

**RELIEF DISPLACEMENT**  
GEOG 493/593

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## Definition

- Characteristic of aerial images over varied terrain
- Objects that rise above than the surface lean away from the principal point
- Objects extending below the surface lean towards the principal point
- Displacement increases with the height of the object and/or distance from the principal point

## Downtown Seattle

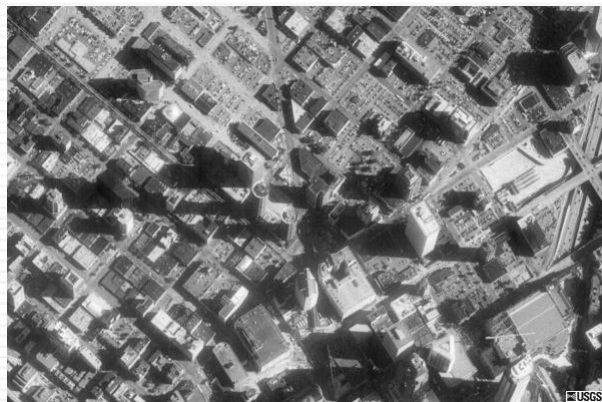


Image courtesy of terraserver-usa.com

## Calculate relief displacement

$$d = \frac{rh}{H}$$

where:

- $r$  = radial distance from principal point to displaced image point
- $h$  = height above surface of the object point
- $H$  = flying height above the surface

## Calculate object height

$$h = \frac{dH}{r}$$

where:

- d = length of displaced object on the photo
- H = flying height above the surface
- r = radial distance from principal point to top of displaced object

## Example

where:

- hotel tower height = 2.2mm
- flying height = 1200m
- radial distance = 3.5mm

$$754.3m = \frac{2.2mm(1200m)}{3.5mm}$$

## Requirements

- Truly vertical photography
- Accurate value for flying height
- Clearly visible objects on photograph
- Principal point located precisely
- Very careful measurement of displacement and radial distances
- **Warning:** Small measurement errors with the photograph result in large errors in ground object height calculation

## Varied terrain

- Terrain points in areas of changing relief also exhibit relief displacement
- Point positions can shift radially inward or outward throwing off length and orientation of measurements between points.
- Calculate and apply displacement value for each point to remove relief distortions
- Displacement value can be positive or negative (inward or outward)

## References

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