Remote Sensing of Evapotranspiration

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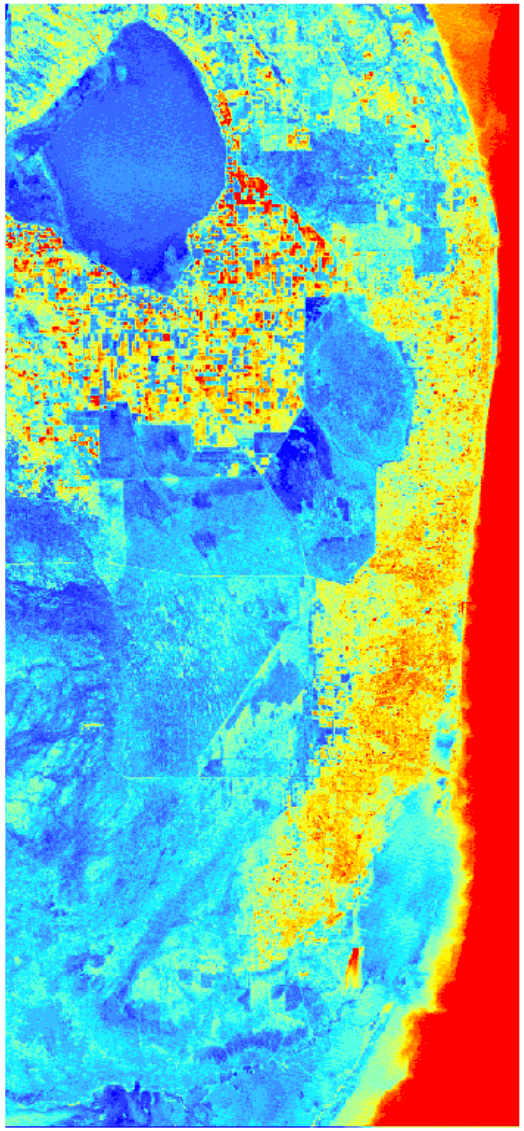
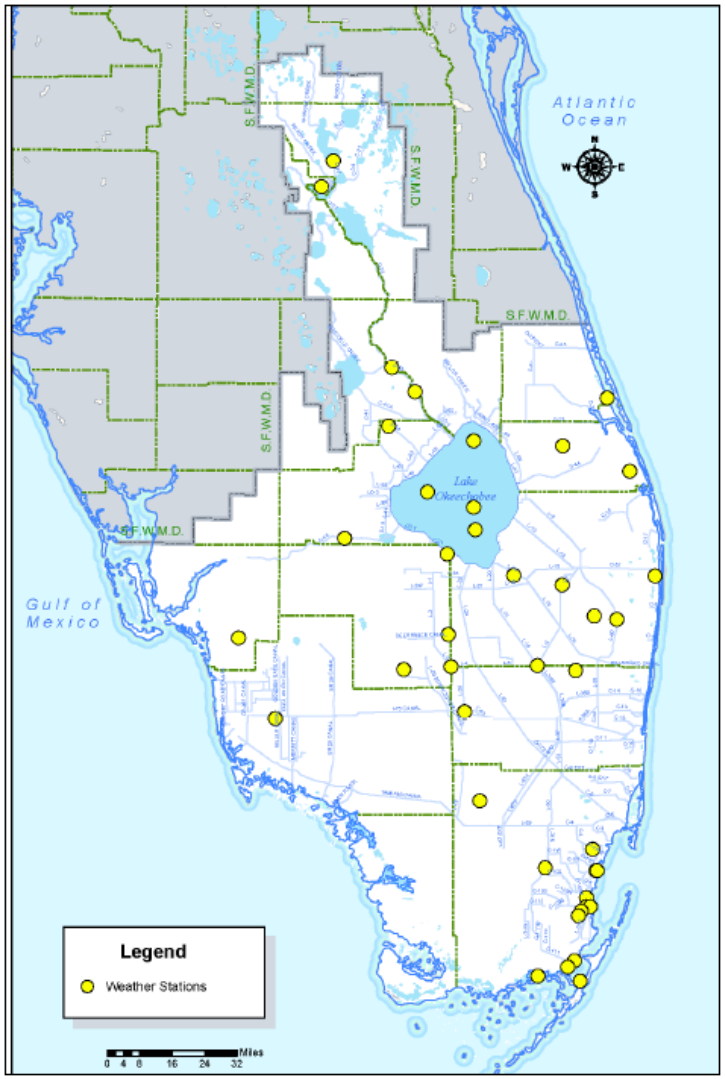
Remote Sensing of Evapotranspiration

