The Global Geographic Grid System (GGGS)

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Motivation: A geographic grid system that handles multiple resolutions and the Arctic

- GEBCO releases provide a Global Geographic Grids defined in fractions of a degree (e.g 1/120, 1/240, 1/480) = (30, 15, 7.5 arc seconds).
- It would be useful to have a system that can handle any resolution in geographic coordinates. Seabed 2030 has mandated four resolutions
- It would be useful to have a system that has less oversampling in the Arctic: Problem slow rendering.

The Global Geographic Grid System
(short forms: Global GGS, GGGS)

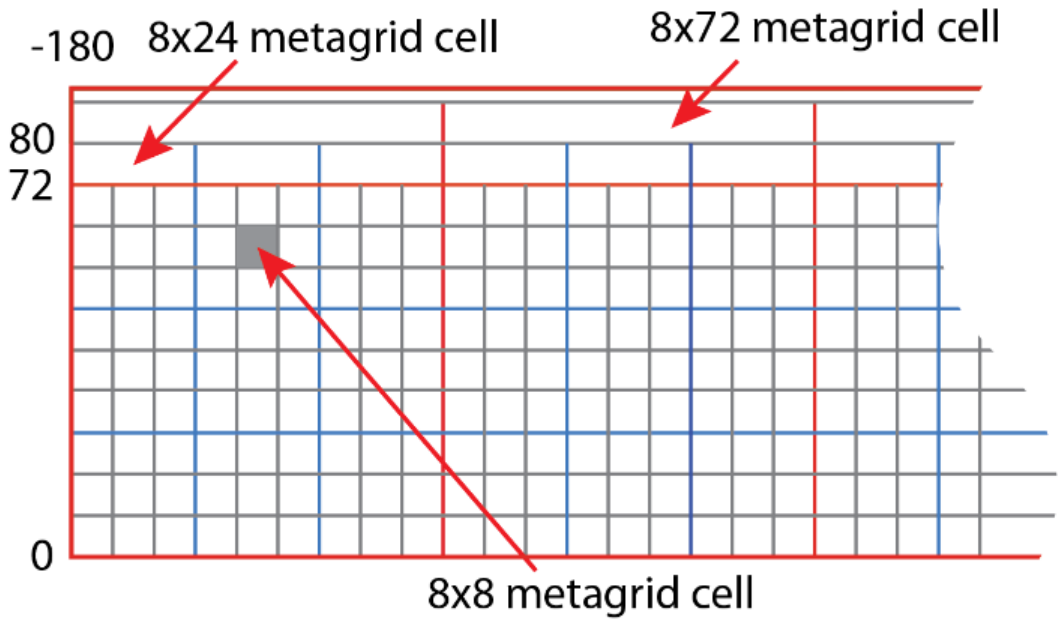
Key ideas:

- Data grids defined by powers of 2. (maximum and minimum sizes)
- E.g. 1024x1024, 512x512, 256x256, 128x128, 64x64
- or 960x960, 480x480, 240x240, 120x120
- A quad tree framework starting with 8x8 degree cells.
- The result: adjacent grids only differ by powers of 2

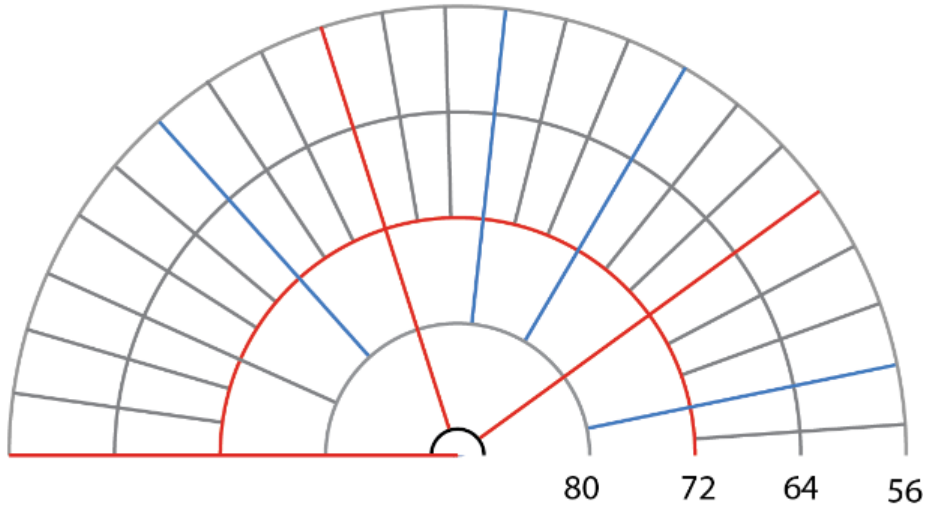
- In regions >60 deg, column spacing is reduced (by successive powers of 2) to deal with oversampling in latitude.

