



Vegetation Dynamics and Seasonal Responses of North and South America from EOS-MODIS Vegetation Indices

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MODIS (MOD 13)

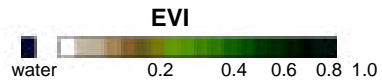
Vegetation Index Products

- ★ The MODIS Products include 2 Vegetation Indices (NDVI, EVI) and QA produced at 16-day and monthly intervals at 250m/ 500m, 1km, and 25km resolutions
- ★ The narrower 'red' MODIS band provides increased chlorophyll sensitivity (band 1),
- ★ The narrower 'NIR' MODIS band avoids highly variable water vapor absorption (band 2),
- ★ Use of the blue channel in the EVI provides aerosol resistance.



Global EVI composite (Sept. 30 - Oct. 15, 2000)

(Spatial and temporal intercomparisons of vegetation activity)



Hammer Aitoff Projection

TBRs, University of Arizona

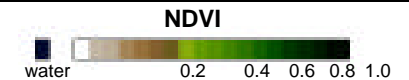
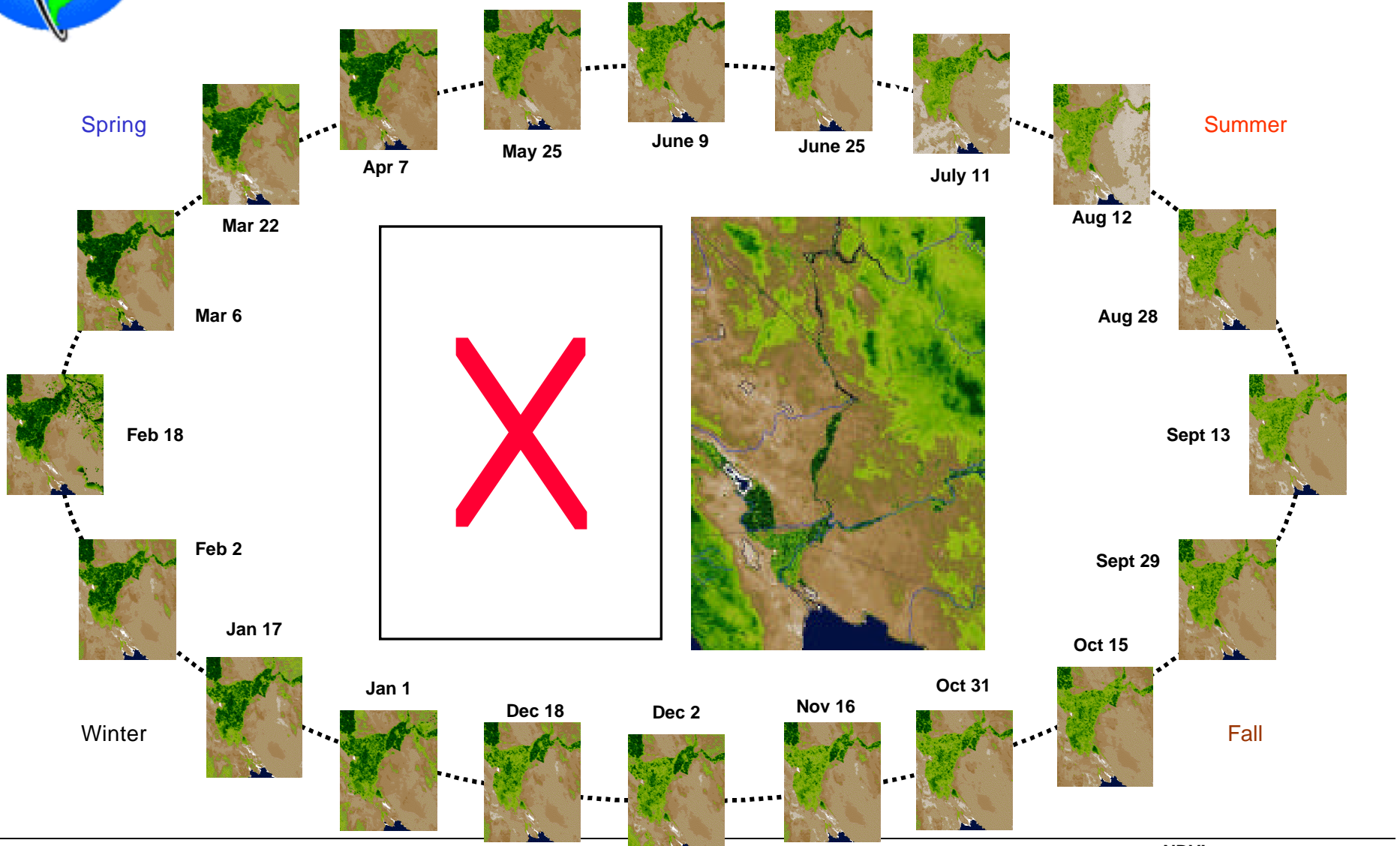
SCF Group, <http://tbrs.arizona.edu>





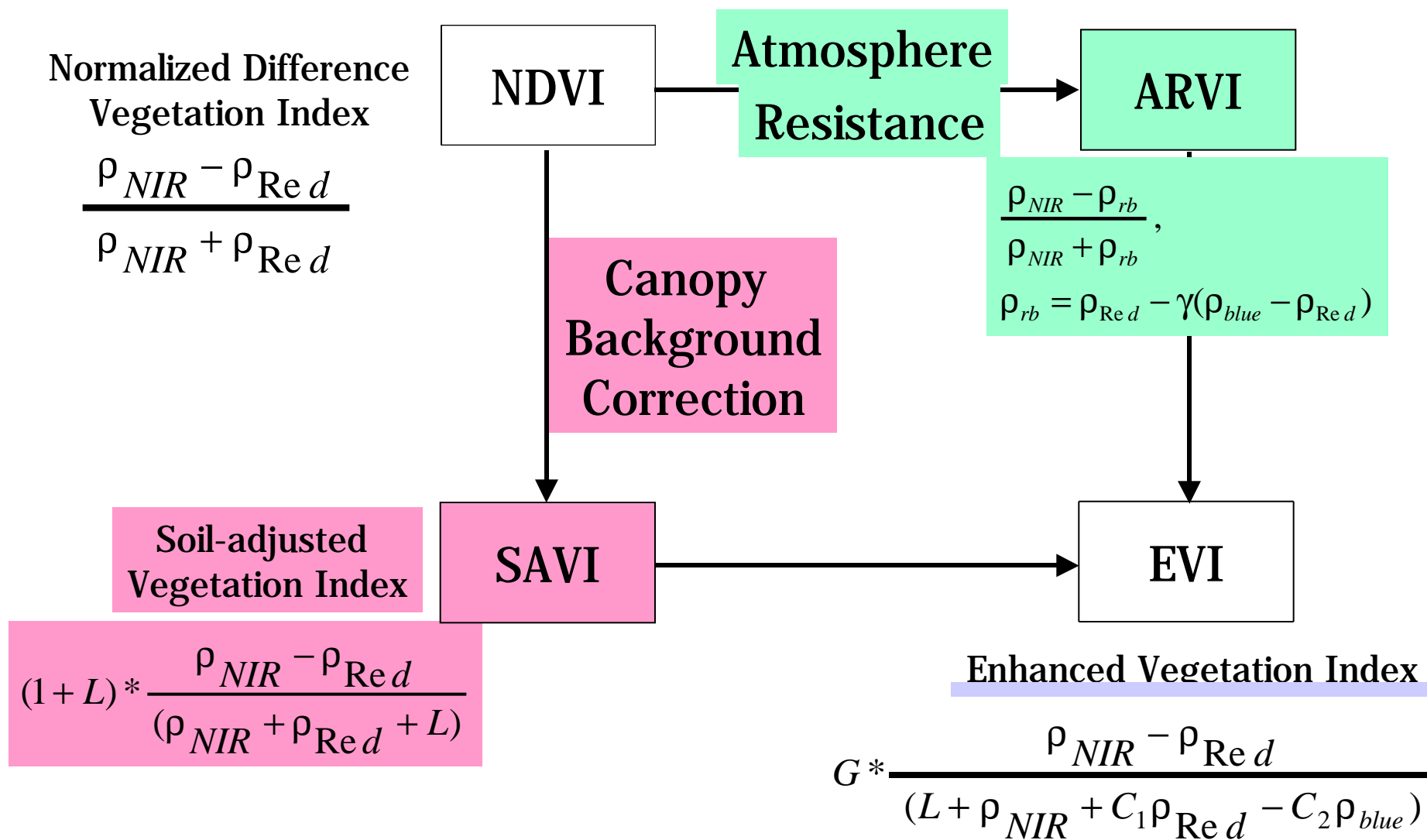
Colorado River Delta

Vegetation Spatial and Temporal Dynamics with MODIS NDVI 2000-2001



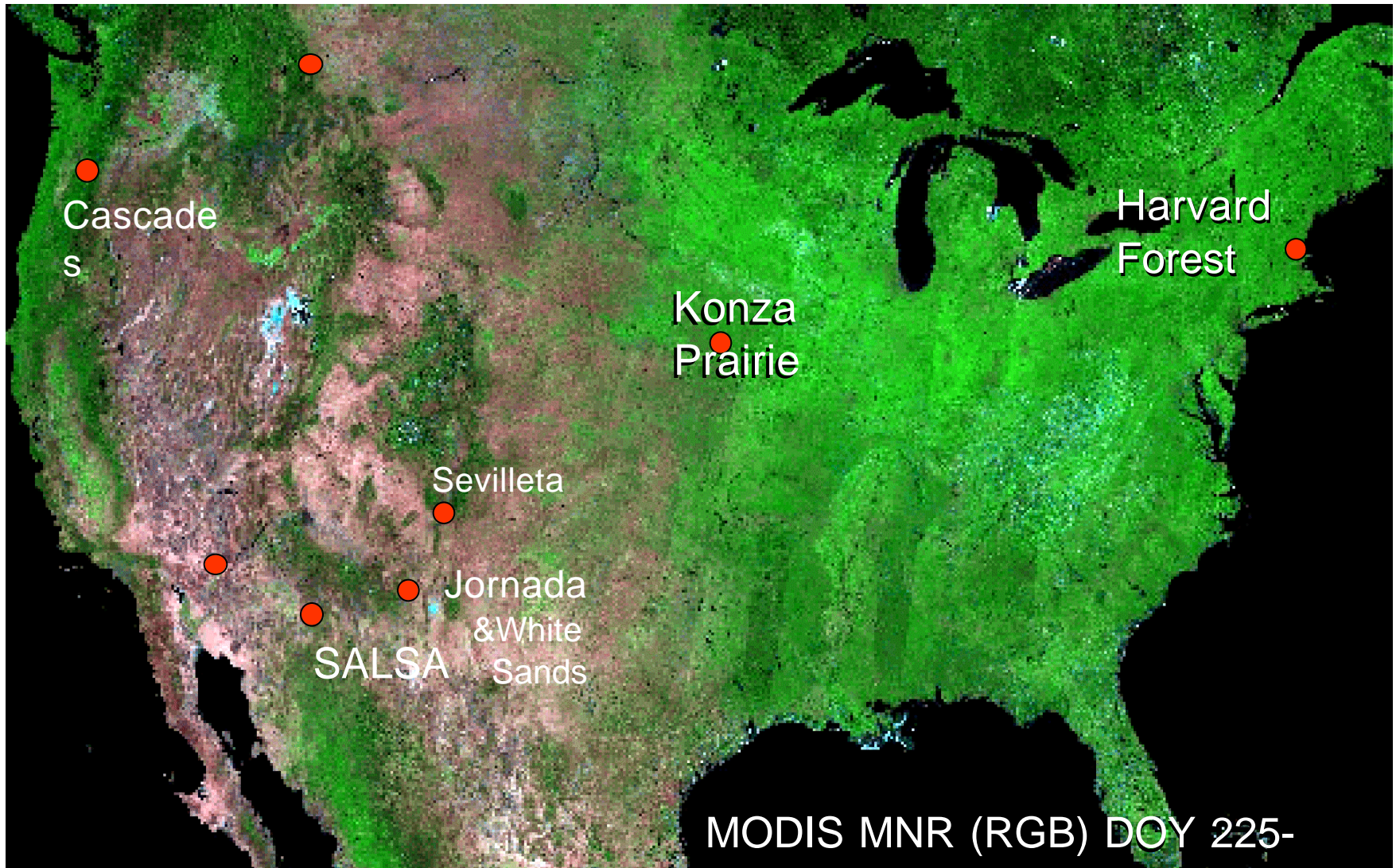


MODIS Vegetation Indices





Geographic location of validation activities and time series plots.