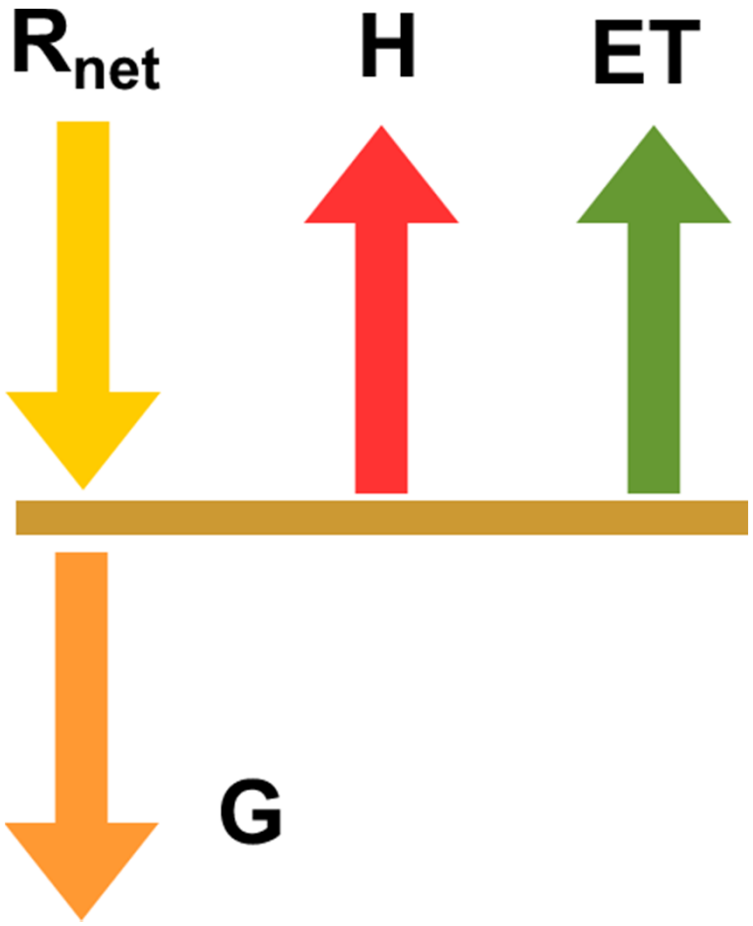


Thermal Imagery

Weather Stations



Energy Balance



$R_{net} = LW + SW$

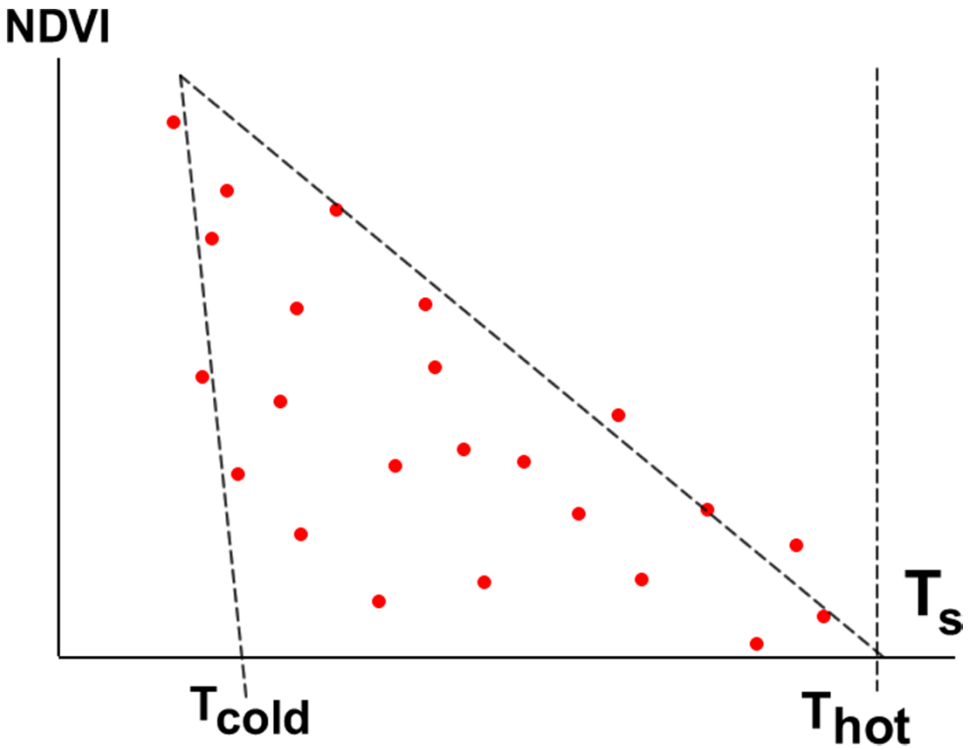
$G = f(LAI, \alpha, T_S)$

Satellite

ET , H = ???

