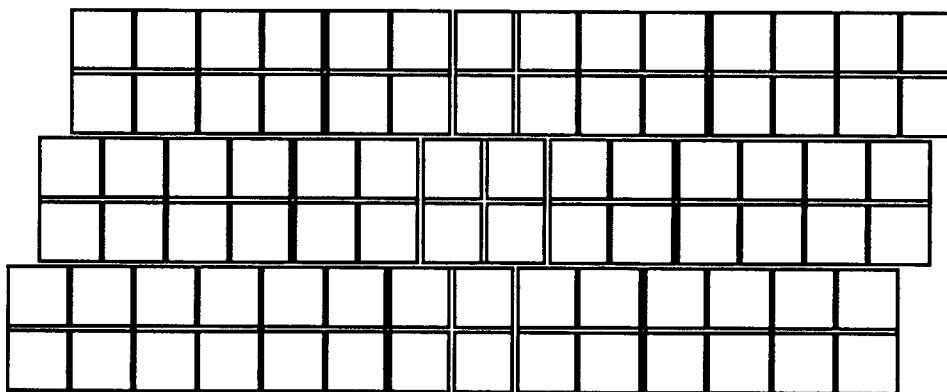


Nesting Grid Cells

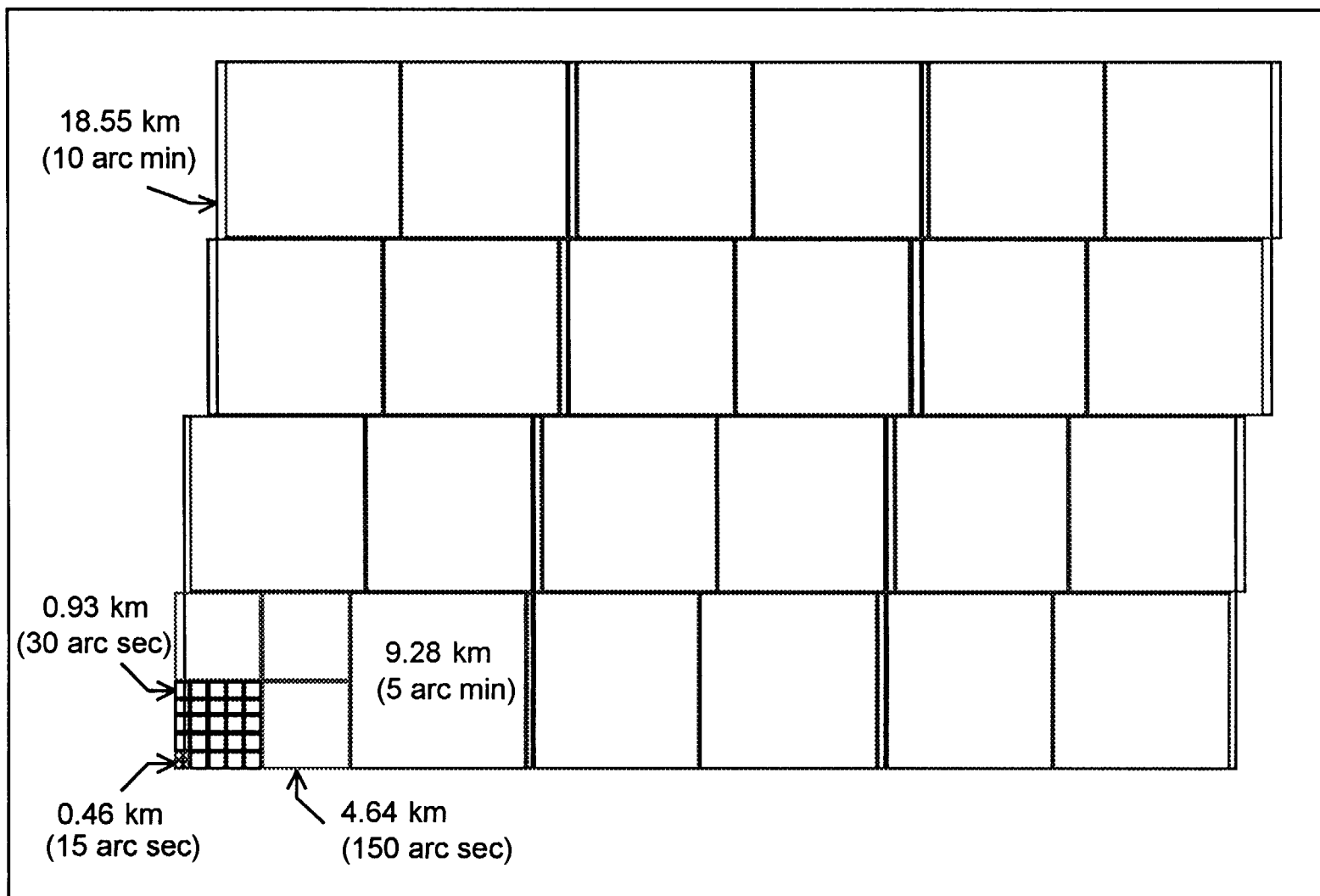
Un-nested Grids



Nested Grids



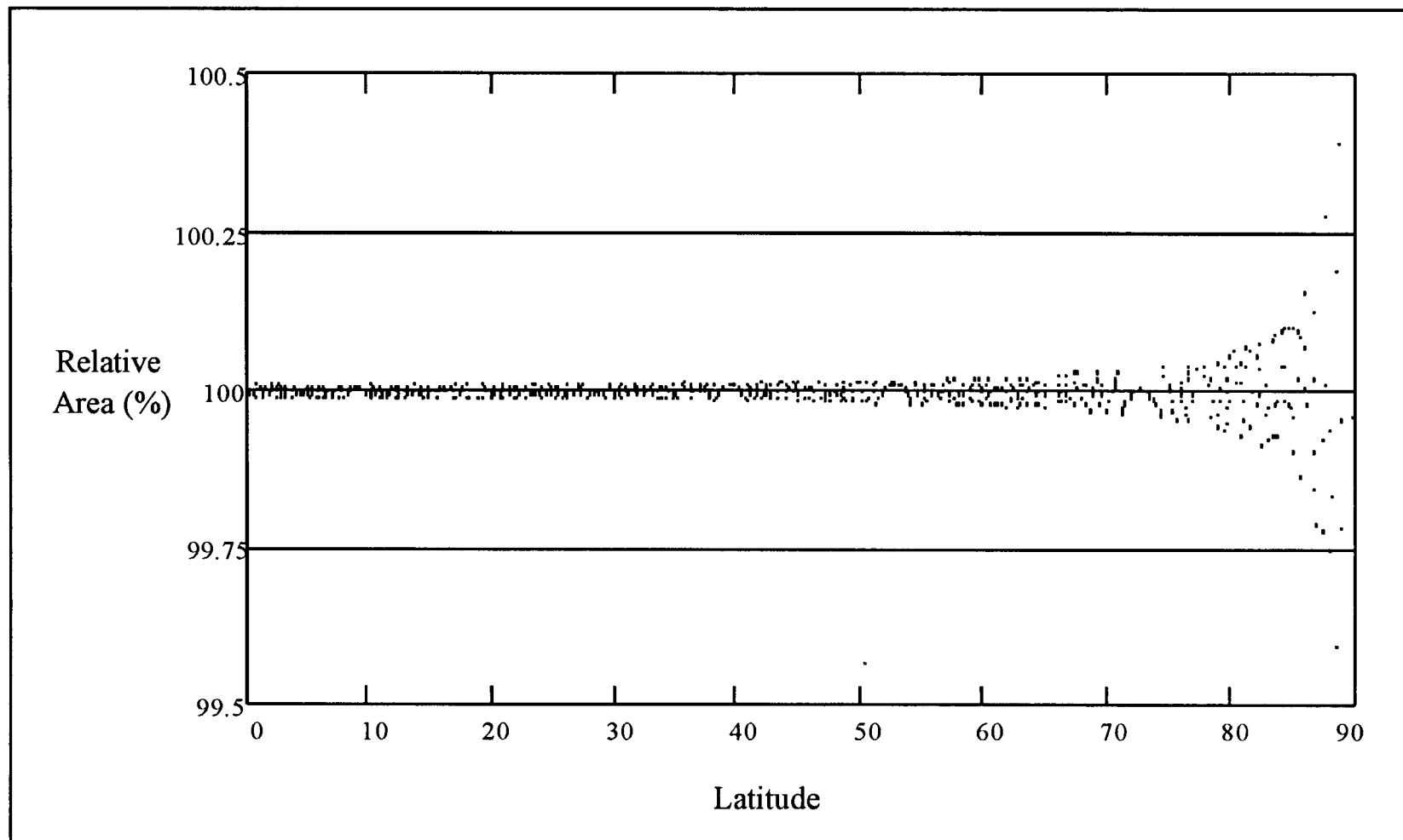
ISSCP Grid - Nested Cells (from 9.28 km down)



ISSCP Grid Nesting Issues

- Nesting Advantages
 - Only Needed Horizontally - ISSCP Grid Naturally Nested Vertically
 - Boundaries Line up Nicely Within 9.28 km Area - Interpolation Easier
 - Area Based Compression (Quad tree) Can be Used
- Is 9.28 km the "best" nesting size?
 - Satisfies Equal Area Criteria
 - Oceans Currently Use 9.28 km Grid Size
 - Most Land/Ocean Grid Sizes Handled - Land/Sea Boundary
 - Atmosphere may Use 18.55 km or Larger Grid
- Indexing Uses Hybrid Approach
 - Simplifies Indexing within Nested Area
 - Uses Standard ISSCP Indexing when Crossing Upper/Lower Boundaries