North American sites with diverse vegetation conditions

White Sands



Sevilleta LTER
(semiarid shrub/ grass)



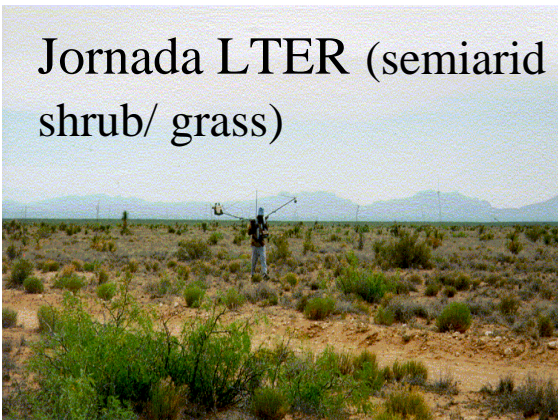
Konza Tallgrass
Prairie



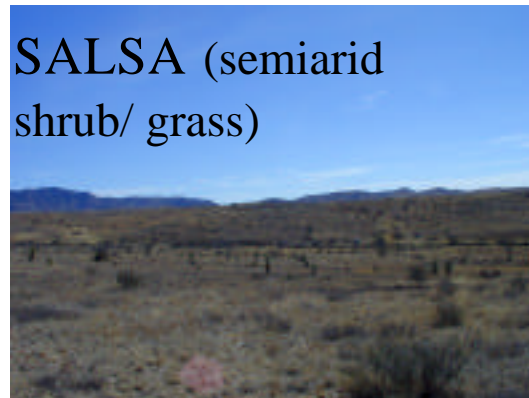
Cascades (mixed
conifer forest)



Jornada LTER (semiarid
shrub/ grass)



SALSA (semiarid
shrub/ grass)

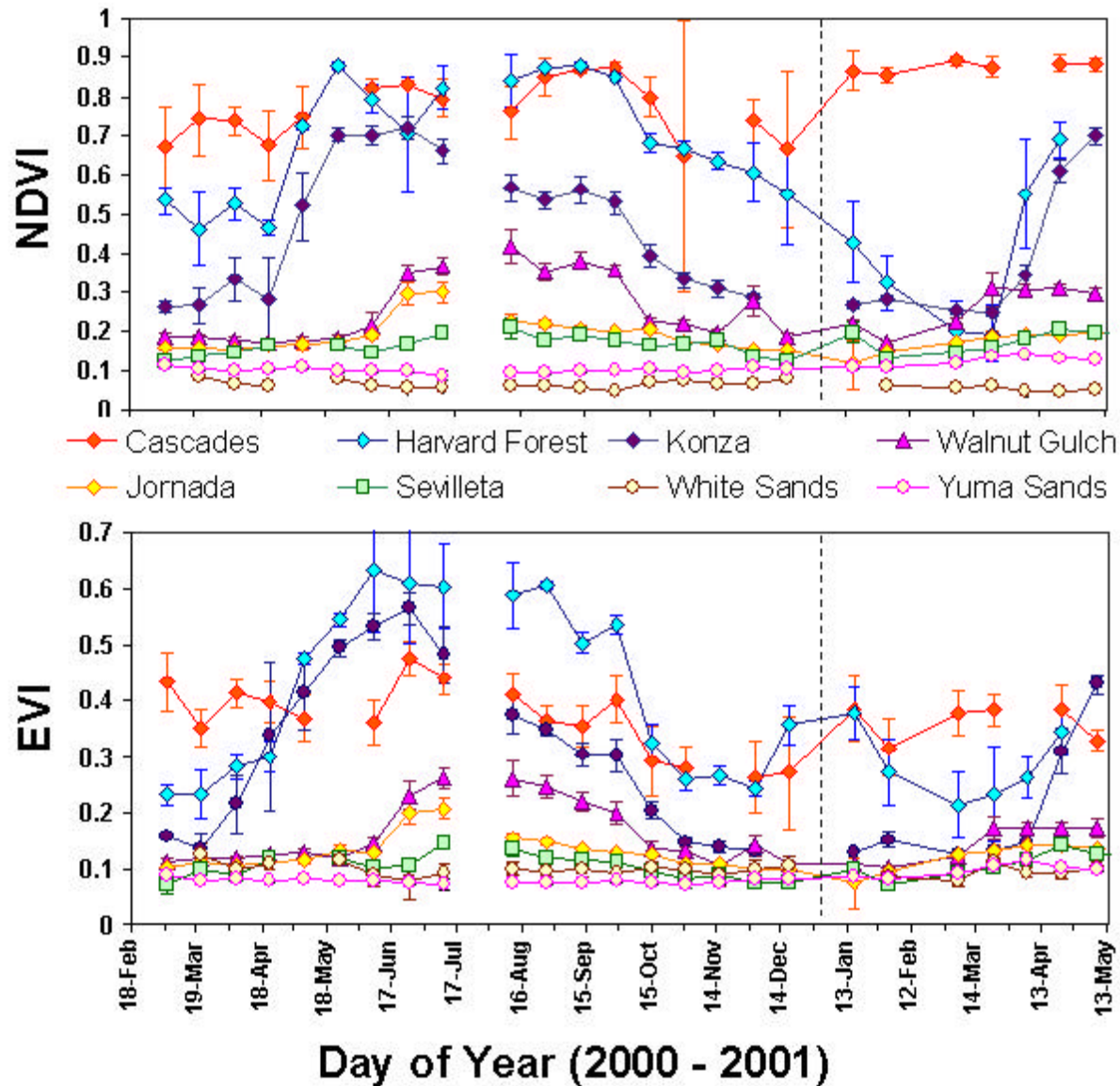


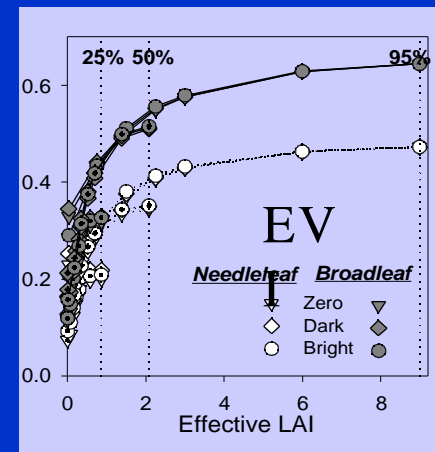
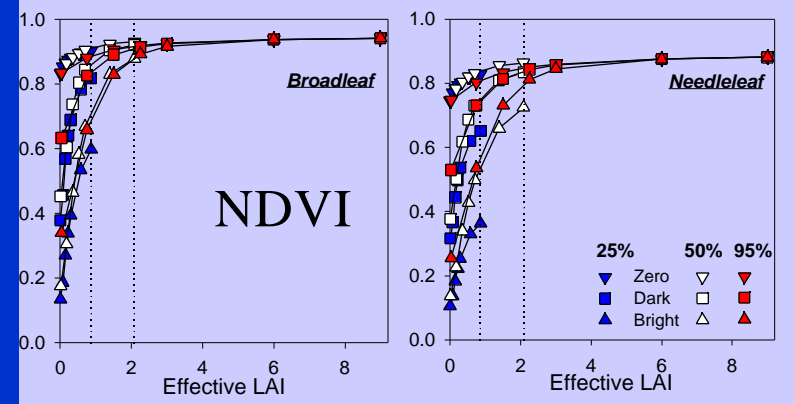
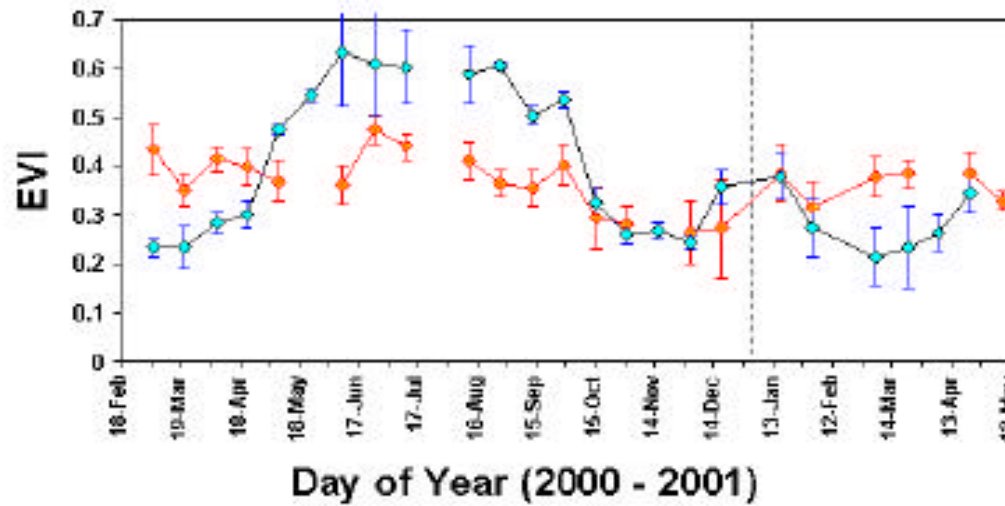
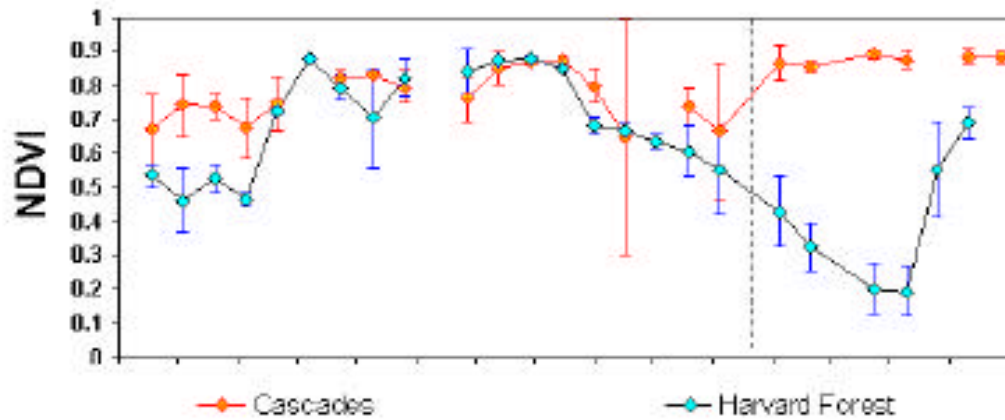
Harvard Forest (mixed
hardwood and conifer forests)



