UTM Squares and Choice of Projection

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NATIONAL GEOSPATIAL NGA INTELLIGENCE AGENCY

UTM Squares and Choice of Projection

Today's theme:

Overlaying a UTM grid
on a map or GIS data layer

is

a means to check
your choice of map projection

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- Unsure of your choice of map projection?
- Following method is for ***large scale*** work only
  - "Larger scale" = more paper *for the same real estate*
  - "Smaller scale" = less paper *for the same real estate*
- The procedure:
  - Determine UTM zone for area-of-interest
    - 60 zones for 360° of longitude (180°W to 180°E)
    - Zone 1 extends from 180°W to 174°W
    - Zone 2 extends from 174°W to 168°W *etc*.
  - Overlay a UTM grid on the map or GIS data layer
  - How does the grid look on ***the map projection you've chosen***?
    - Squares? – map projection is valid
    - Other shapes?
      -- Change the projection,
      -- Mitigate the defects, *or*…
      -- Justify doing nothing

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Examples

#	Map projection type	Map projection	Latitude	City
1	Cylindrical	Web-Mercator	2°N	Mogadishu, Somalia
2	Cylindrical	Equirectangular	2°N	Mogadishu, Somalia
3	Cylindrical	Mercator	71°N	Barrow, Alaska
4	Cylindrical	Plate Carrée	71°N	Barrow, Alaska