$R_{net} - G = ET + H$

Triangle Method

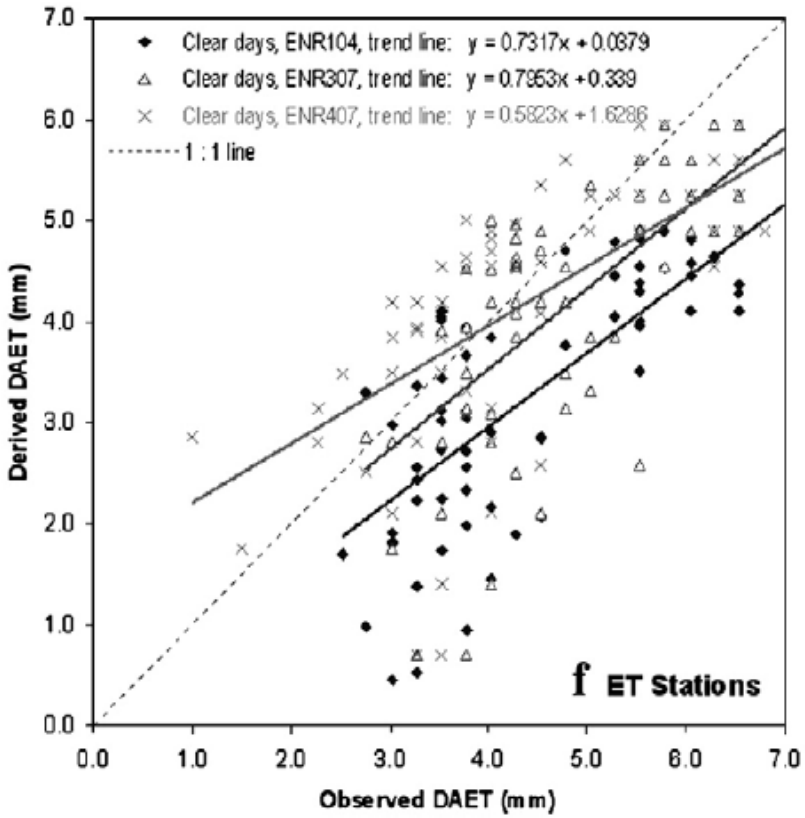


$$ET = EF\,(R_{net} - G)$$

$$EF = \frac{(T_{Hot} - T)}{(T_{Hot} - T_{Cold})}$$

Jiang et al, 2009

South Florida