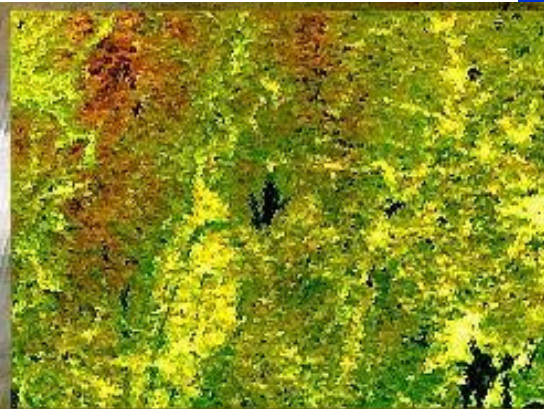


Seasonal Patterns of Major Biomes in North America





10 September 2000



12 October 2000



23 October 2000



Semi-arid Vegetation Dynamics



April 8

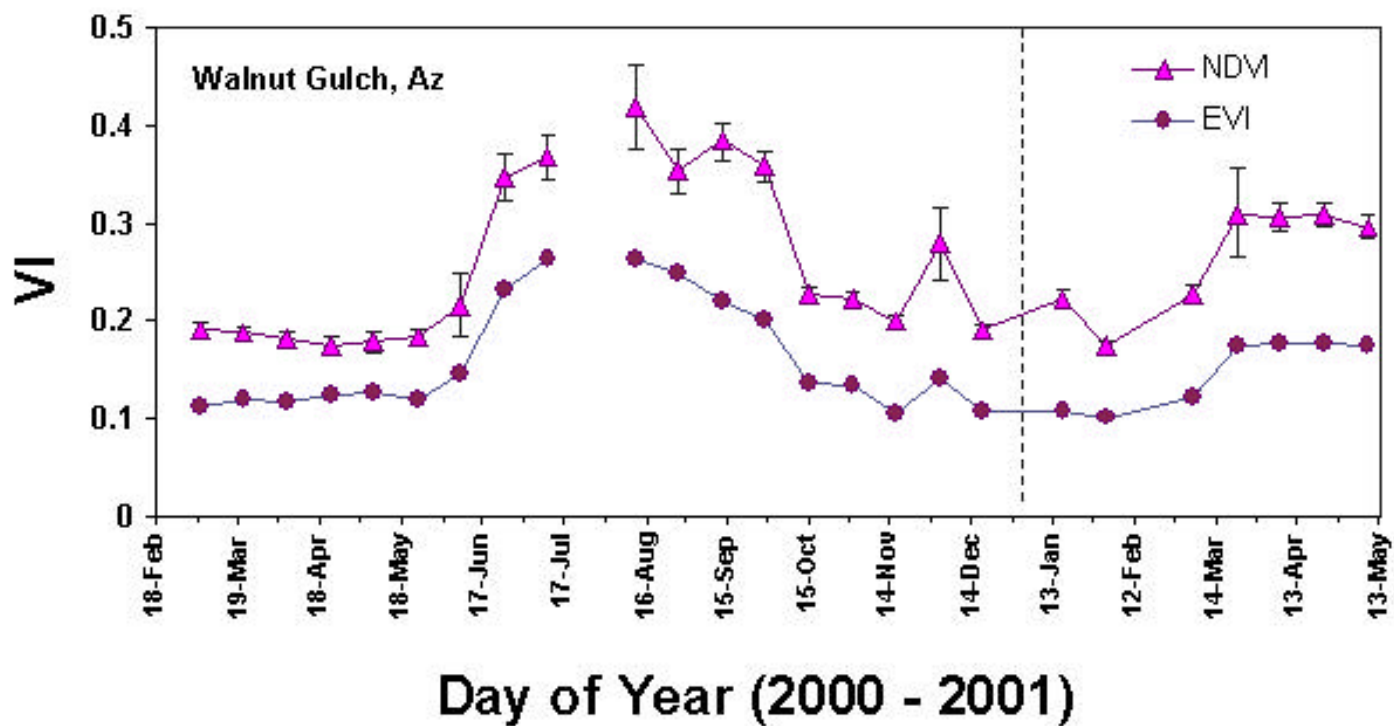


May 26



June 26

July 13



Oct 1

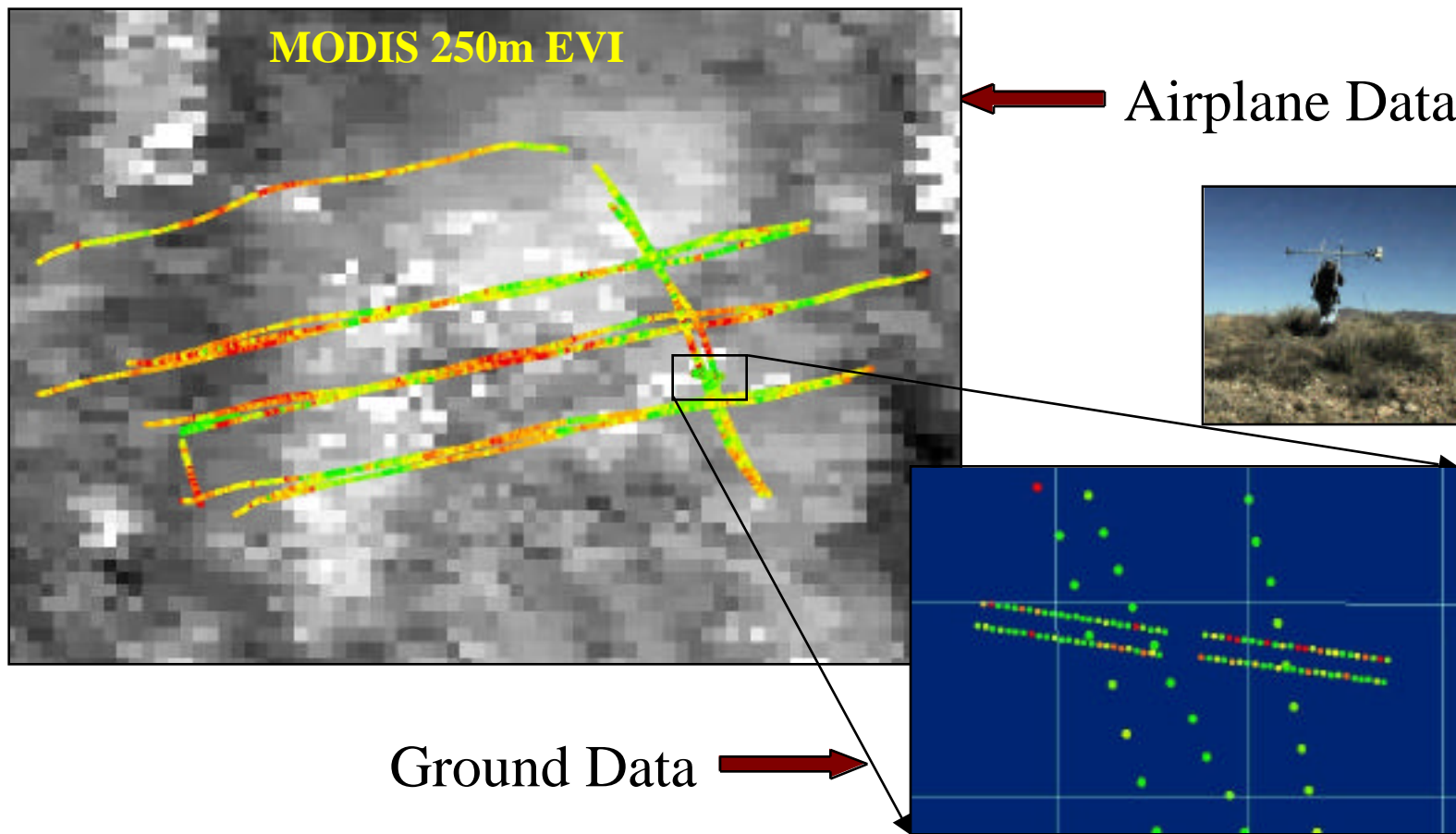
Sep 15

Aug 14

July 29

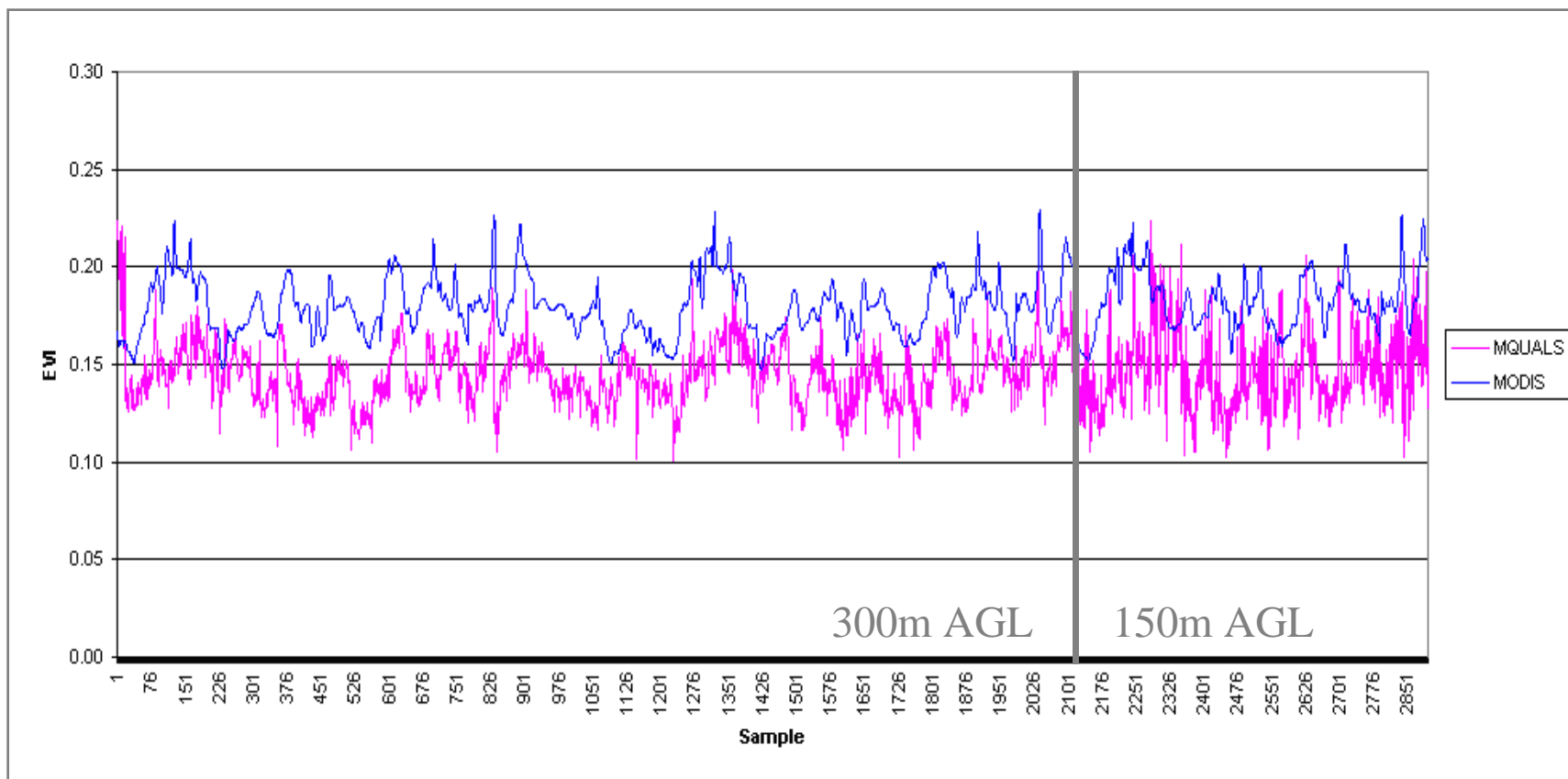


WGEW – Exotech EVI



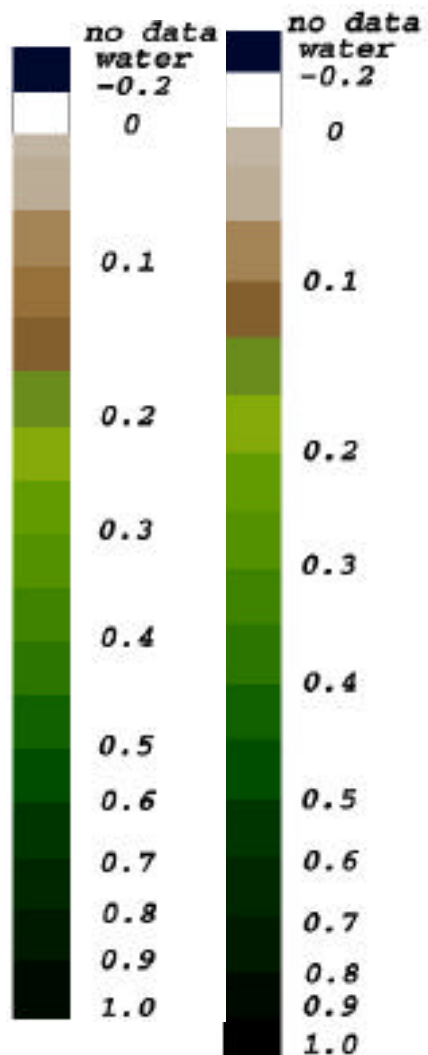


EVI from MODIS & Exotech



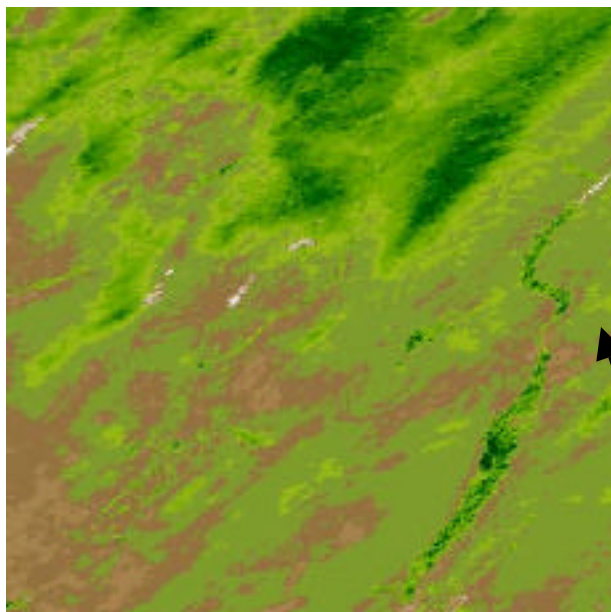
Dry Season (129 ~ 144)

Wet Season (200 ~ 208)

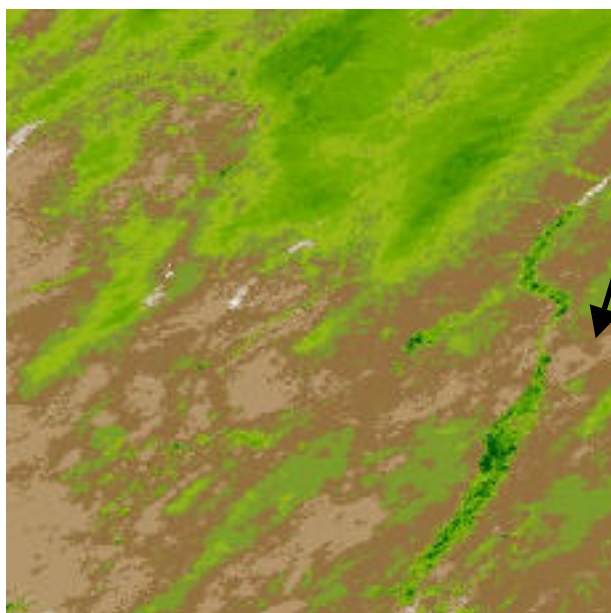


NDVI

EVI

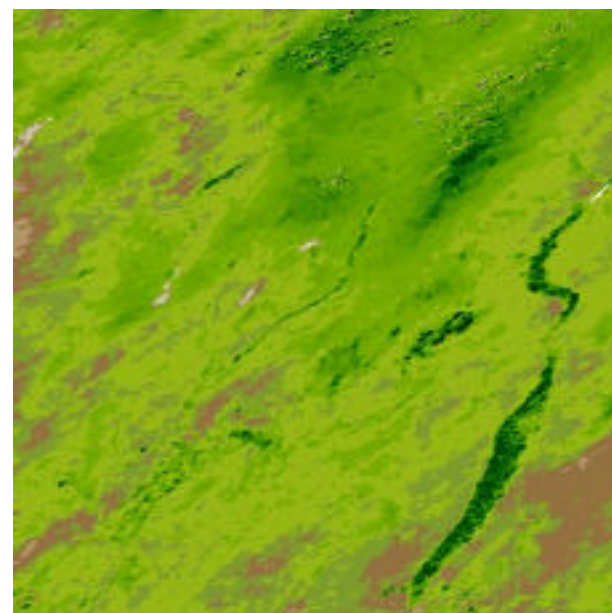
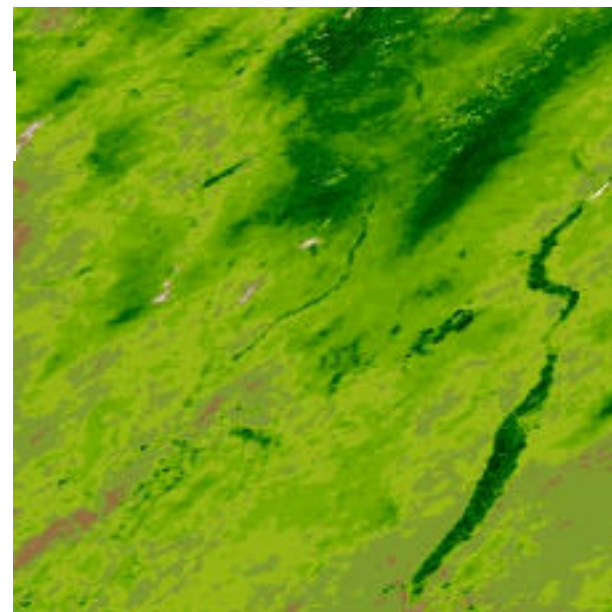