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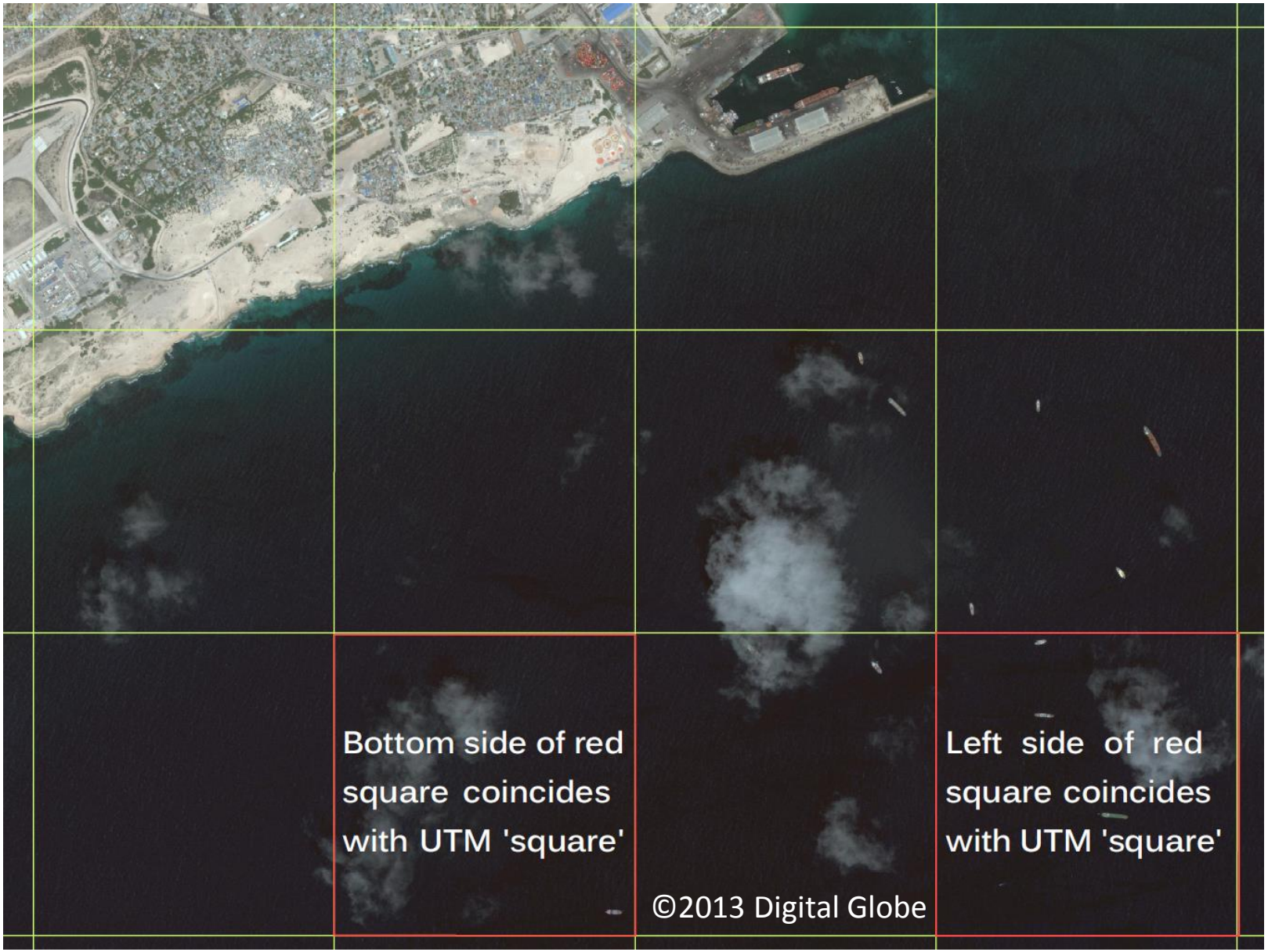