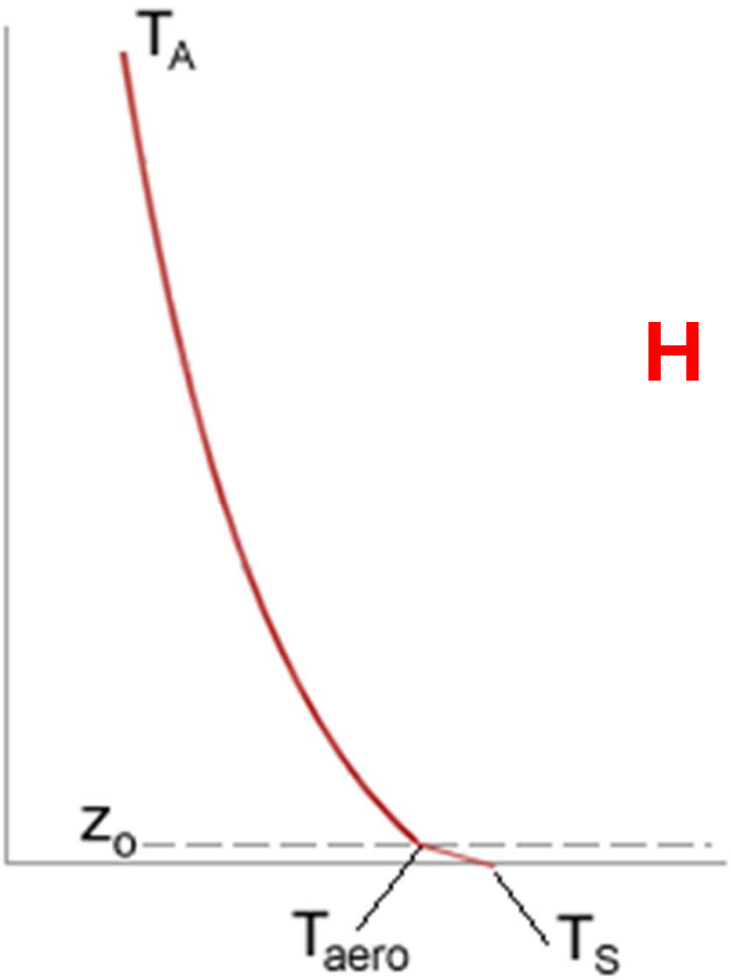
Residual Method

$$ET = R_{net} - G - H$$

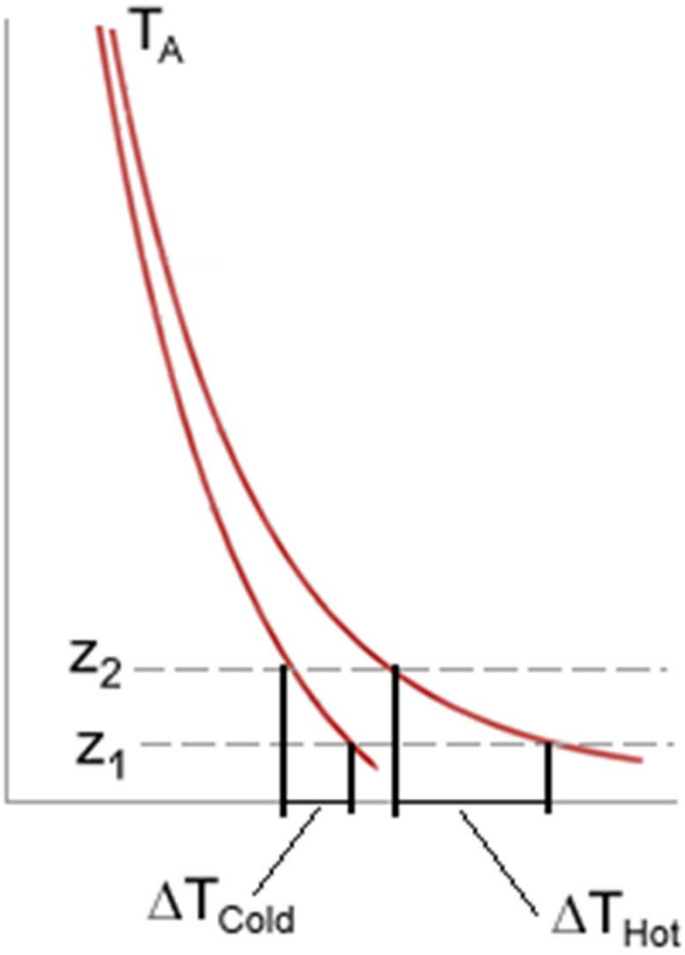
$$H = g_A(u, z_o, \text{stability})\,(T_{aero} - T_A)$$

Ground & Satellite

???