NDVI



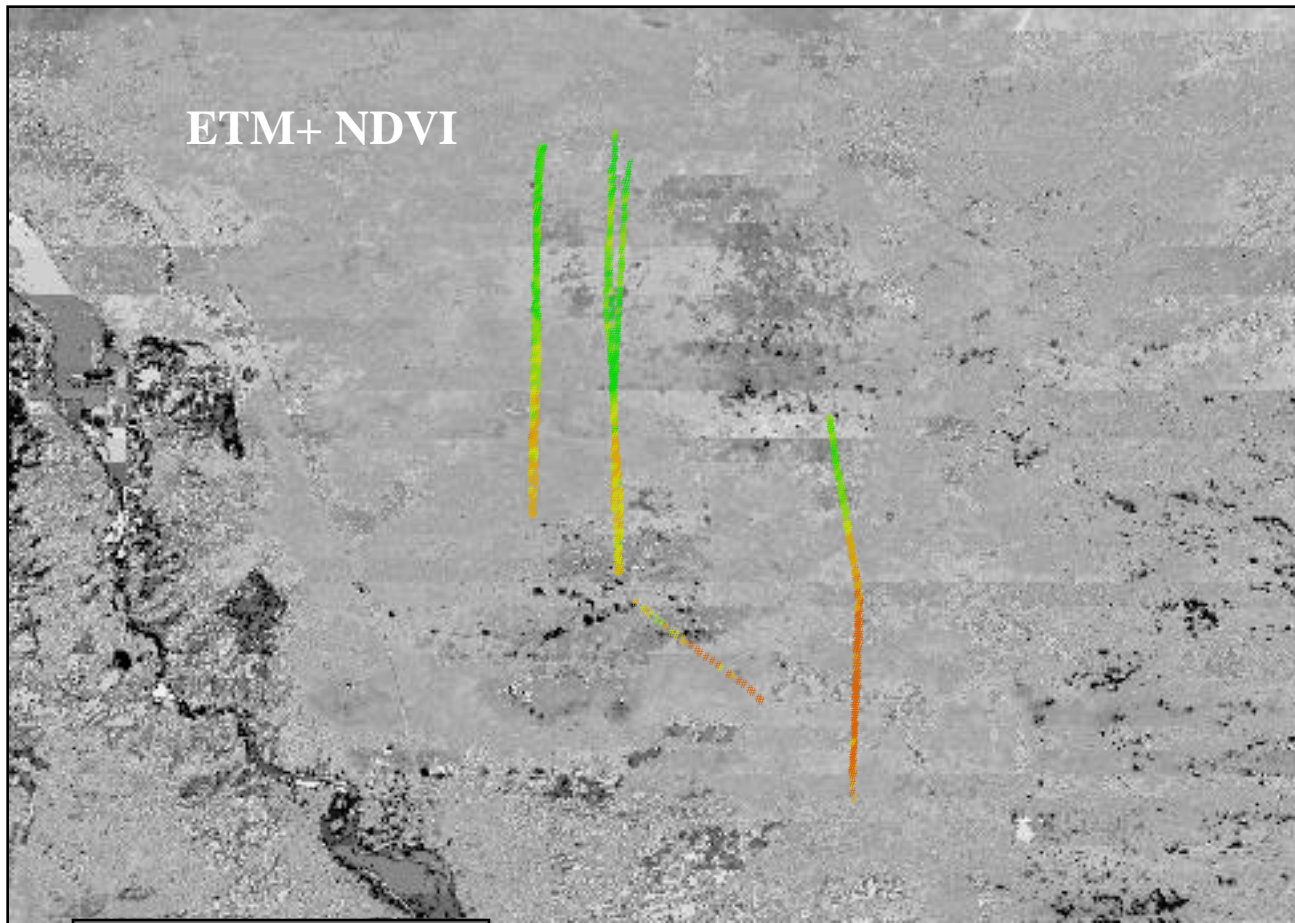
JER

EVI





Jornada – Exotech EVI

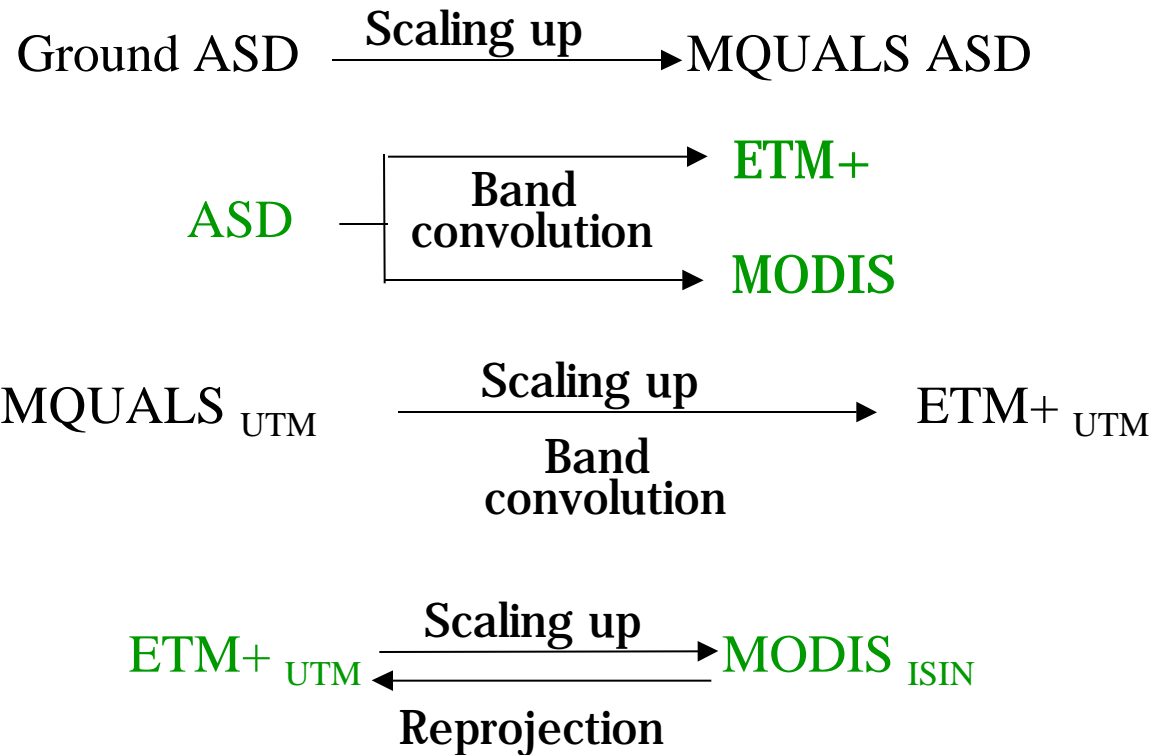


Green = high EVI
Orange = low EVI



Scaling:

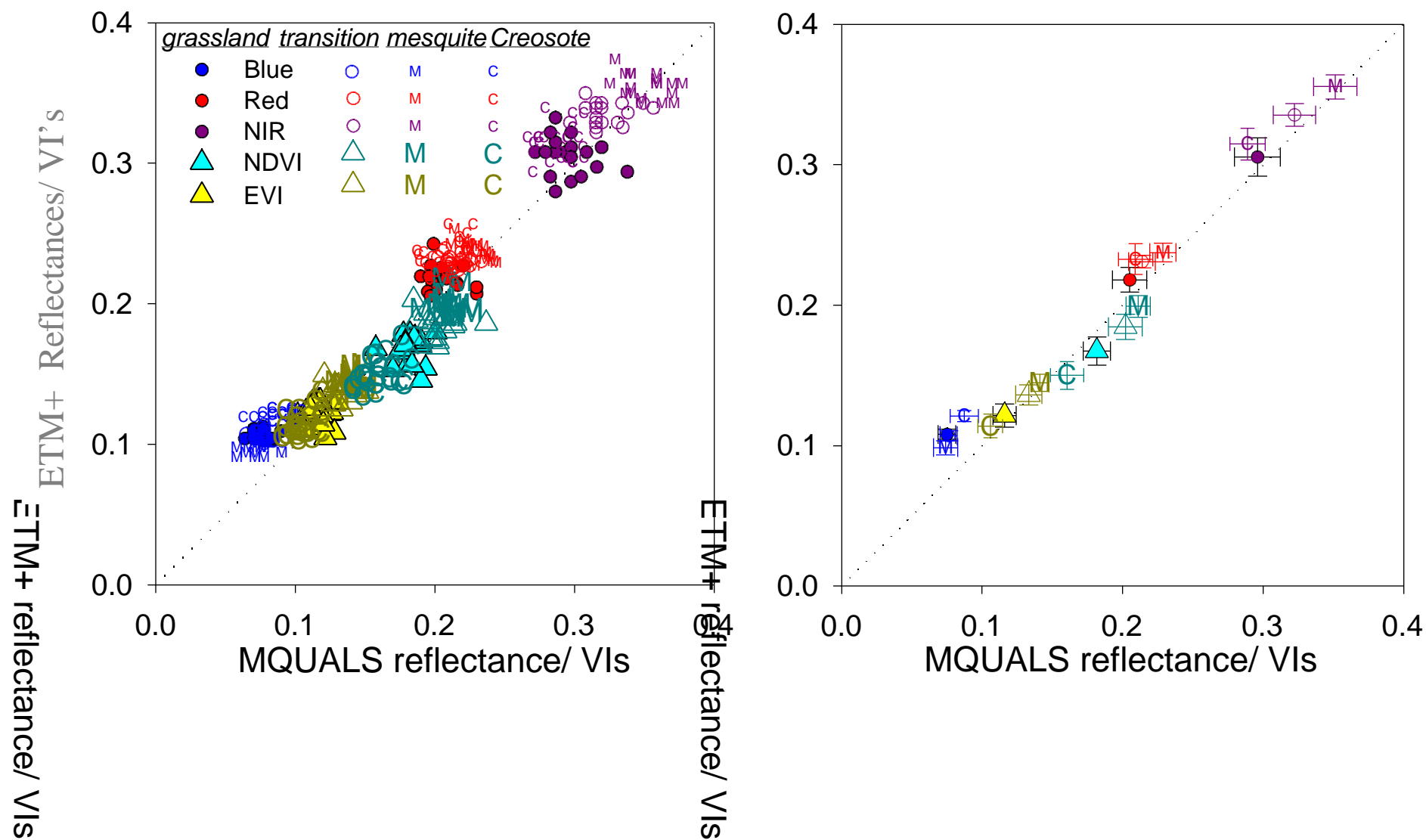
ground > mquals > ETM+ > MODIS





MQUALS vs. ETM+ (JER)

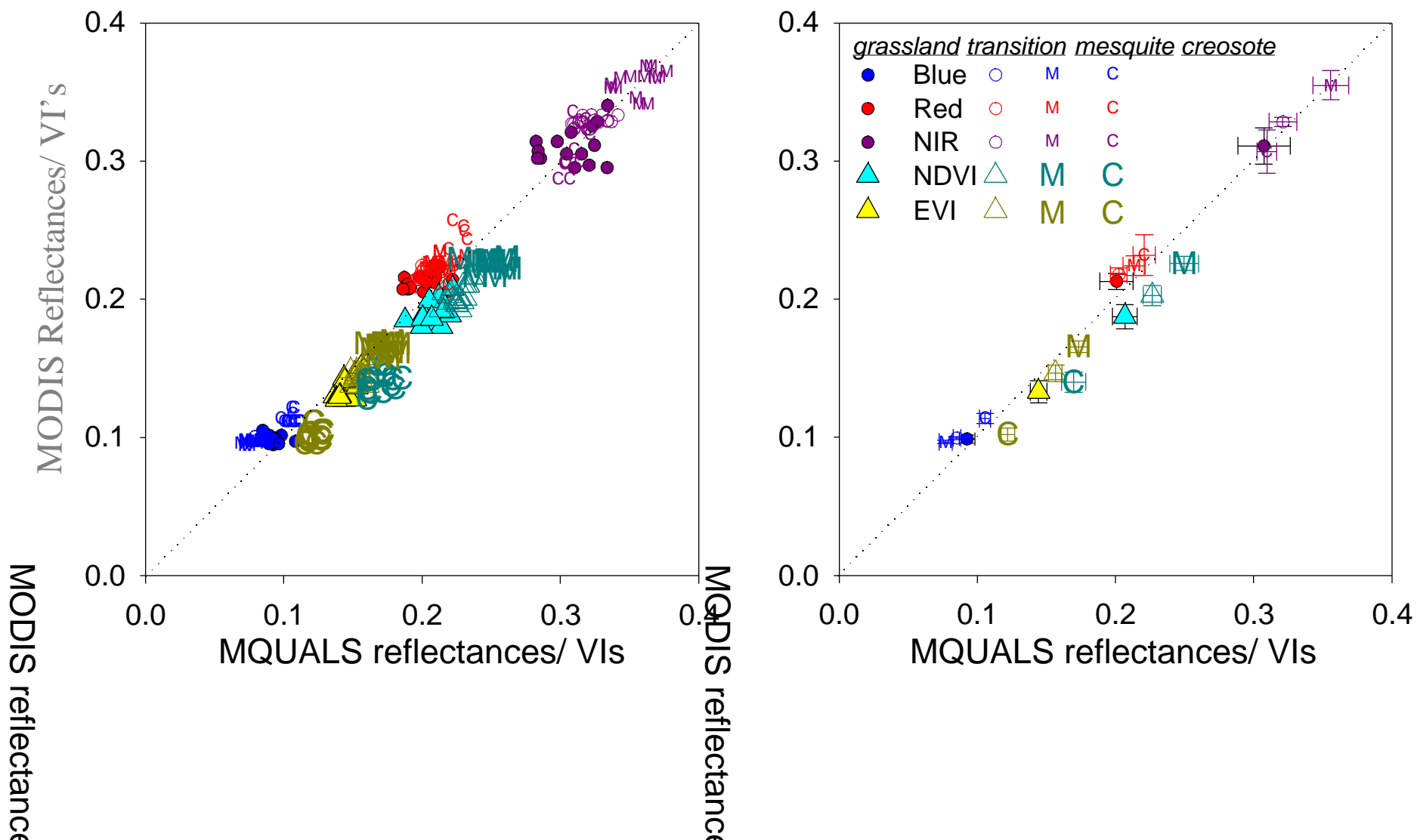
(May 2000/2001)





