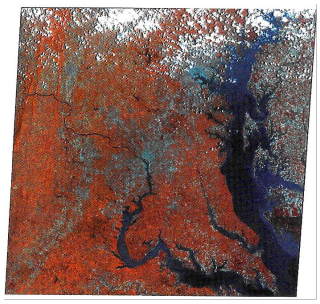
Radiometric Normalization – Automatic Scattergram-Controlled Regression



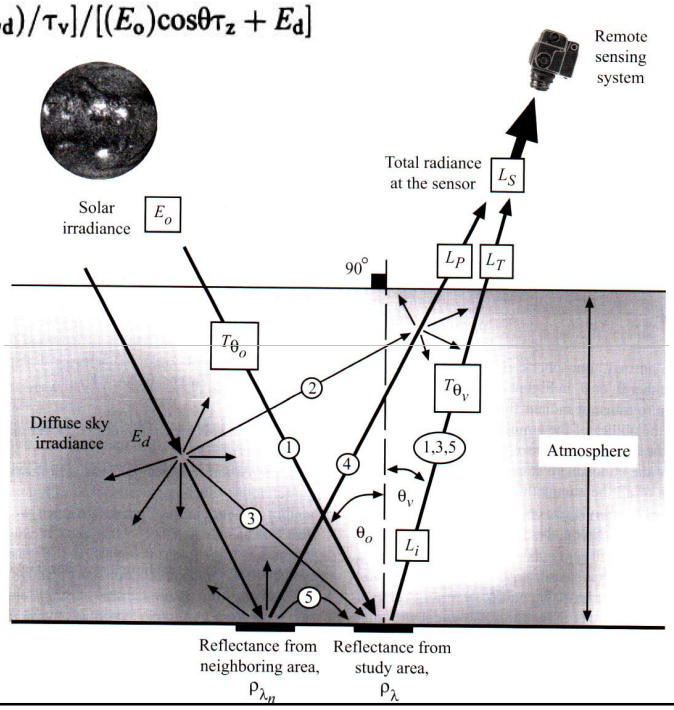
25 June 1990 MSS

8 July 1973 MSS

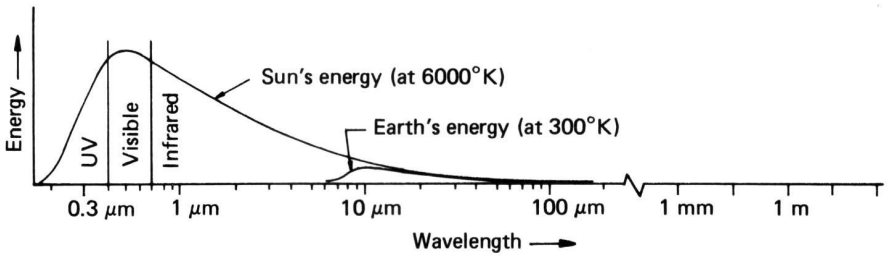
ASCR Normalized 1973 Image

Elvidge, C.D. et al. 1995. Relative radiometric normalization of Landsat MSS data using an automatic scattergram-controlled regression. *PE&RS* 61(10):1255-1260.

$$\rho = [\pi\,(L_{sat} - L_d)/\tau_v]/[(E_o)\cos\theta\tau_z + E_d]$$



Sources of EMR



(a) Energy sources

Scattergrams

Sources of disagreement?

- Clouds
- Radiometric variations
- Land-cover change

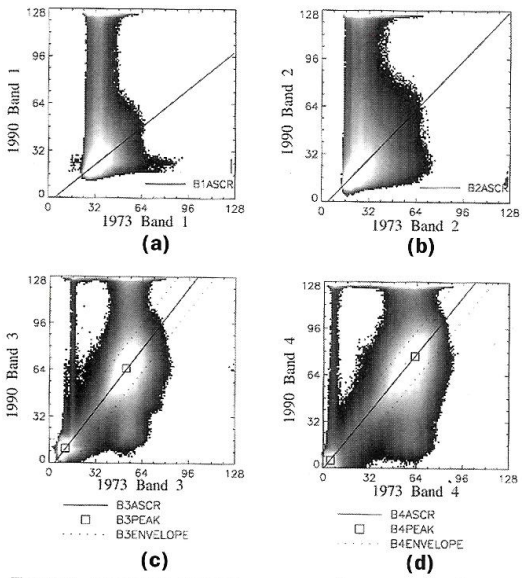
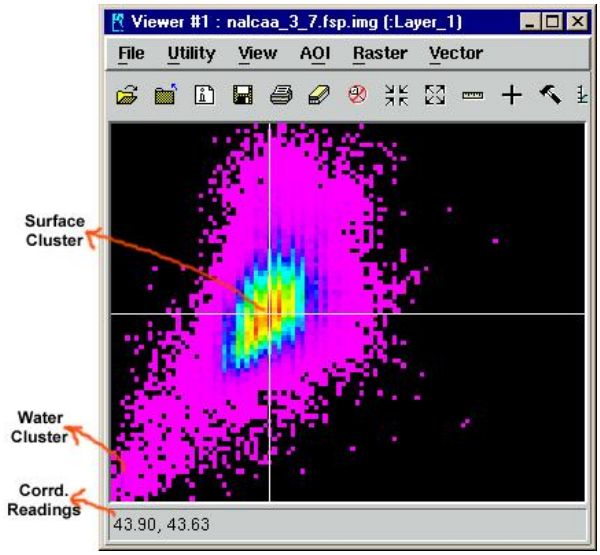


Figure 1. Band-by-band full scene scattergrams for the 1990 versus 1973 Landsat MSS data. (a) Scattergram of the 1990 Band 1 versus 1973 Band 1. (b) Scattergram of the 1990 Band 2 versus 1973 Band 2. (c) Scattergram of 1990 Band 3 versus 1973 Band 3. (d) Scattergram of 1990 Band 4 versus 1973 Band 4.



ASCR

1. Compute scattergrams of NIR bands
2. Identity water and land centers on both scattergrams, formulate no-change area definitions, and select pixels within no-change areas
3. Compute regression models for all bands using only pixels within no-change areas
   - Y = a X + b
   - Y: reference image
   - X: image to be normalized
4. Normalize image using the regression models
   - X' = a X + b
   - X': normalized image

No-Change Areas

Known:

- x and y coord of land and water centers
- Half perpendicular width (HPW) ~ 10 DN

Find the area between the parallel dashed lines:

- Solid line y = ax + b
  Slope a = $(y_2-y_1)/(x_2-x_1)$
  Intersect b = $y_1 - ax_1$
- Half vertical width (HVW)
  HVW = SQRT(1 + a^2) * HPW
- Areas between dashed lines
  |y – ax – b| <= HVW