SEBAL *(Bastiaanssen)*



$$\Delta T = a + bT_S$$

Fit a,b using local weather station

$$H_{Cold} \rightarrow \Delta T_{Cold},\ T_{Cold}$$

$$H_{Hot} \rightarrow \Delta T_{Hot},\ T_{Hot}$$

Usually Assume $ET_{Hot} \sim 0$

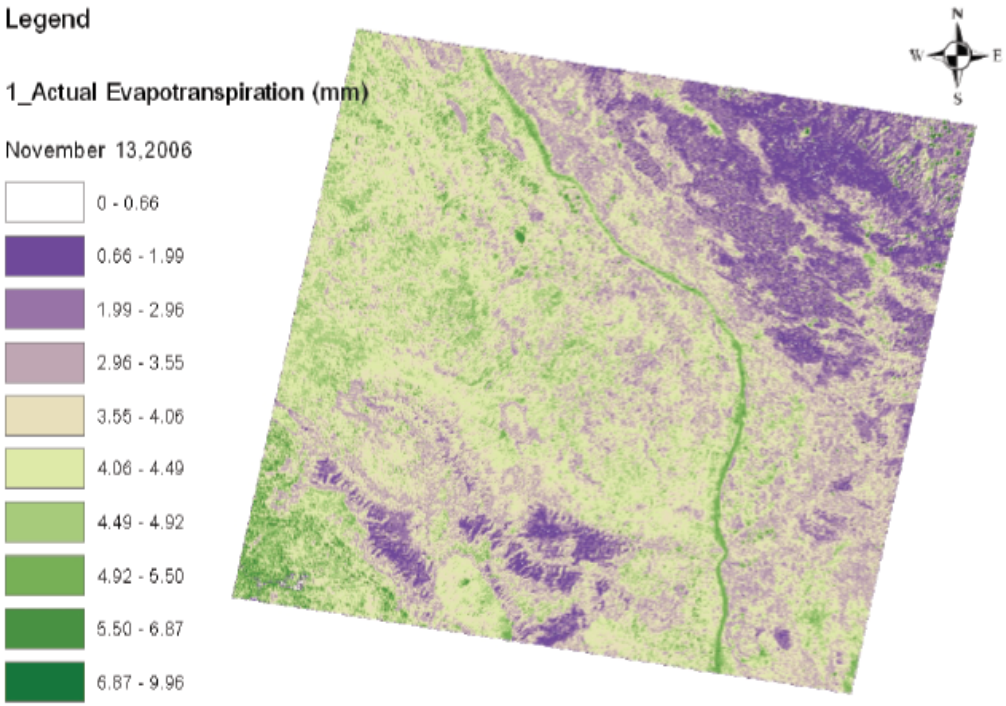
$$ET = R_{net} - G - g_A \Delta T$$

Biases tend to cancel out