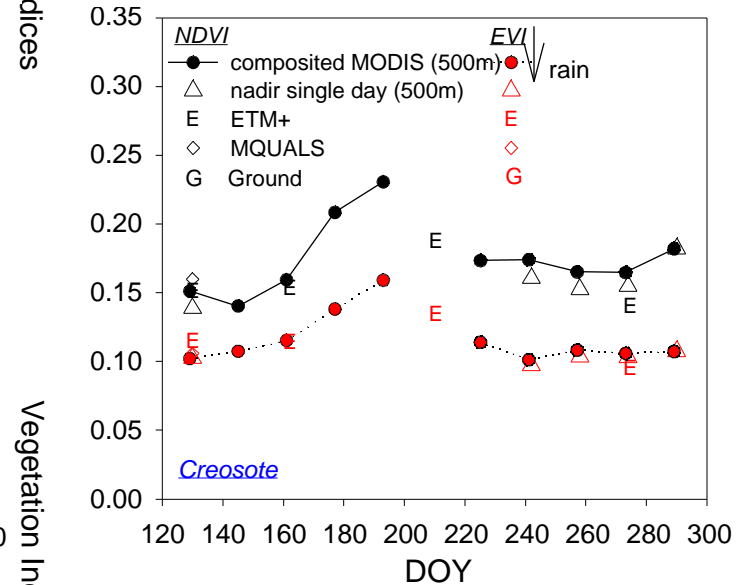
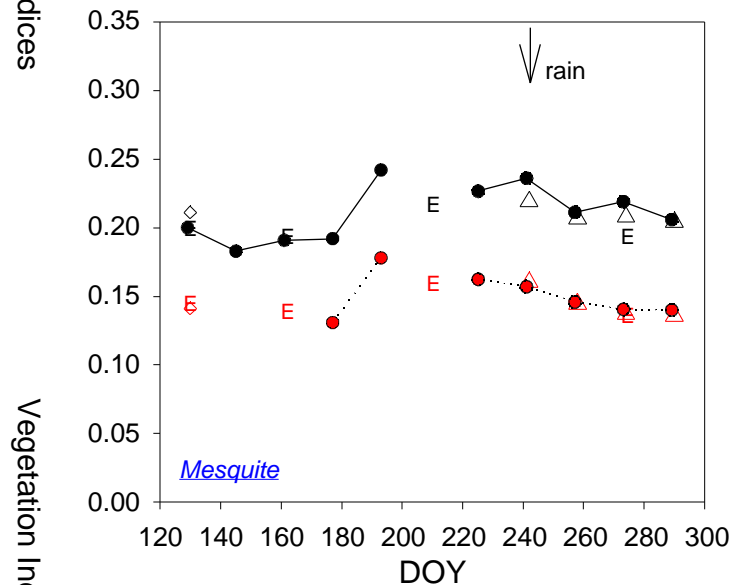
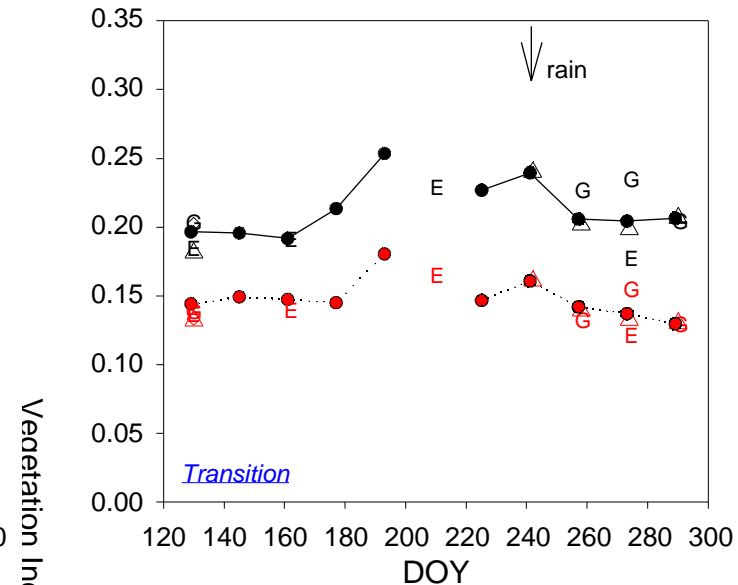
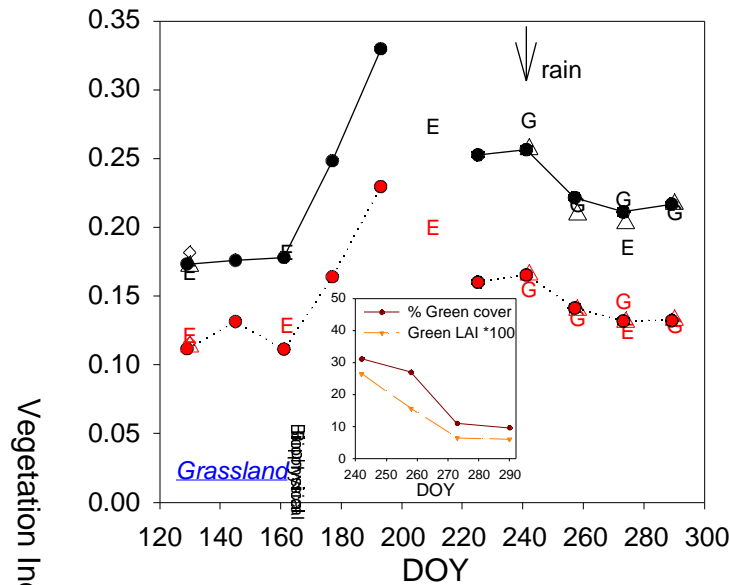
MQUALS vs. MODIS (JER)

(May 2000/2001)



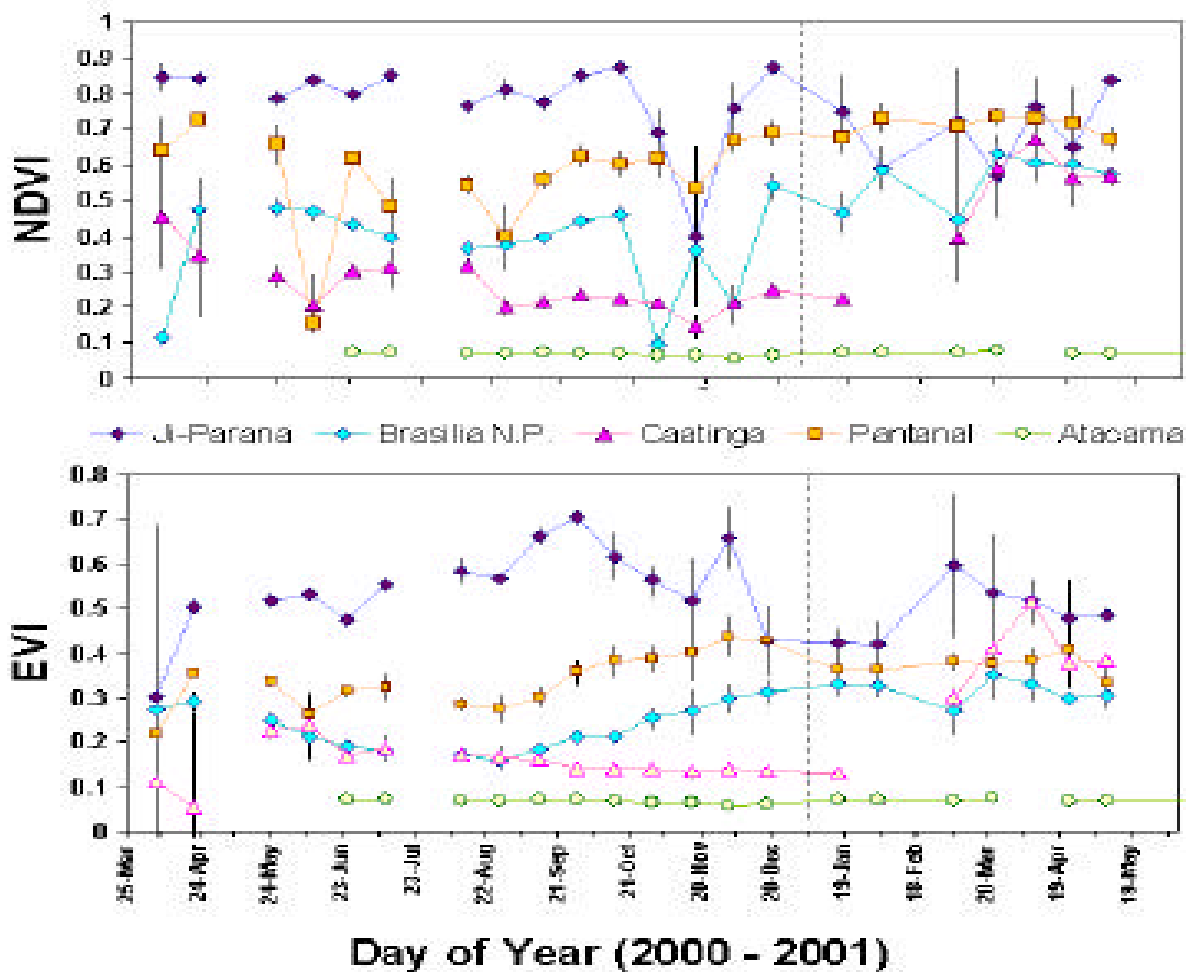


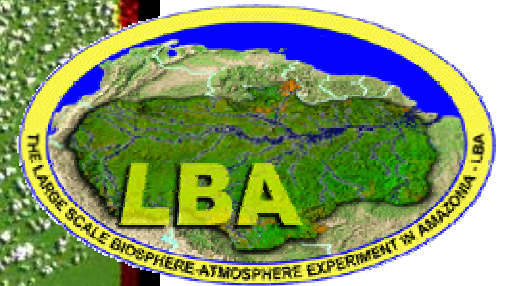
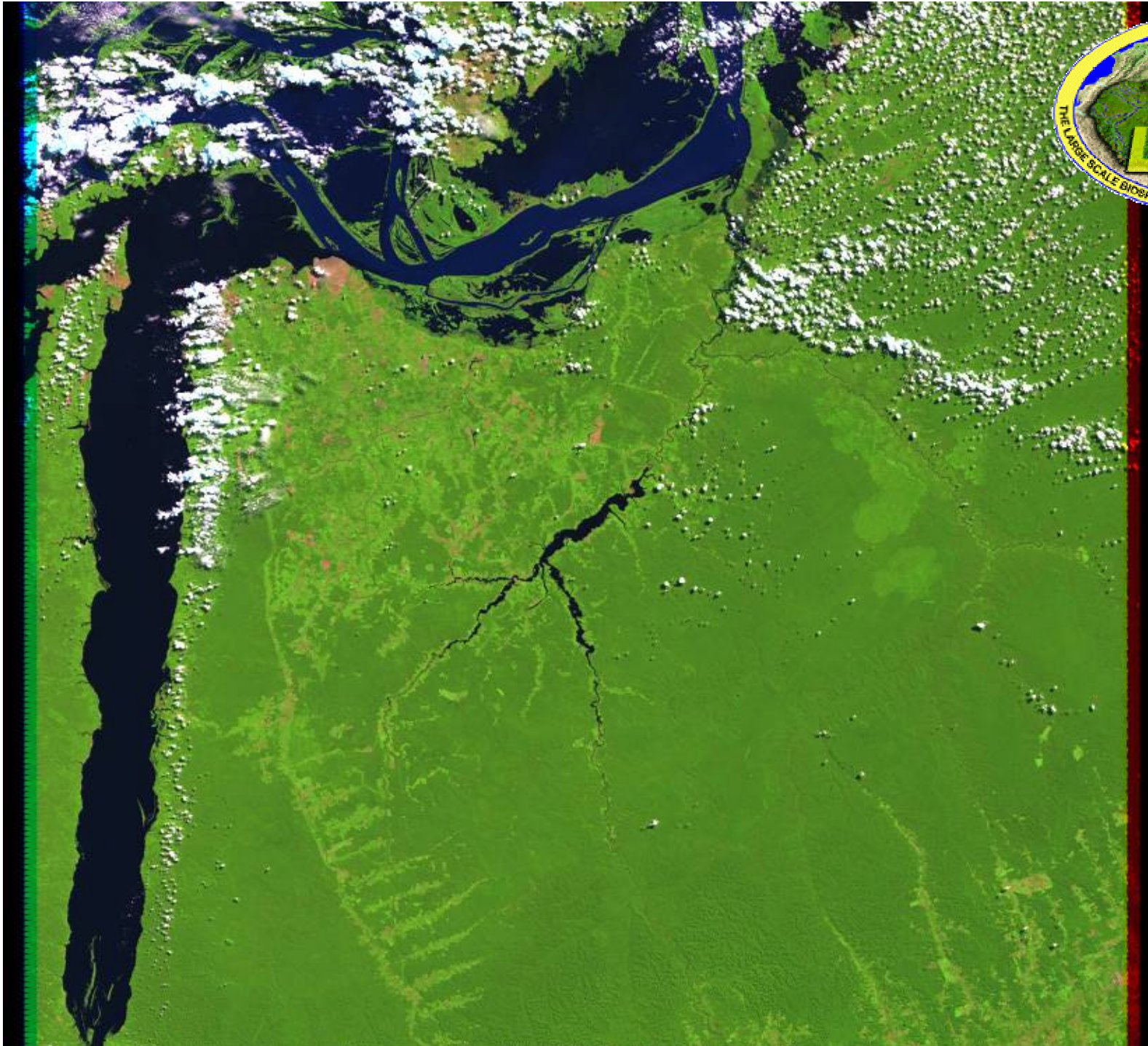
Multitemporal VI Comparisons (MODIS, ETM+, MQUALS, Ground)





Seasonal Patterns of Major Biomes in South America



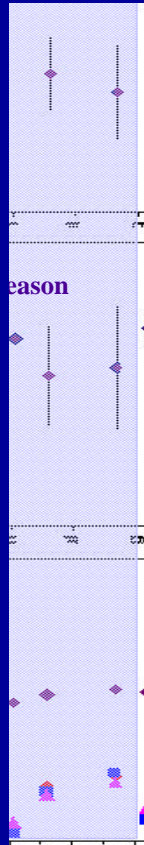


ETM+
DOY 211,
2001
(Tapajos)



