ESTIMATION OF EVAPORATIVE FRACTION (EF) FROM EASILY OBTAINABLE STANDARD PRODUCTS IN SOUTHERN FLORIDA
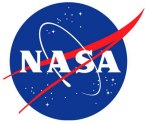
Ali Levent Yagci [1], Joseph A. Santanello [1], John W. Jones [2]

ali.l.yagci@nasa.gov, joseph.a.santanello@nasa.gov, jwjones@usgs.gov

[1] NASA Goddard Space Flight Center, Hydrological Sciences Laboratory, Greenbelt, MD, U.S.A.
[2] U.S. Geological Survey, Eastern Geographic Science Center, Reston, VA, U.S.A.

INTRODUCTION

- ET is one of the key surface variables for hydrological applications, monitoring of natural and anthropogenic water consumption, closing energy balance and water budgets and drought identification.
- Accurate MODIS-based ET in urgent need for Land Surface, Hydrological, Mesoscale, and Global Climate Models:
  - 1-km spatial resolution
  - Daily temporal resolution
- Accurate Landsat-based ET in urgent need for agricultural water consumption of individual fields:
  - 30-m spatial resolution
  - 16-day temporal resolution

METHOD
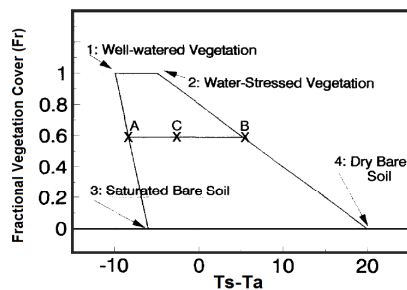
Theoretical dry and wet edges in a two dimensional space of Fr and (Ts-Ta).

ABBREVIATIONS

- EF = Evaporative Fraction , EF= LE/(Rn-G)
- ET = Evapotranspiration in mm/day units
- LE = Latent Heat Flux in Wm^{-2}, energy equivalent of ET
- Rn = Net radiation in Wm^{-2}
- G = Soil Heat Flux in Wm^{-2}
- Fr = Fractional Vegetation Cover
- NDVI = Normalized Difference Vegetation Index
- Ts or LST = Land Surface Temperature
- Ta = Air temperature at 2m reference height
- LSM = Land surface models

CONCLUSIONS & FUTURE WORK

- This model/approach shows promise in estimating EF, and subsequently ET, at high spatial and temporal resolutions
- It runs with easily obtainable minimal inputs without needing ground observations
- Stable EF is only good for clear days
- More validation is needed at other climates/regimes
- Daily ET from MODIS could be used to support LSMs
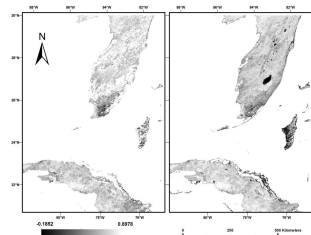- Method is readily transferable and expandable to continents and globe

RESULTS
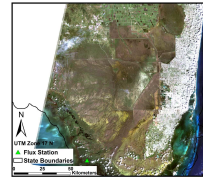
The location of Eddy correlation flux tower (US-Skr) in the Everglades. Land cover is Mangrove forest.
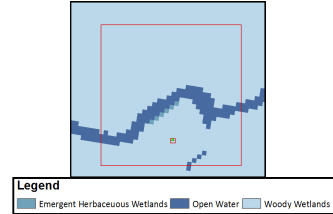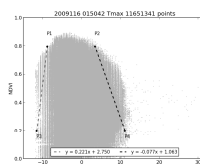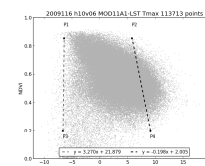
Landsat and MODIS Pixel Footprint

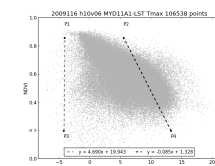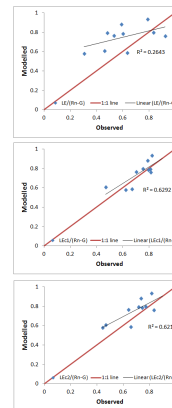Gap-filling by temporal interpolation

MODIS-NDVI   MODIS-LST

Scatterplots of NDVI/(Ts-Ta) space on Apr 26, 2009

Landsat   MODIS-Terra   MODIS-Aqua

Raw Data

Residual-LE
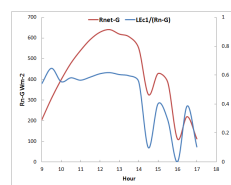
Bowen Ratio

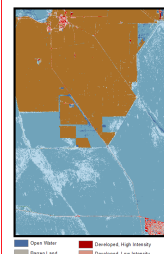Modeled vs. Observed EF   Landsat   MODIS-Terra   MODIS-Aqua
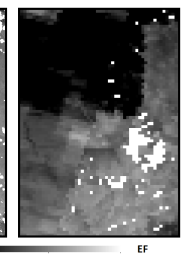

Daily EF variation on Feb 5, 2009

NLCD 2011 Land Cover Map

EF maps on Feb 21, 2009
Landsat   MODIS-Terra