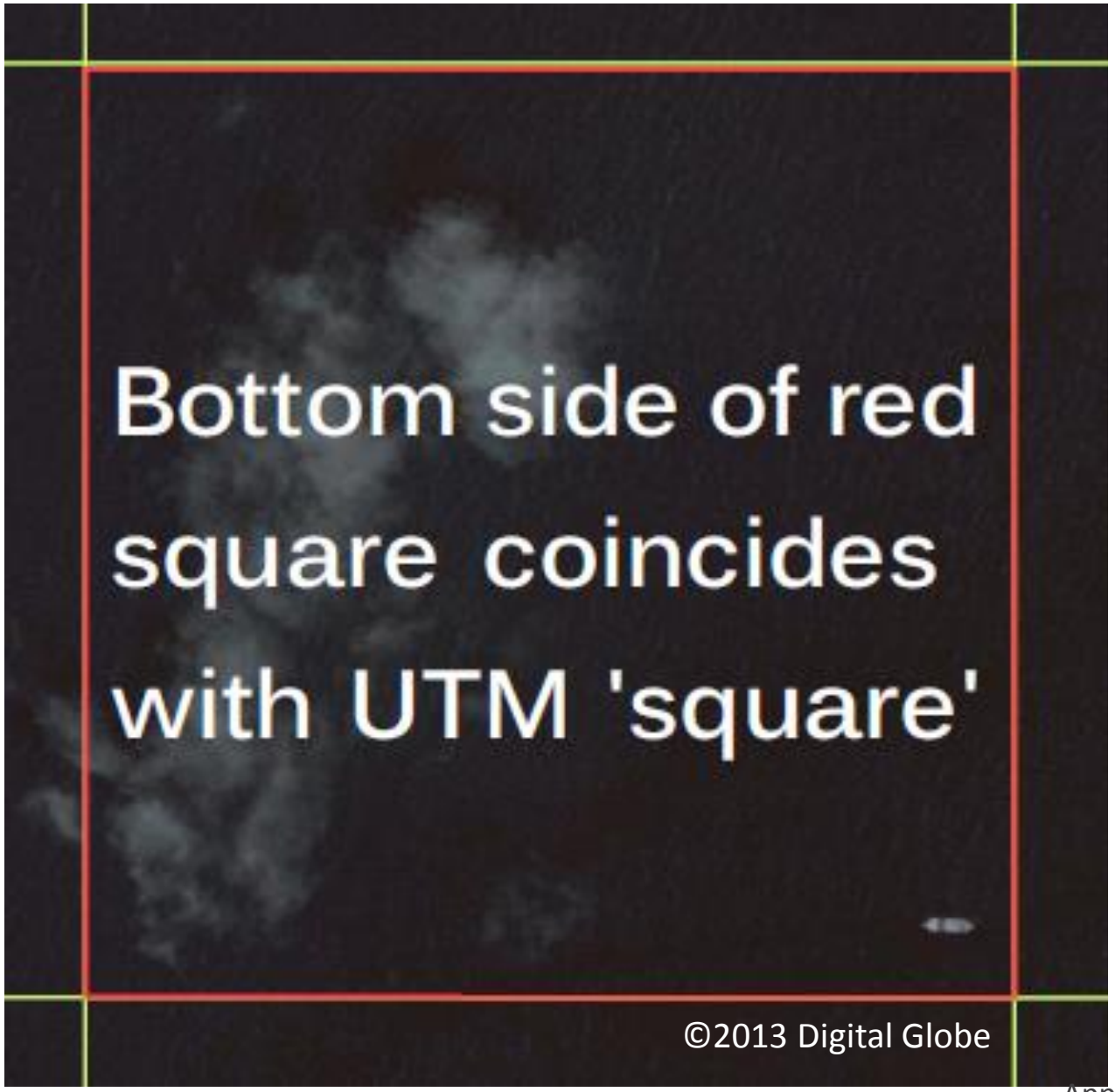
Web-Mercator (Mogadishu)