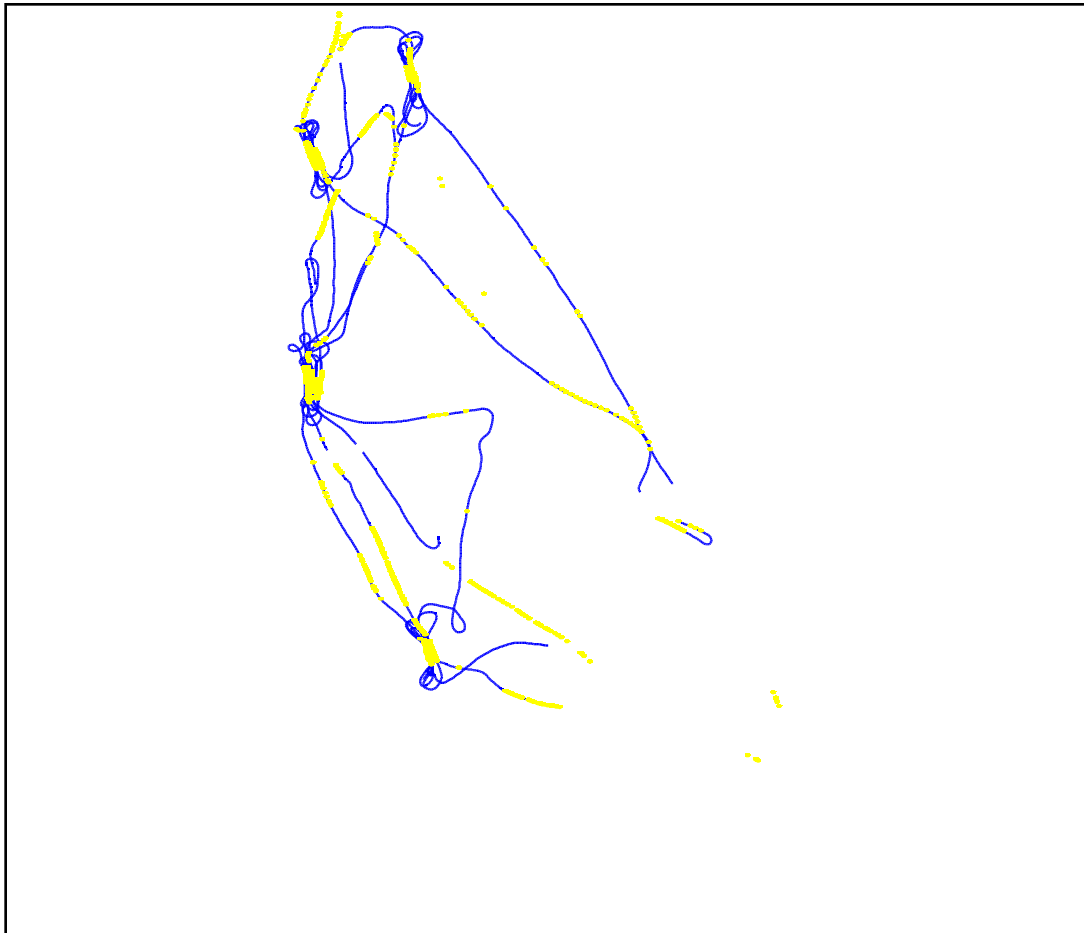
Seasonality observed by MODIS

Tapajós National Forest, Brazil





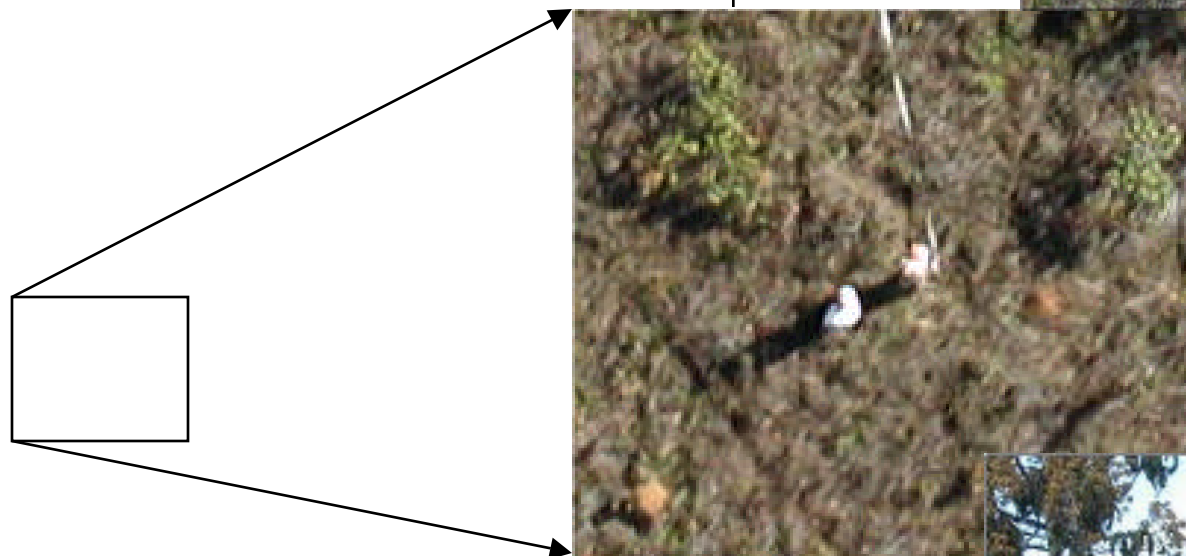
Brasilia National Park



- Blue = ASD
- Yellow = Digital Images

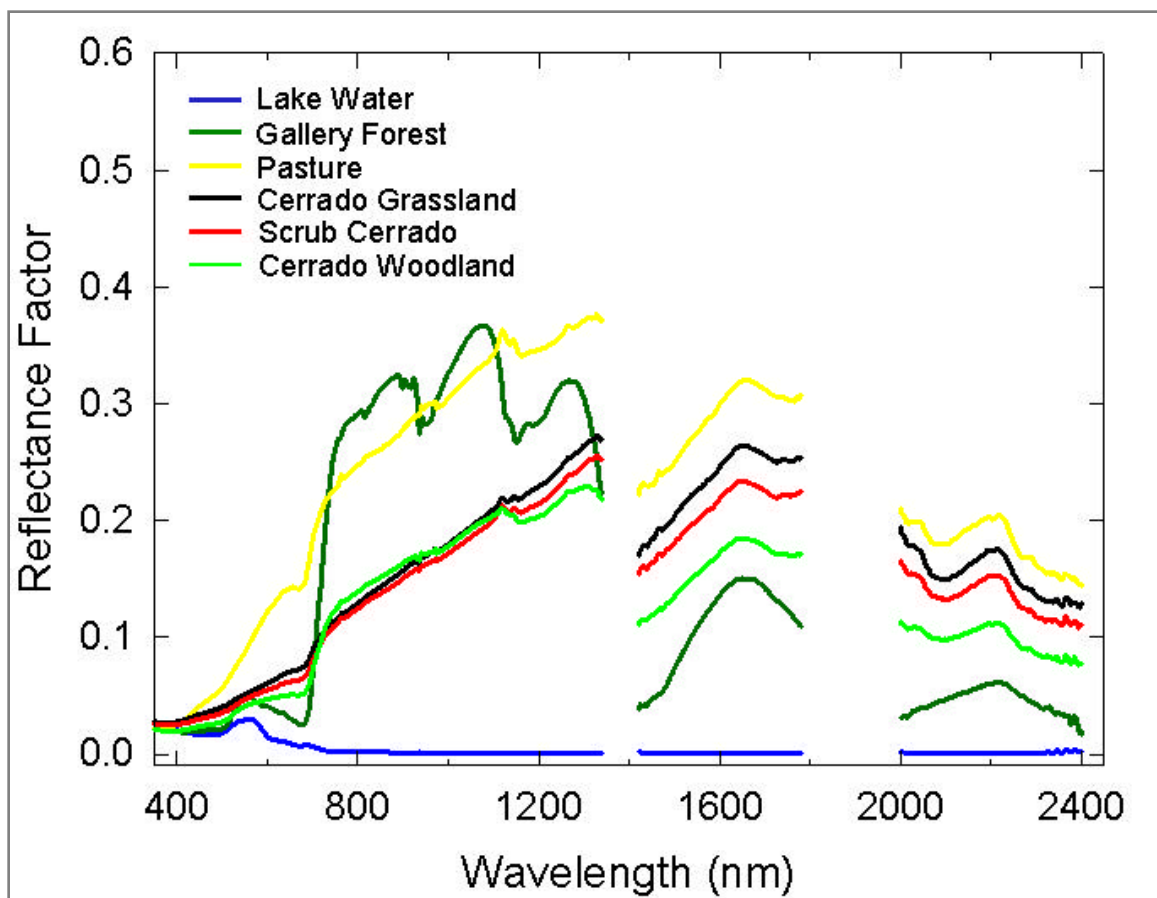


Brazil Olympus Digital Images



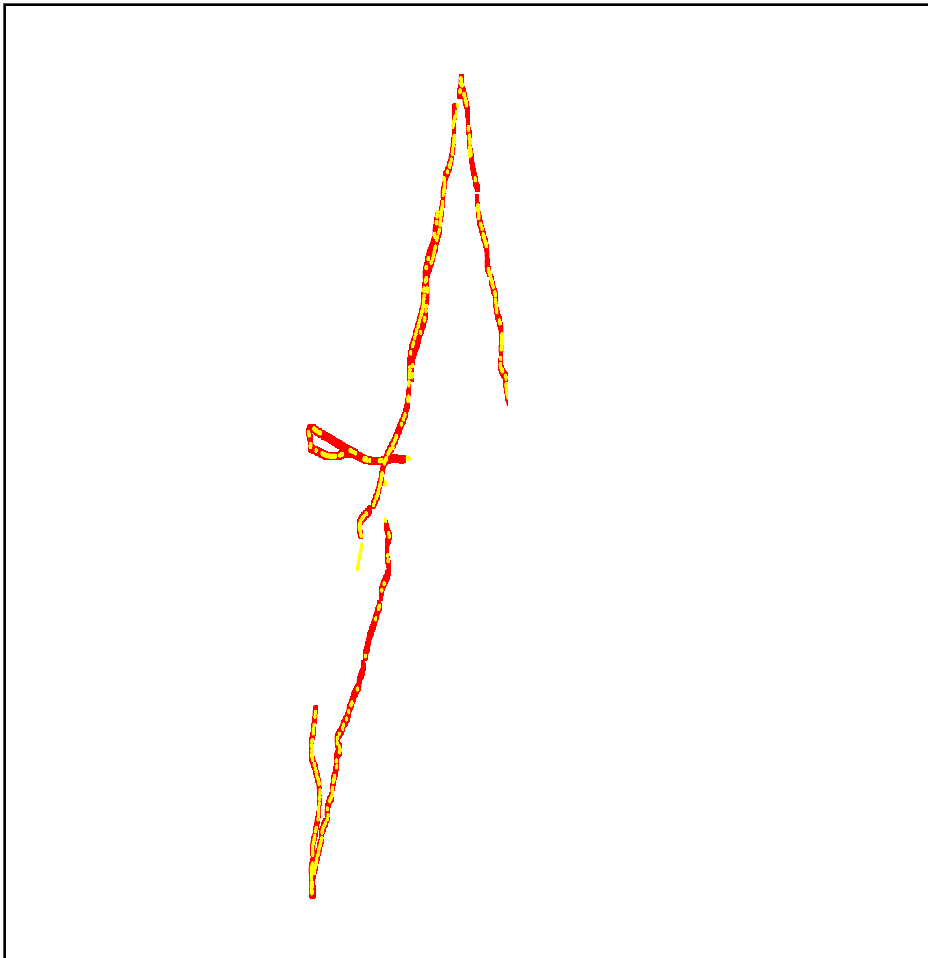


ASD from Brasilia NP





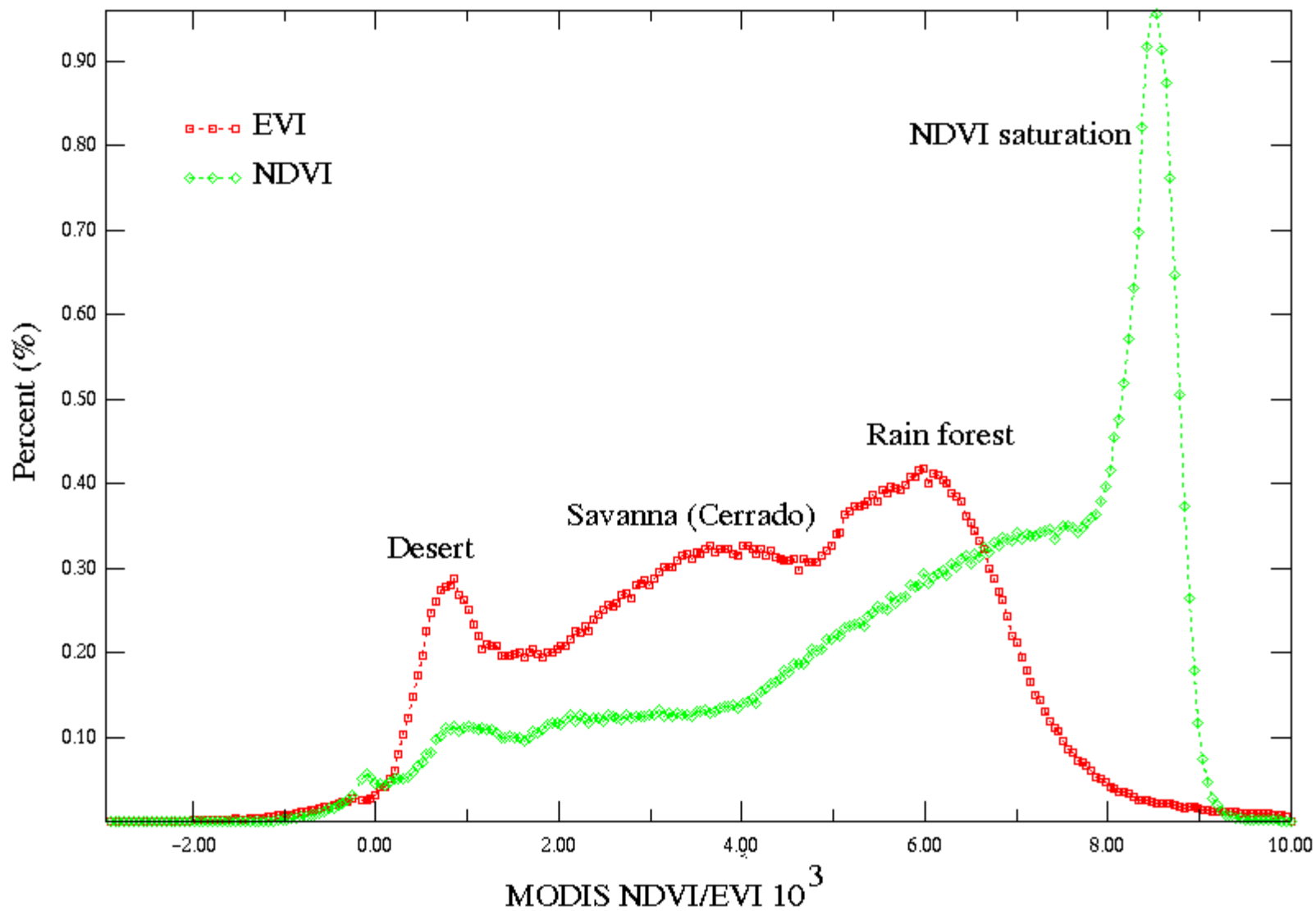
Araguaia National Park



- Red = ASD
- Yellow = Digital Images