Actual ET

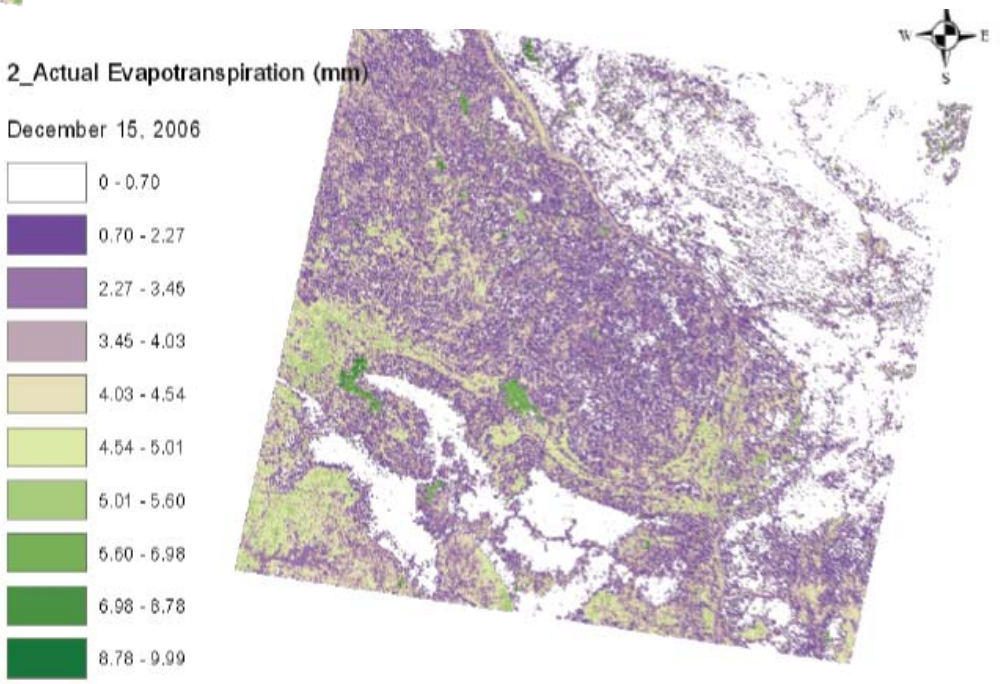
Mekhong river basin
Northeast Thailand

Kosa, 2011

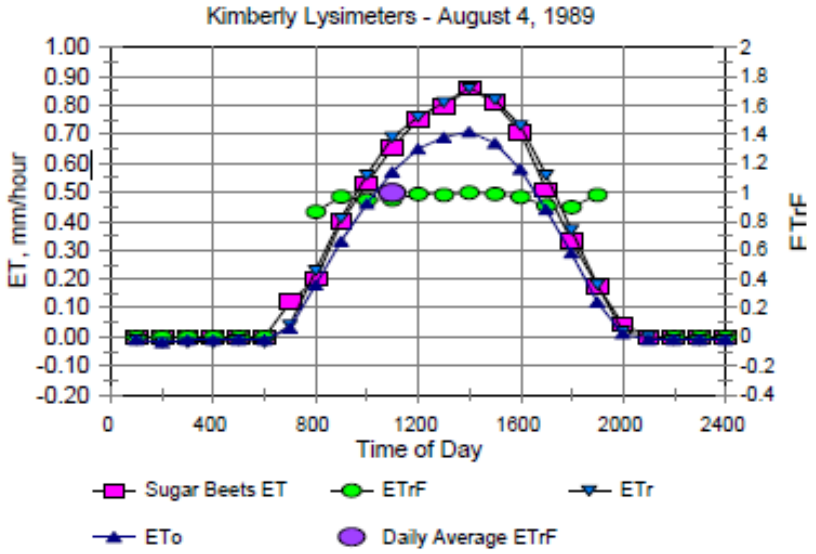


November 13 2006

December 15, 2006



Temporal Resolution



Snapshot > Daily ET

$$EF = \frac{ET}{R_{Net} - G} = \text{Const}$$

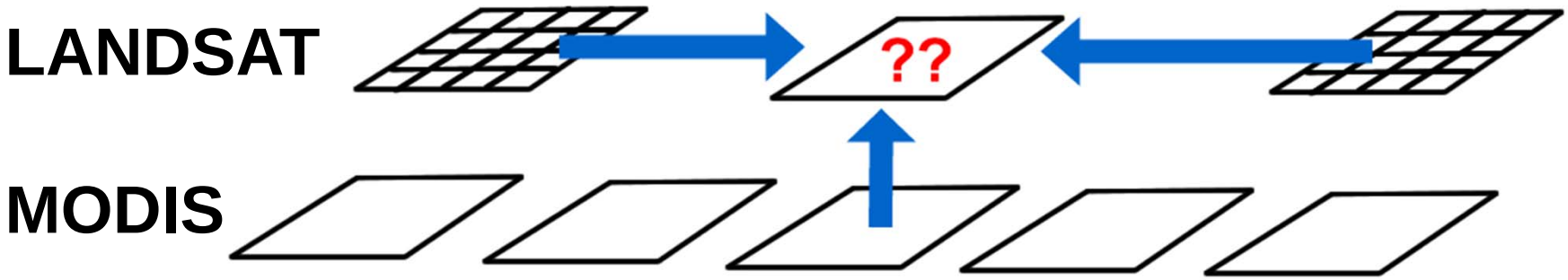
Clouds???