A metagrid hierarchy combined with regularly gridded dem tiles

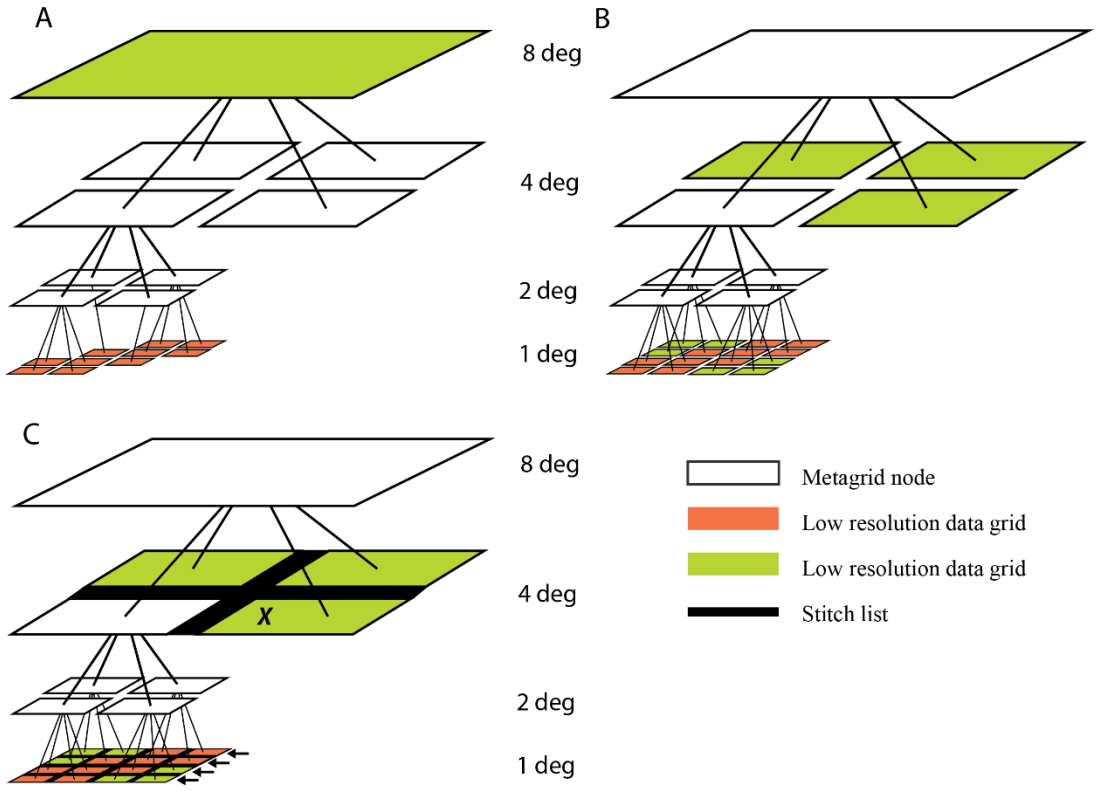
Top level grid

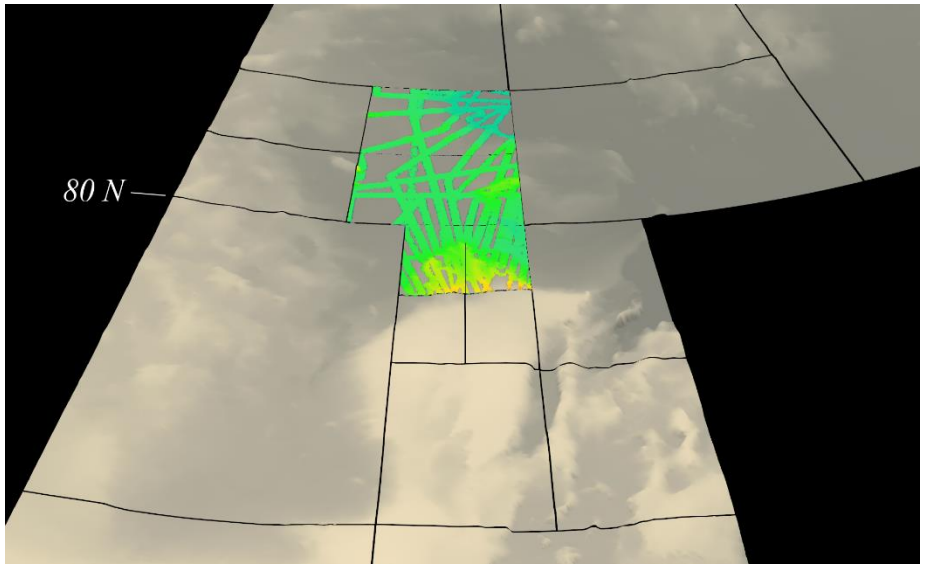


Reasons for not doing a binary subdivision of the whole Globe: 1) Preserve degrees as a first class unit.
2) Combatibility with GEBCO practice



Example: High res data embedded in low res data





Data grids form a power of two hierarchy:

- For computer graphics rendering
- Grids should not be too large (slow or impossible to load)
- Also not too small (overhead)