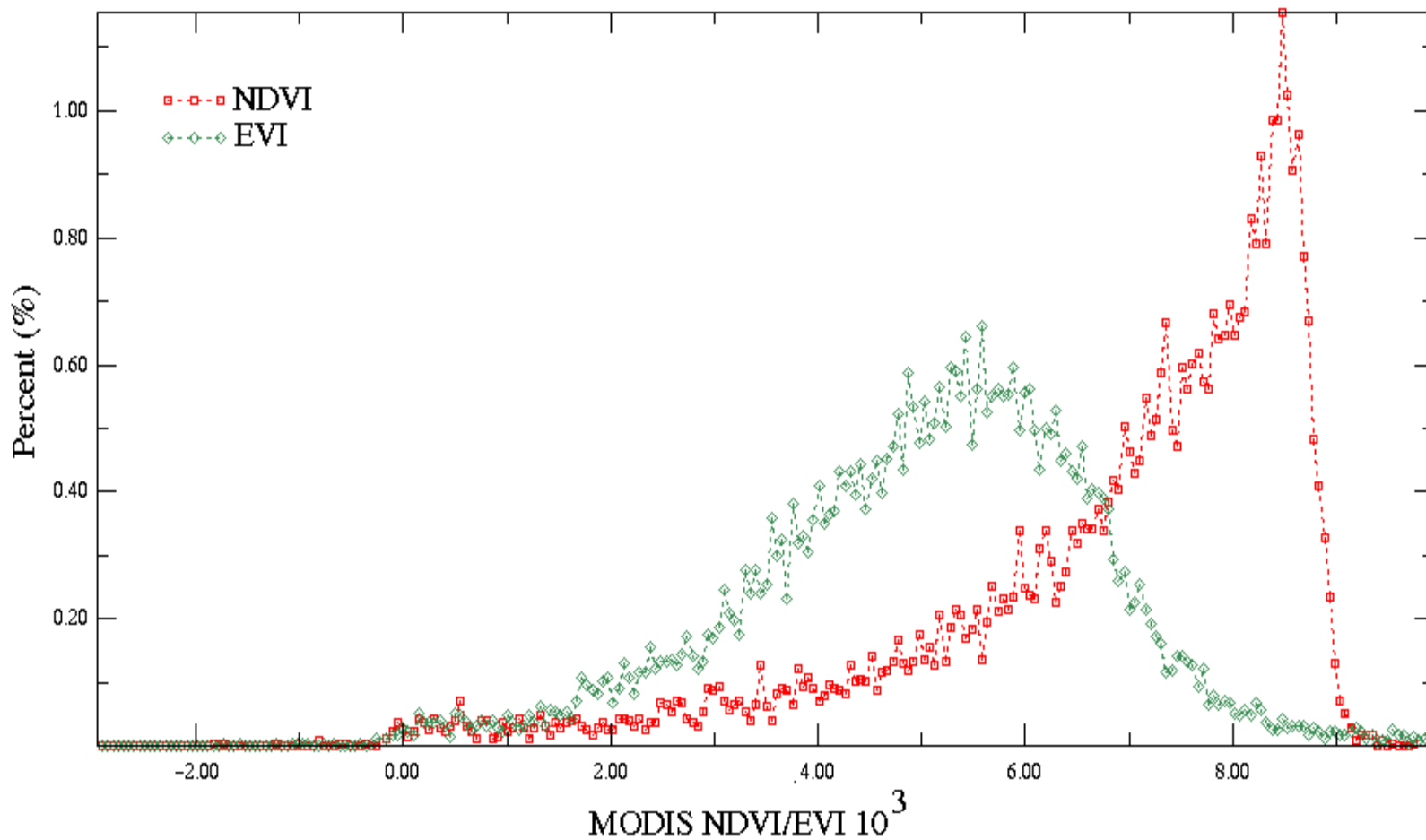


MODIS NDVI and EVI Histograms (South America)



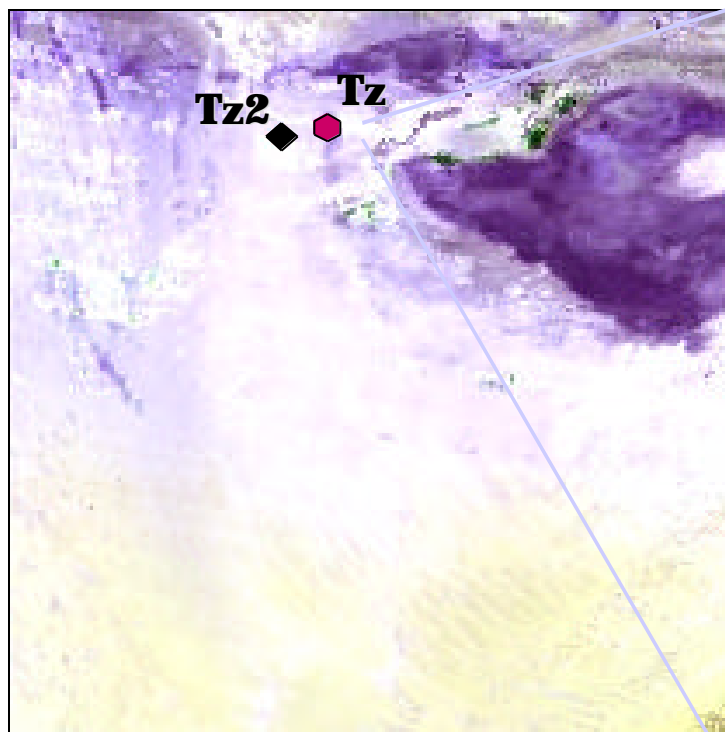


MODIS NDVI/EVI Histograms (World' rain forest)

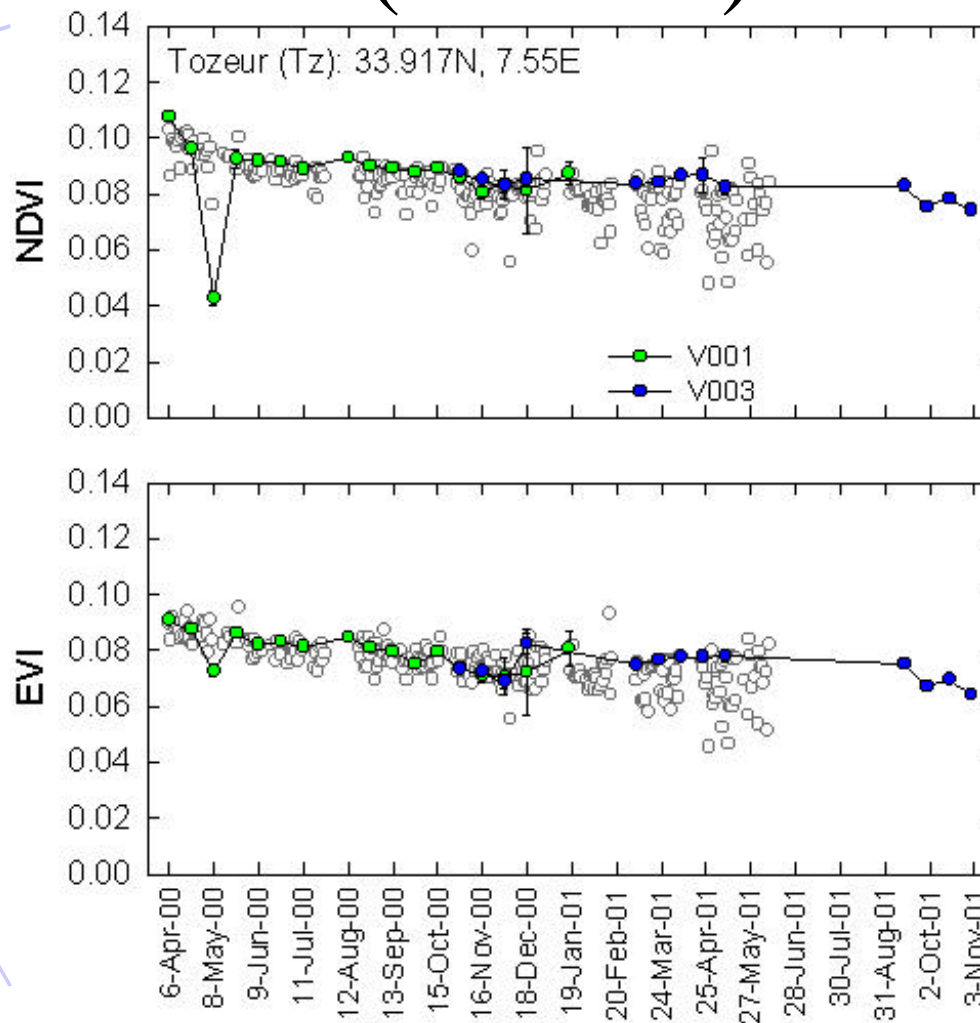




MODIS VI Long Term Stability Monitoring Saharan Desert Sites (h18v05)

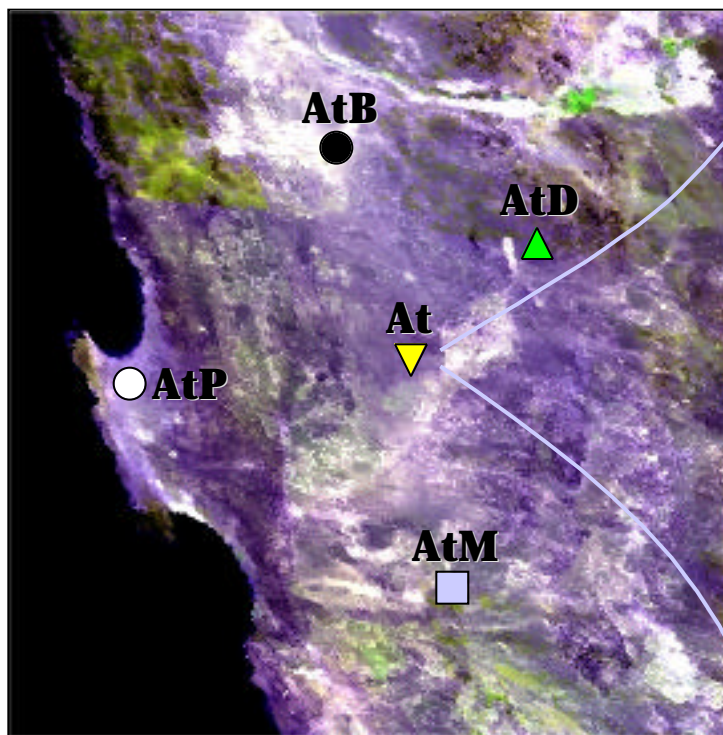


MOD13A2 (V3)
Mar 6 – Mar 21, 2001
False Color Composite (1, 2, 3)

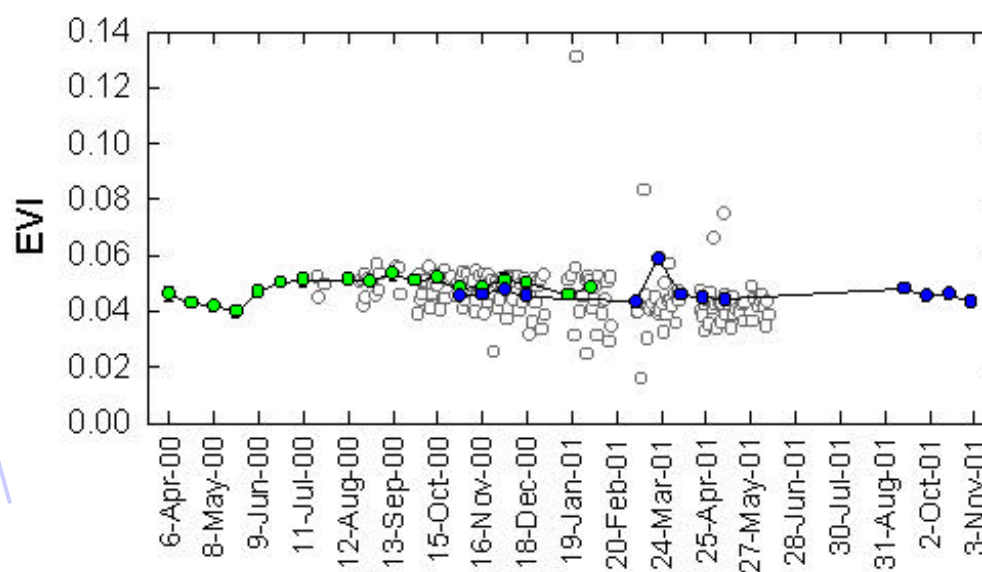
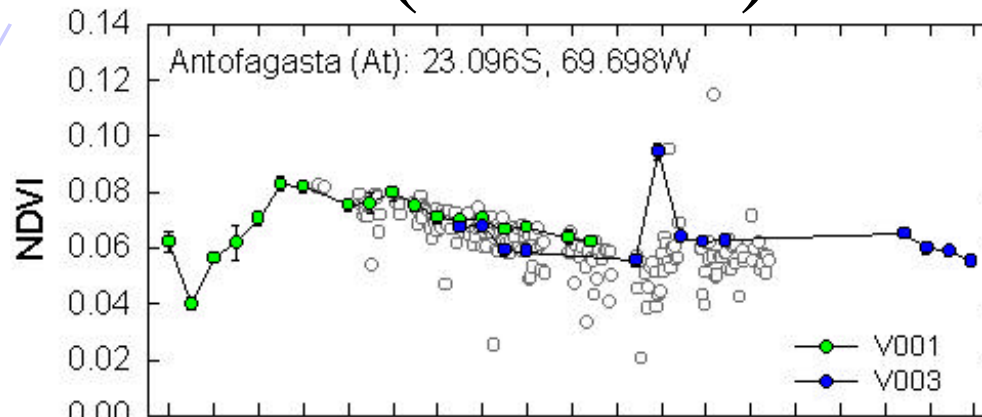