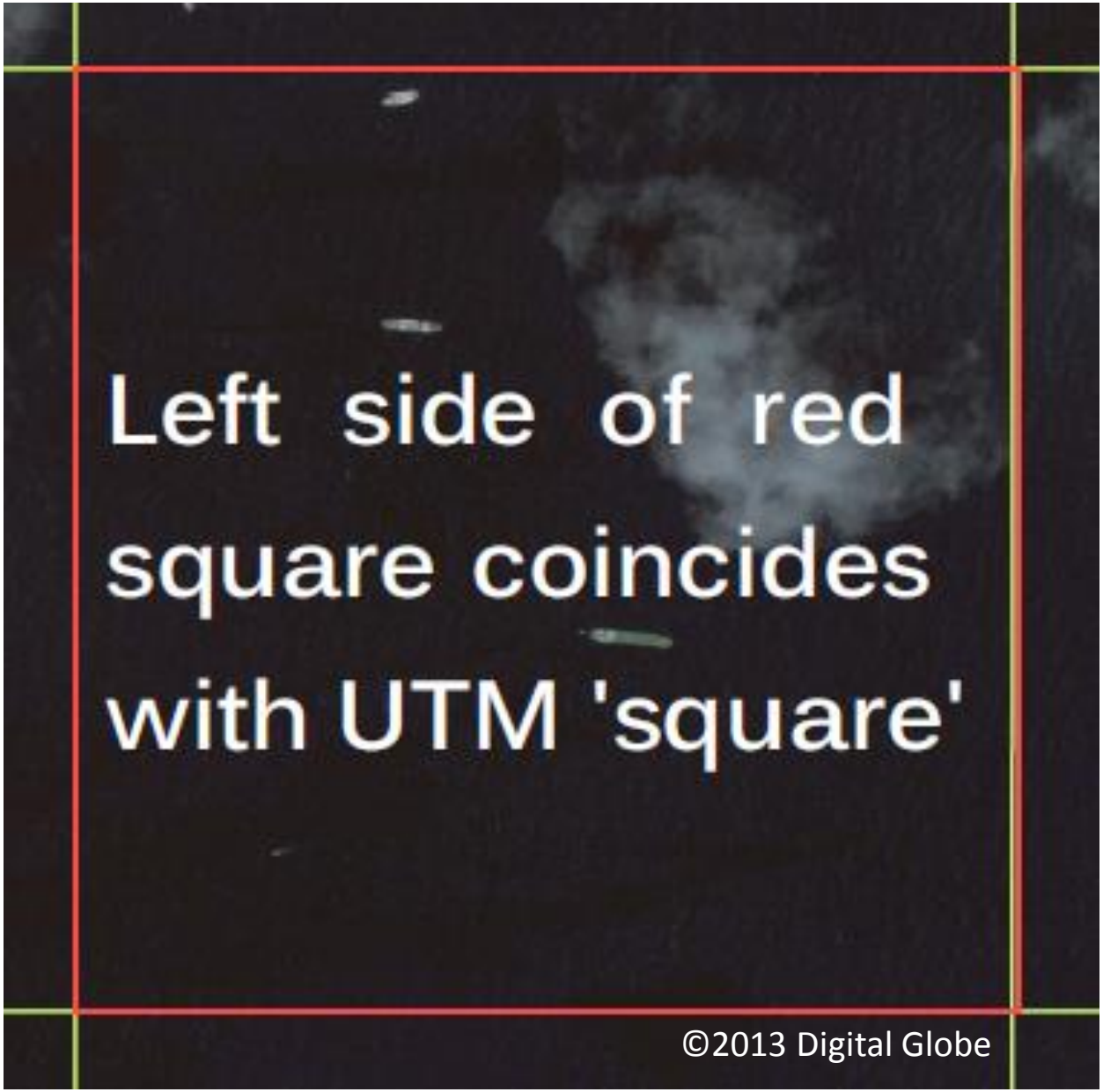
Web-Mercator (Mogadishu)