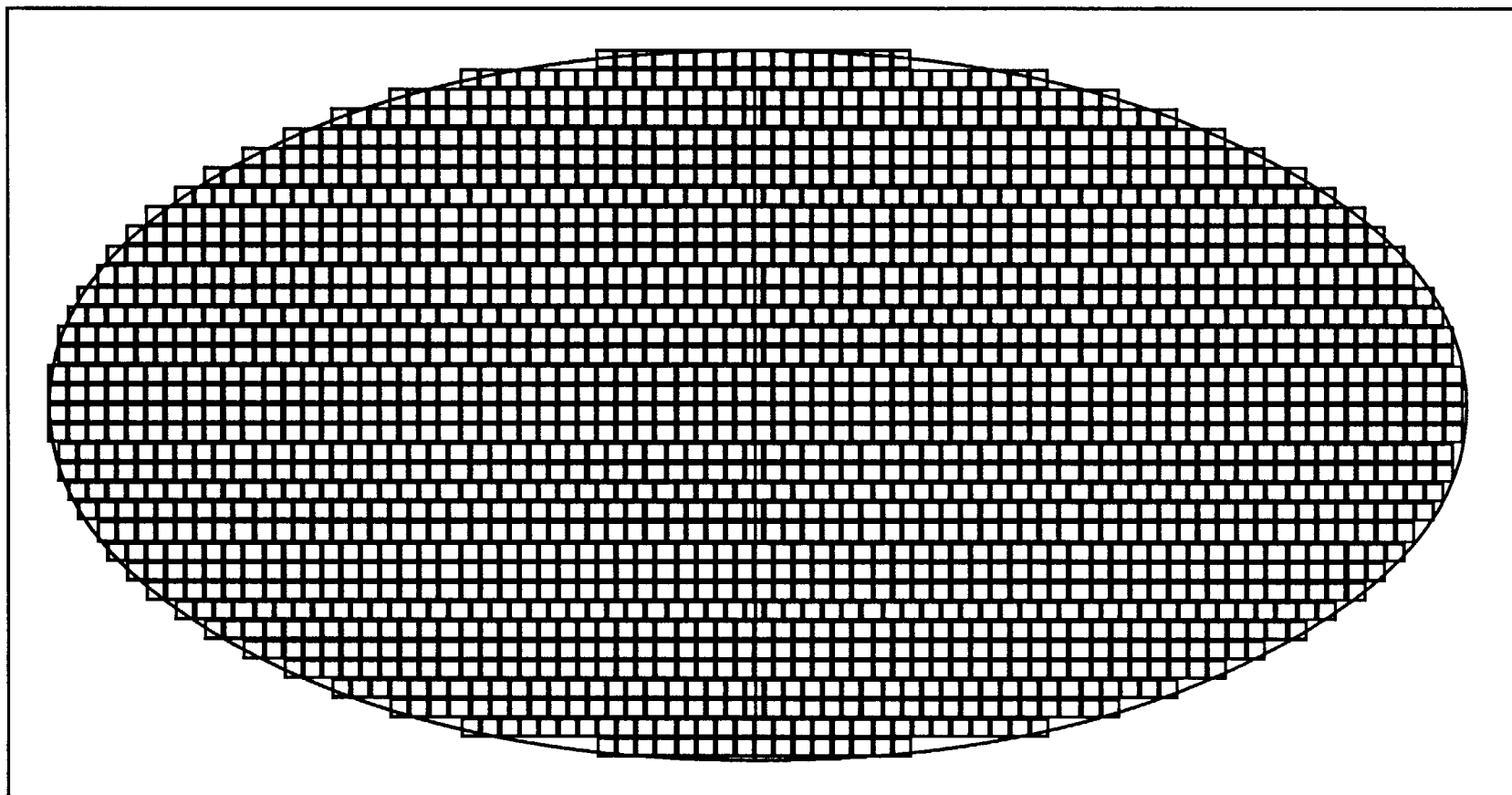
Area Error from Discrete Number of Cells and Other Approximations (Lower Latitudes)



ISSCP Area Error

Cell Length (km)	Cell Area (km**2)	Area Mean (km**2)	Area Std. Dev. (km**2)
4.64	21.37	0.096 (0.45 %)	0.086 (0.40 %)
9.28	85.48	0.38 (0.45 %)	0.34 (0.40 %)
18.55	341.9	1.54 (0.45 %)	1.38 (0.41 %)
56.66	3,077	13.7 (0.45 %)	13.0 (0.42 %)
111.32	12,310	56.2 (0.46 %)	54.7 (0.44 %)

ISSCP Grid



Grid Based on Sinusoidal Map Projection Equations:

$$x = R \text{ Lon} \cos(\text{Lat})$$

$$y = R \text{ Lat}$$

R - Earth Radius