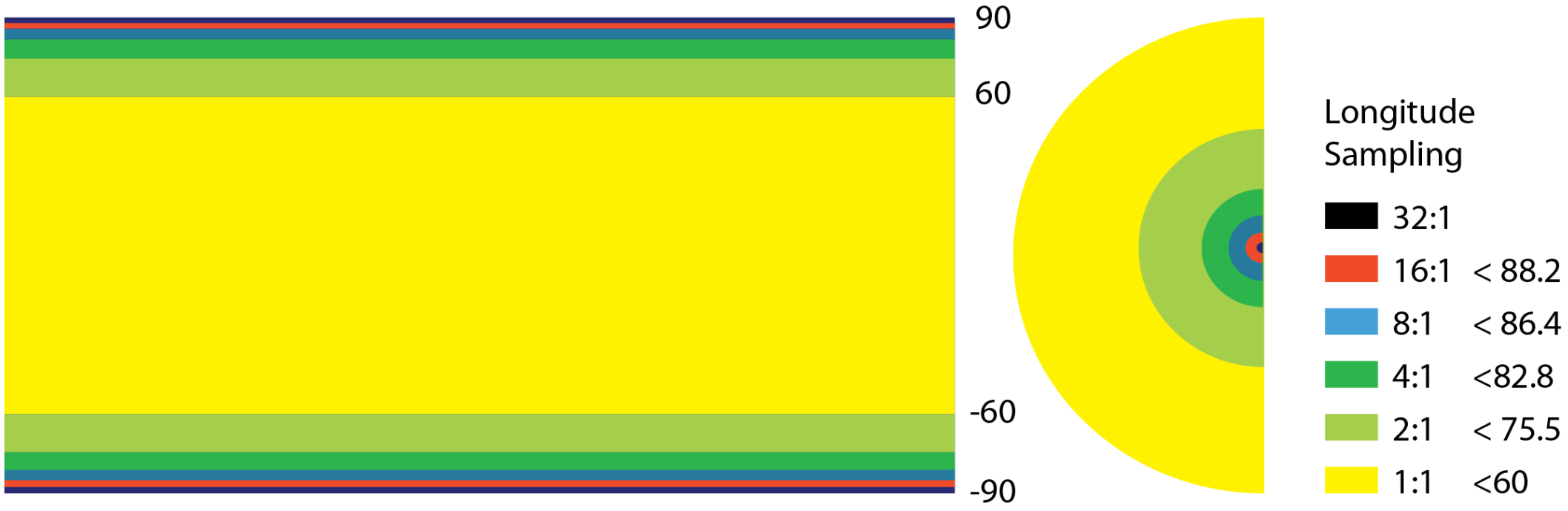
E.g. Gebco 2019

Has 240x240 grid cells per deg^2

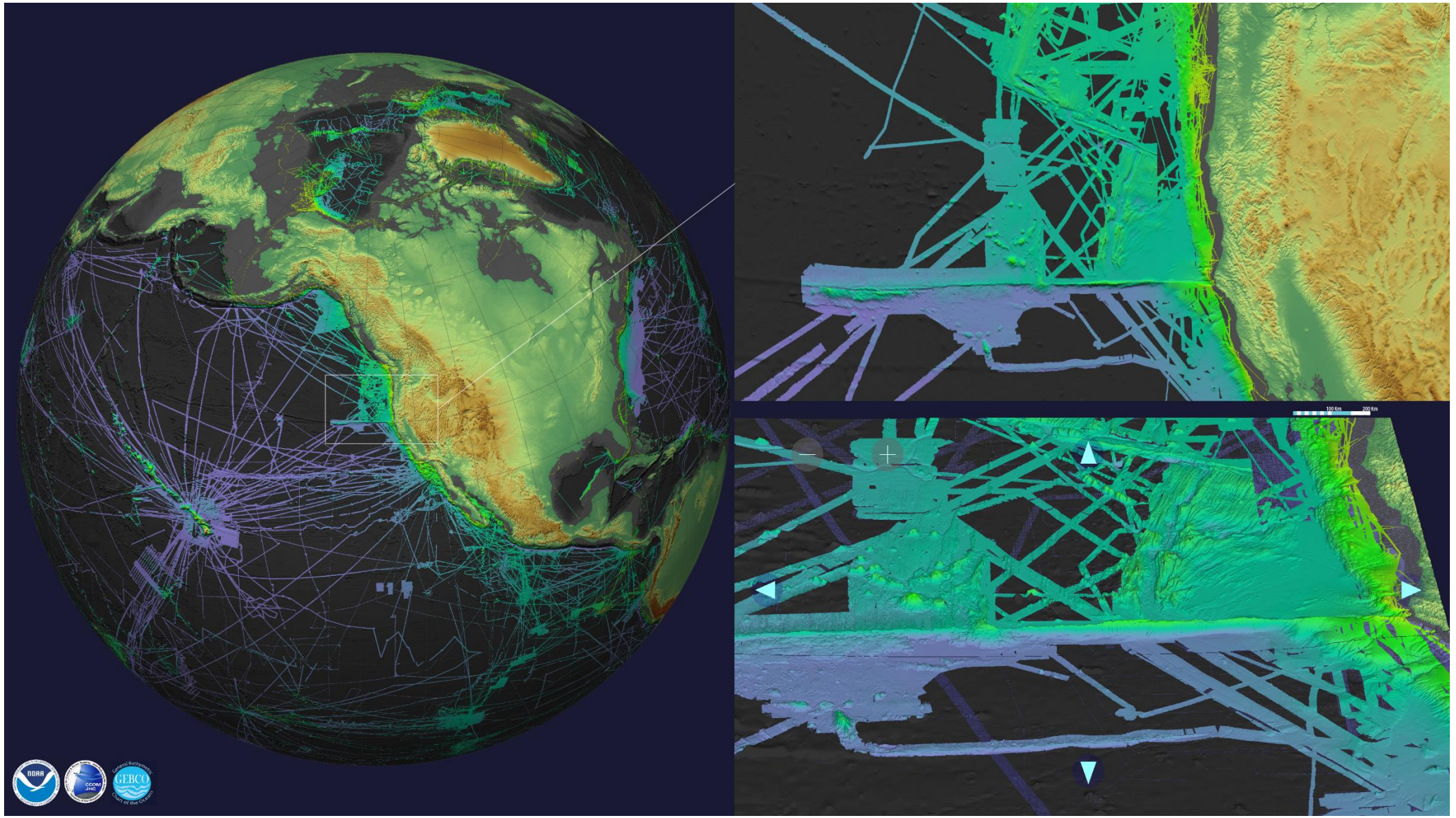
So we can create 4x4 deg tiles

960x960

Sampling changes with latitude
- reduce samples in longitude direction
- Applied to data grids