Red = actual square on projection plane

Green = UTM 1000m square. **Too tall for its width**.

Web-Mercator (Mogadishu)



Red = actual square on projection plane

Green = UTM 1000m square. **Too narrow for its height**.

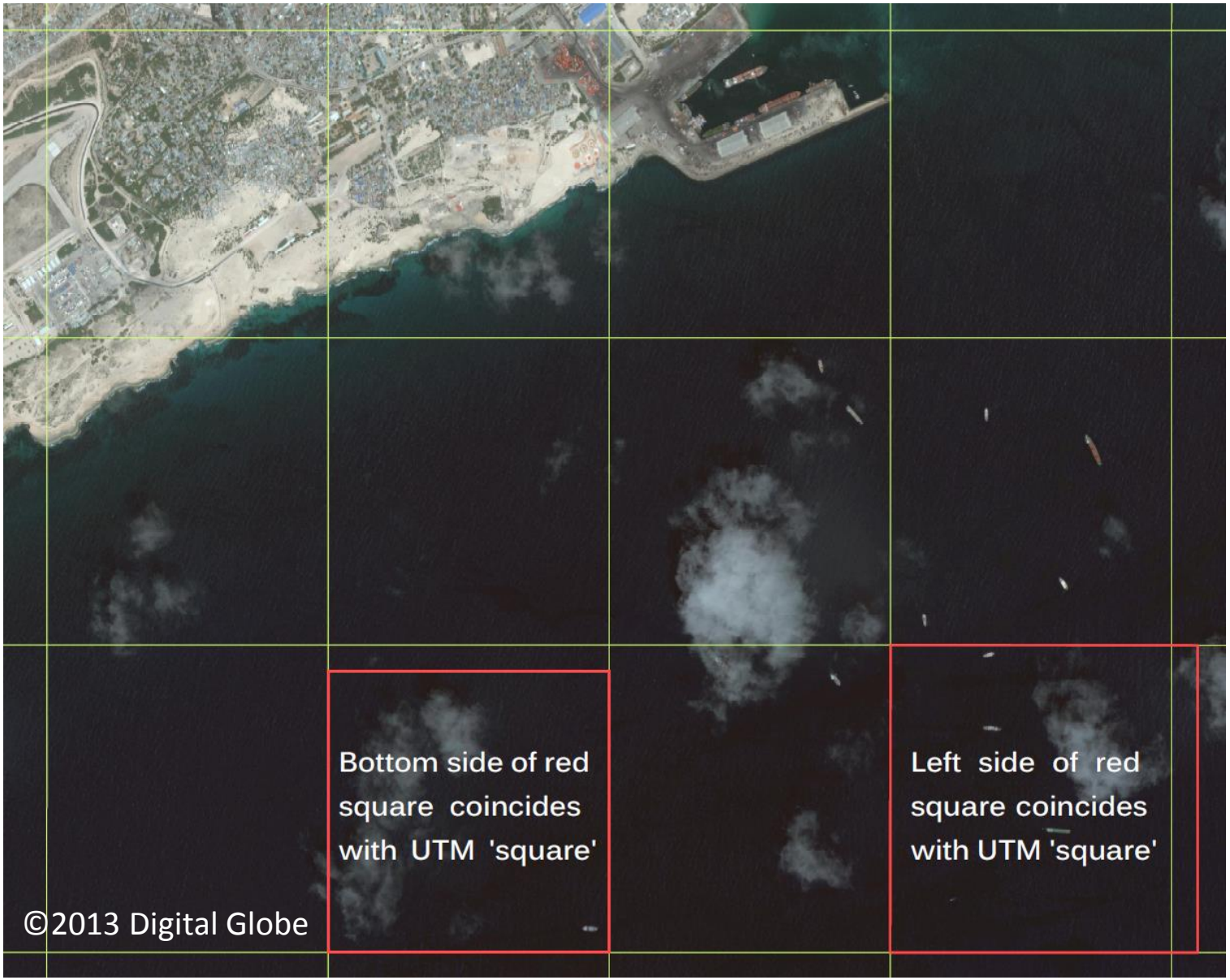
Web-Mercator (Mogadishu)