Need Clear Sky Images.

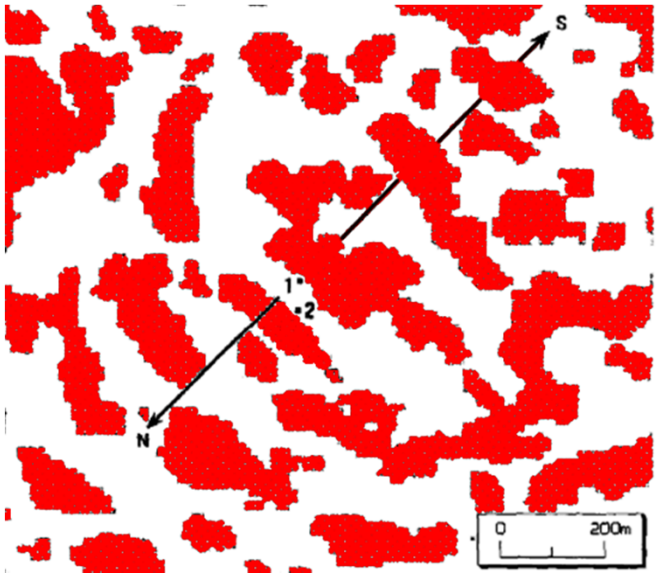
Can Have Big Gaps In Imagery

Data Fusing

Platform	Spatial Res	Return
LANDSAT	120 m	16 day
MODIS	1 km	2 per day
GOES	5-10 km	Geosync



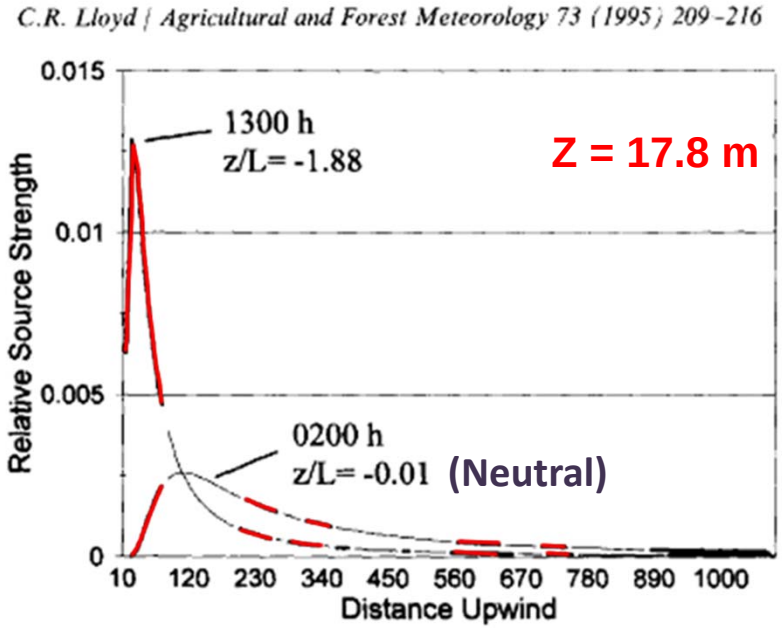
Heterogeneity



What are weather stations measuring?

Sensible Heat found using "Similarity" theory….

Will it work?



Monitoring Network

Temp and Humidity at 1 height?

Priestly-Taylor or Penman-Monteith … parameters?

Temp and Humidity at 2 heights?

Bowen Ratio method

$$\beta = \frac{H}{ET} = \gamma \frac{T_1 - T_2}{q_1 - q_2}$$

$$ET = \frac{R_{net} - G}{1 + \beta}$$

THANK YOU