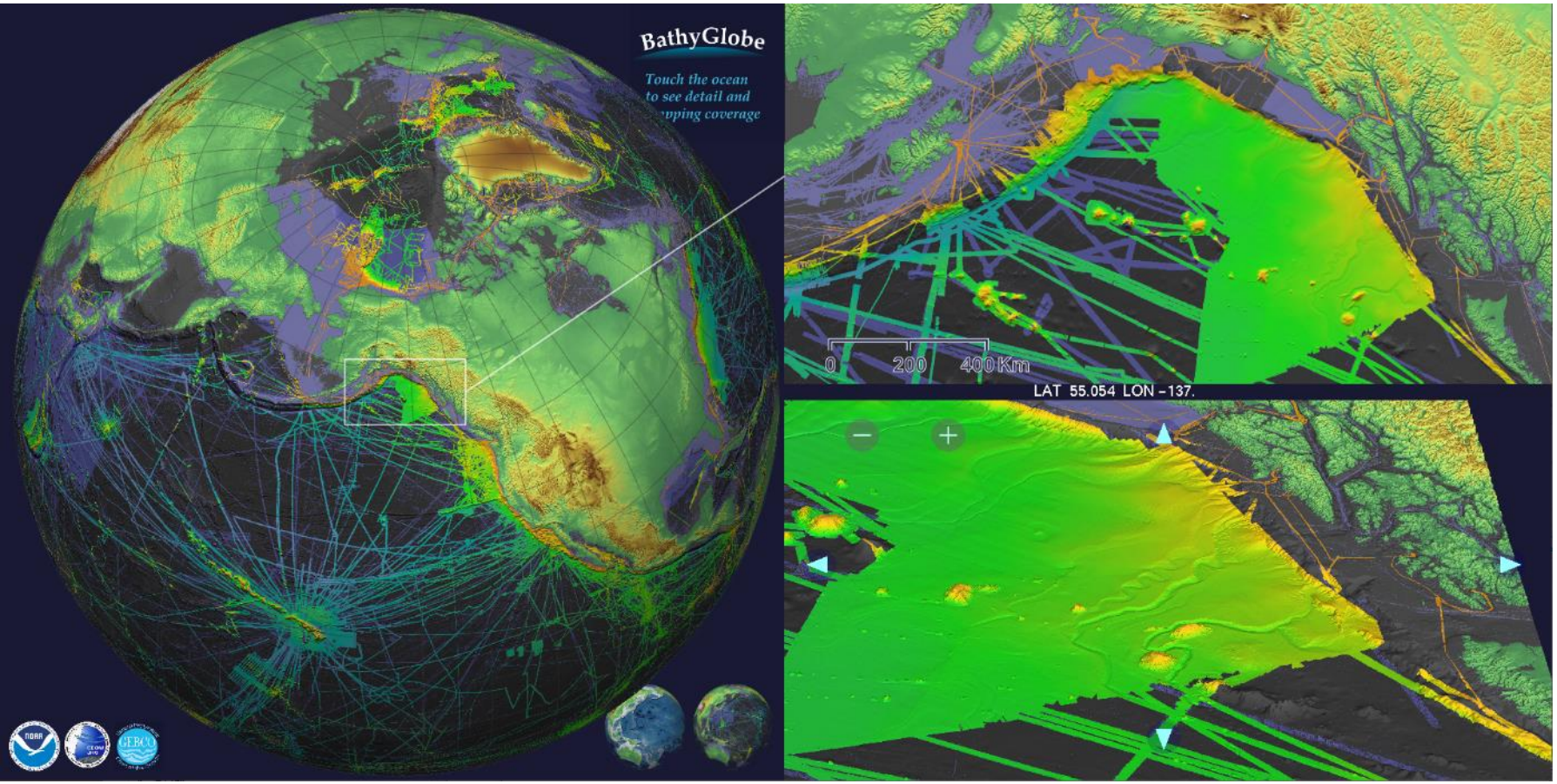


BathyGlobe 2.0 incorporating GGGS

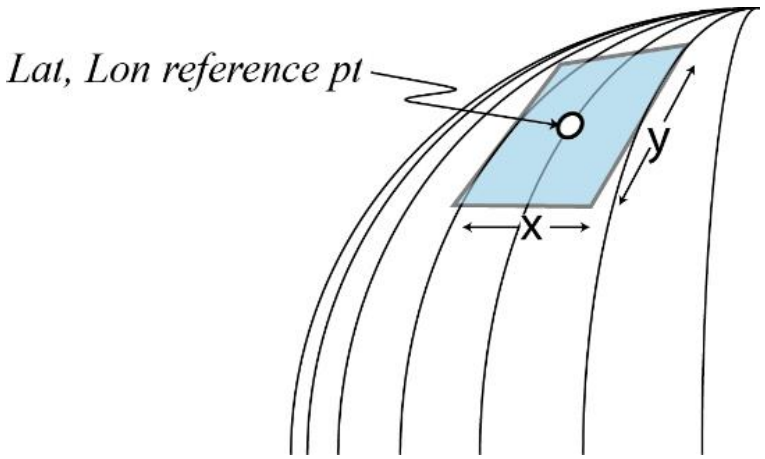


Projections

Stereographic



Orthographic on a tangent plane



Bathy Globe: An interactive globe to highlight ocean mapping activities

- Designed for a 4K touch monitor.
- The globe. Touch and rotate to center.
- Right above: area of Gebco 2014 at full resolution. Stereographic projection.
- Below: attributes – what has been mapped.
- Yellow area: 100 meter data – touch to display in 3D perspective.

- Globe 1.0