Show how the incorrect portrayal of the individual UTM 1000m squares is compounded when looking at a UTM 10,000m square.

Switch to Adobe Reader to view the file:

Mogadishu_WebMercator_Approved_LOWRES.pdf

Equi-rectangular – ARC System Zone 1 (Mogadishu)



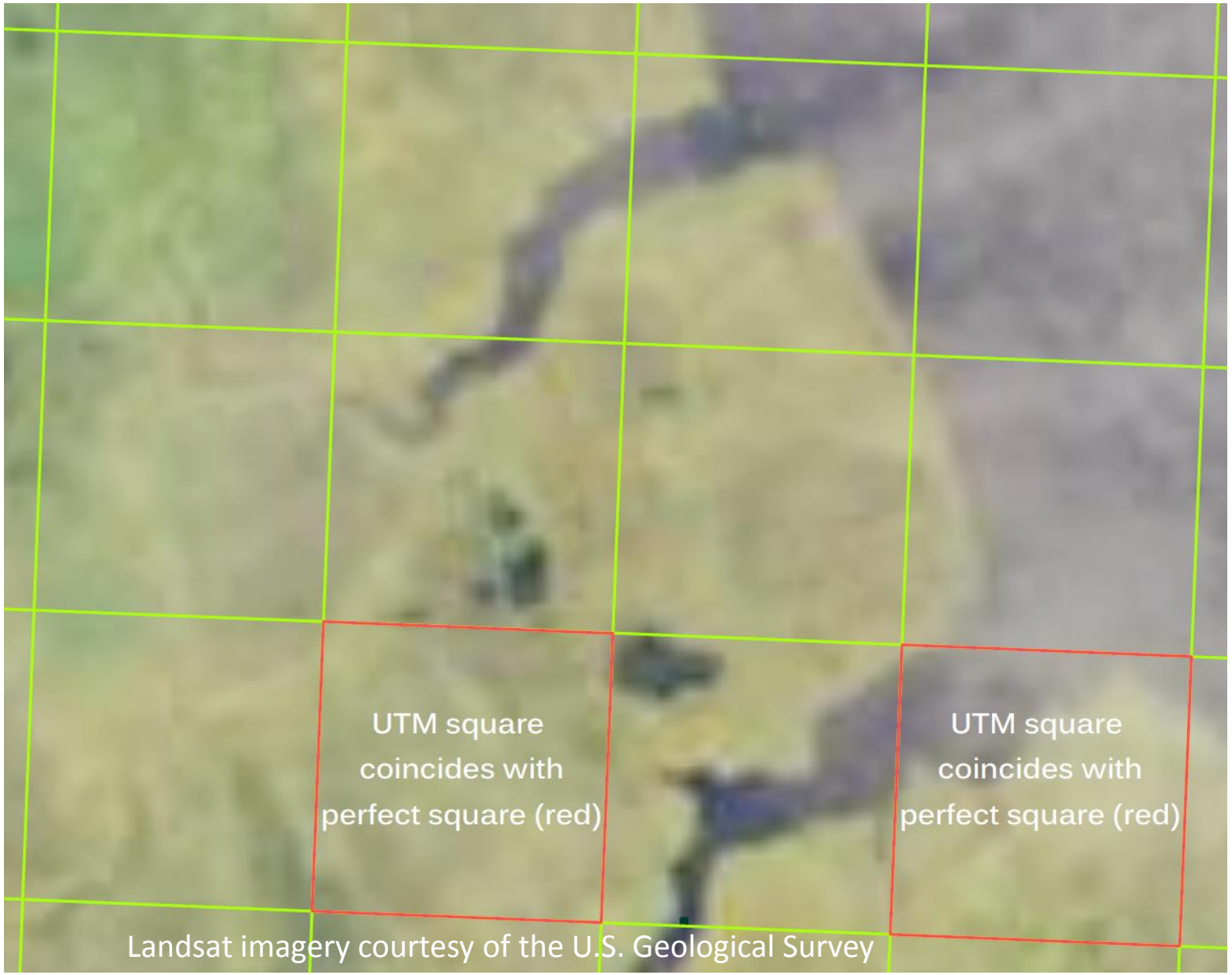
Equi-rectangular – ARC System Zone 1 (Mogadishu)

Show how the incorrect portrayal of the individual UTM 1000m squares is compounded when looking at a UTM 10,000m square.

Switch to Adobe Reader to view the file:

Mogadishu_EquiR_Approved_LOWRES.pdf

Mercator (Barrow, Alaska)



Mercator (Barrow, Alaska)

Show that although the portrayal of the individual UTM 1000m squares is correct as seen at this scale, the UTM 10,000m square is not portrayed as a square due to the size distortion properties of Mercator at high latitudes.

Switch to Adobe Reader to view the file:

Barrow_Mercator_Approved_LOWRES.pdf

Plate Carrée – “geographics” (Barrow, Alaska)

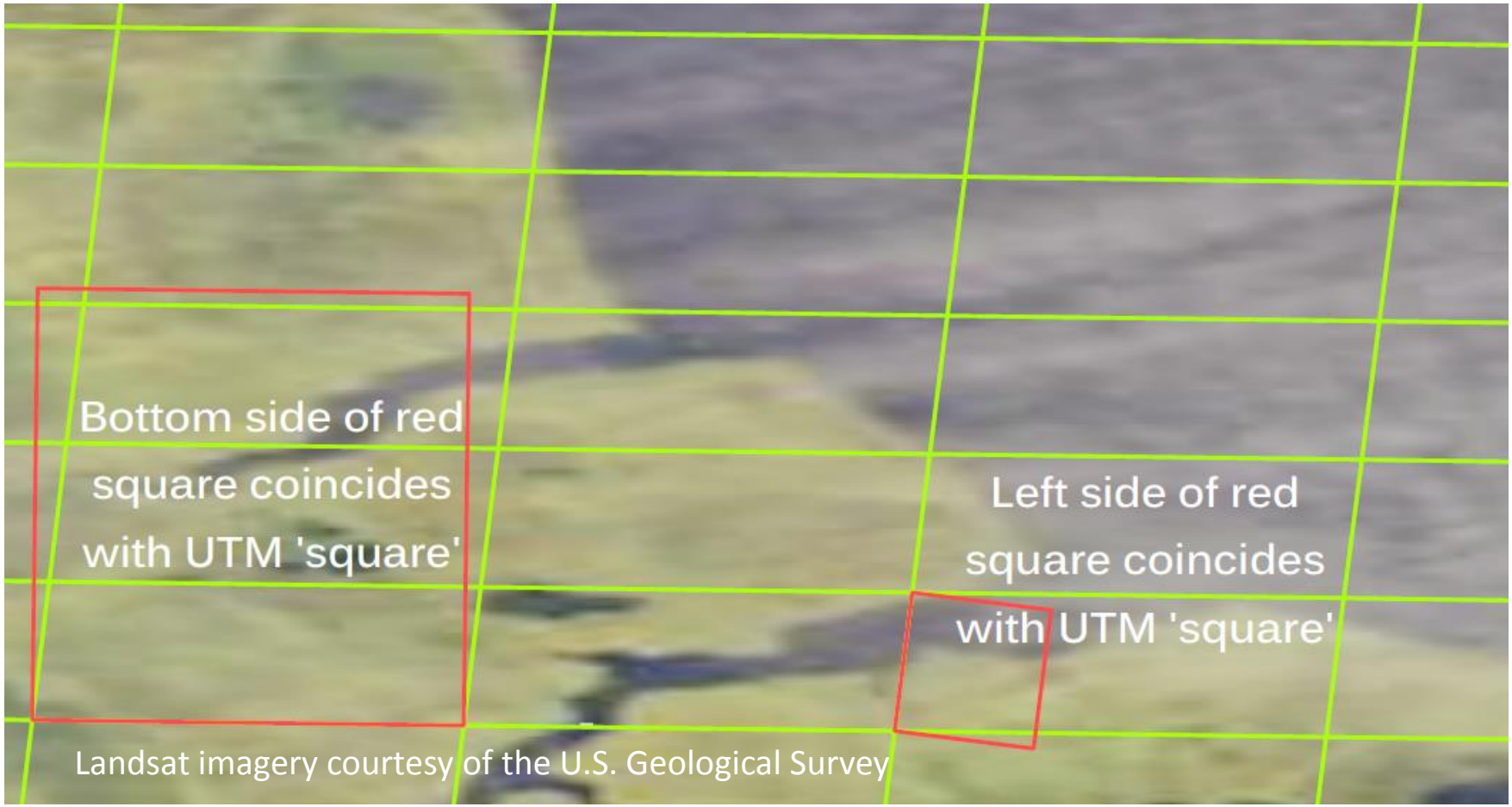


Plate Carrée – “geographics” (Barrow, Alaska)

Show how the incorrect portrayal of the individual UTM 1000m squares is compounded when looking at a UTM 10,000m square.

Switch to Adobe Reader to view the file:

Barrow_PlateC_Approved_LOWRES.pdf

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Examples – what was learned

#	Map projection	City	Comments
1	Web-Mercator	Mogadishu	Non-conformal by a small amount. (Near the Equator is the worst case)
2	Equirectangular	Mogadishu	Significantly non-conformal
3	Mercator	Barrow	Conformal, but size-distortion at high latitudes affects larger UTM square.
4	Plate Carrée	Barrow	Severely non-conformal. This is not appropriate for large-scale mapping. (Near the Poles are the worst cases).

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UTM Squares and Choice of Projection

The method – overlaying a UTM grid – is general (applies to any projection for large-scale work)

Find the ESRI shape files for UTM grids at:

http://earth-info.nga.mil/GandG/coordssys/gislayers/gislayers.html

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Scratch