MODIS VI Long Term Stability Monitoring Atacama Desert Sites (h11v11)



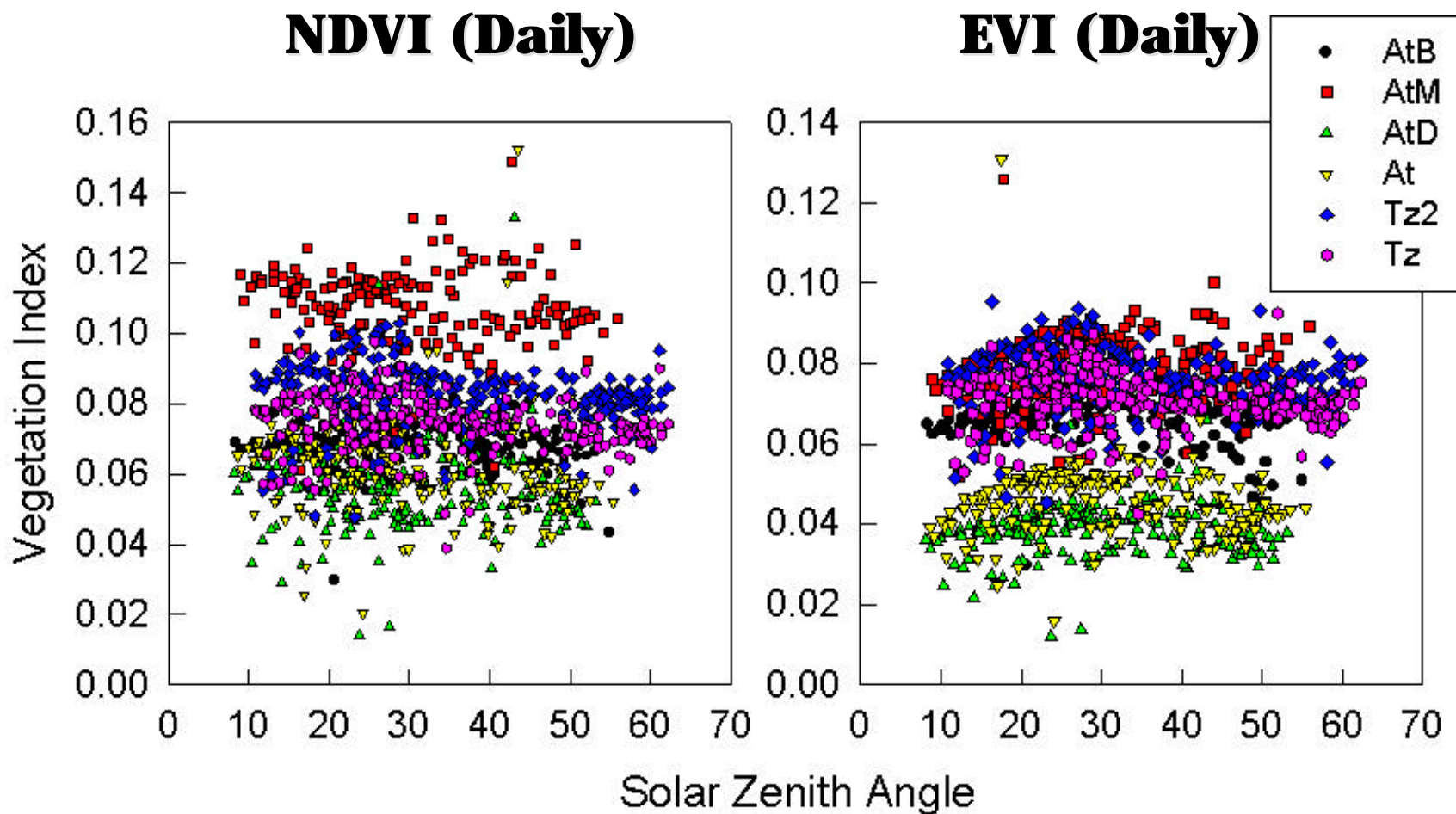
MOD13A1 (V3)
Sep 30 – Oct 15, 2001
False Color Composite (1, 2, 3)





MODIS VI Long Term Stability Monitoring

VI vs. Sun Zenith Angle Plots



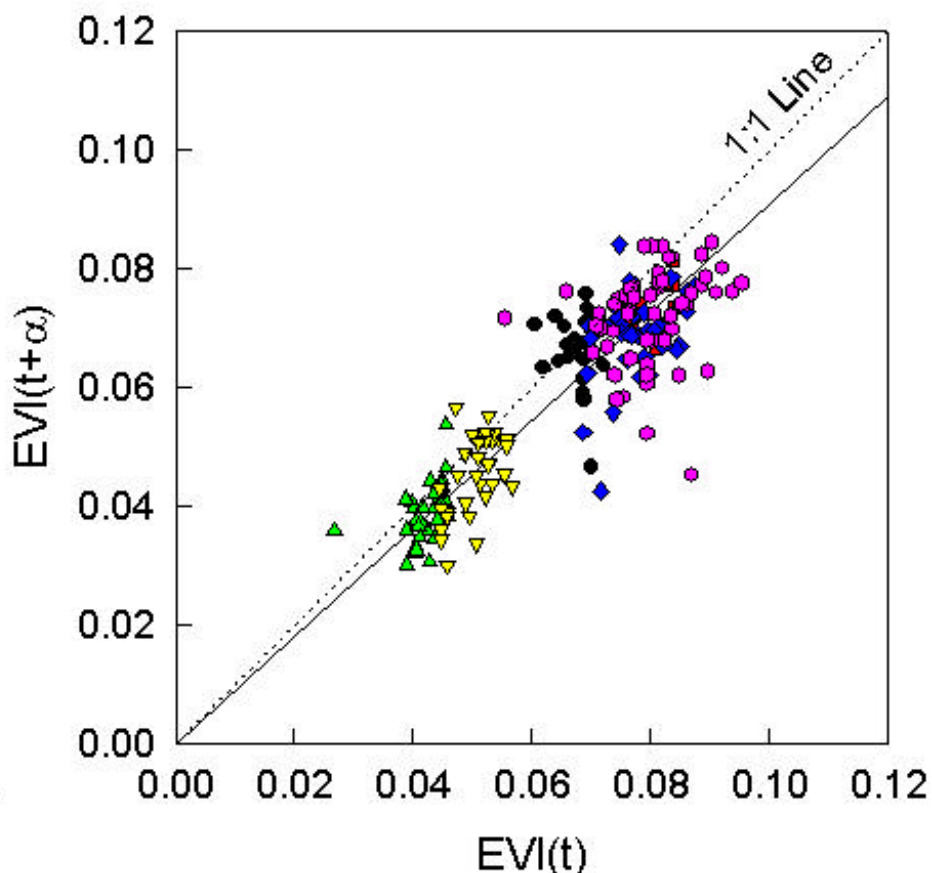
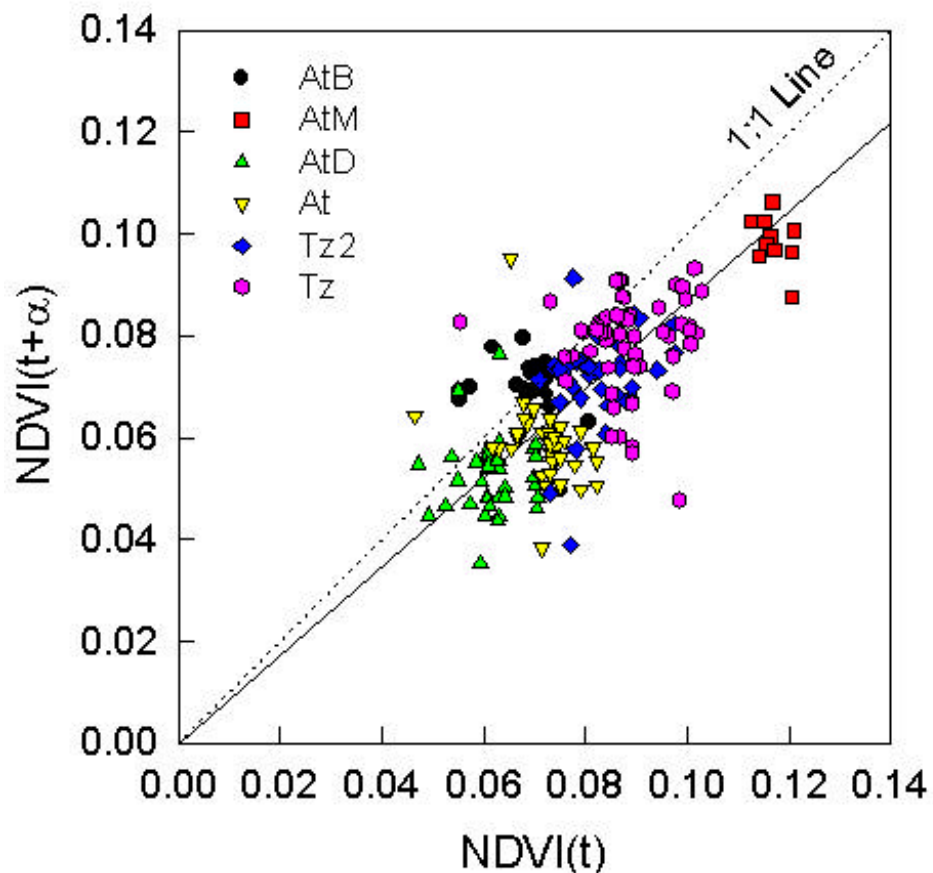


MODIS VI Long Term Stability Monitoring

VI Comparisons with Time-Lags

NDVI (Daily)

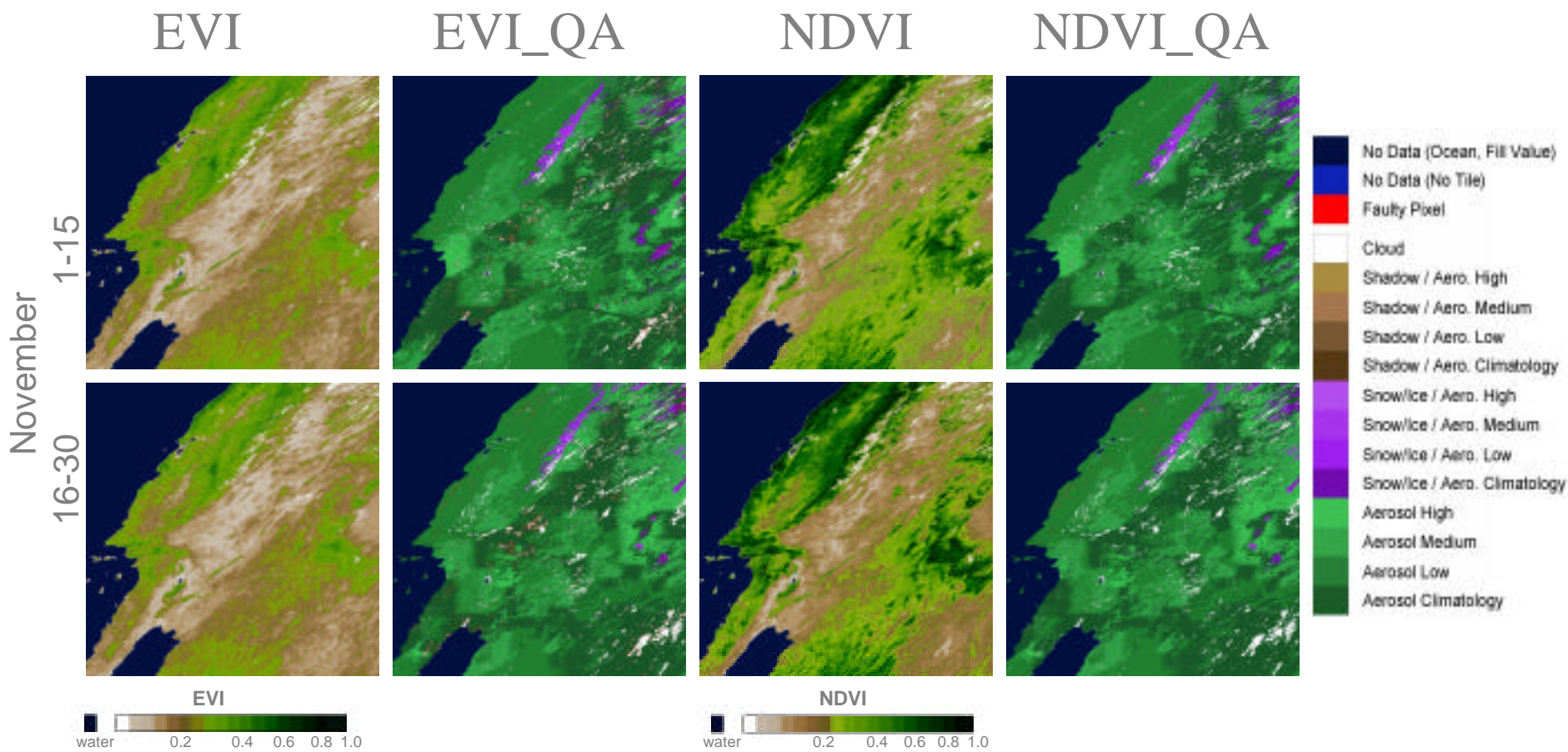
EVI (Daily)

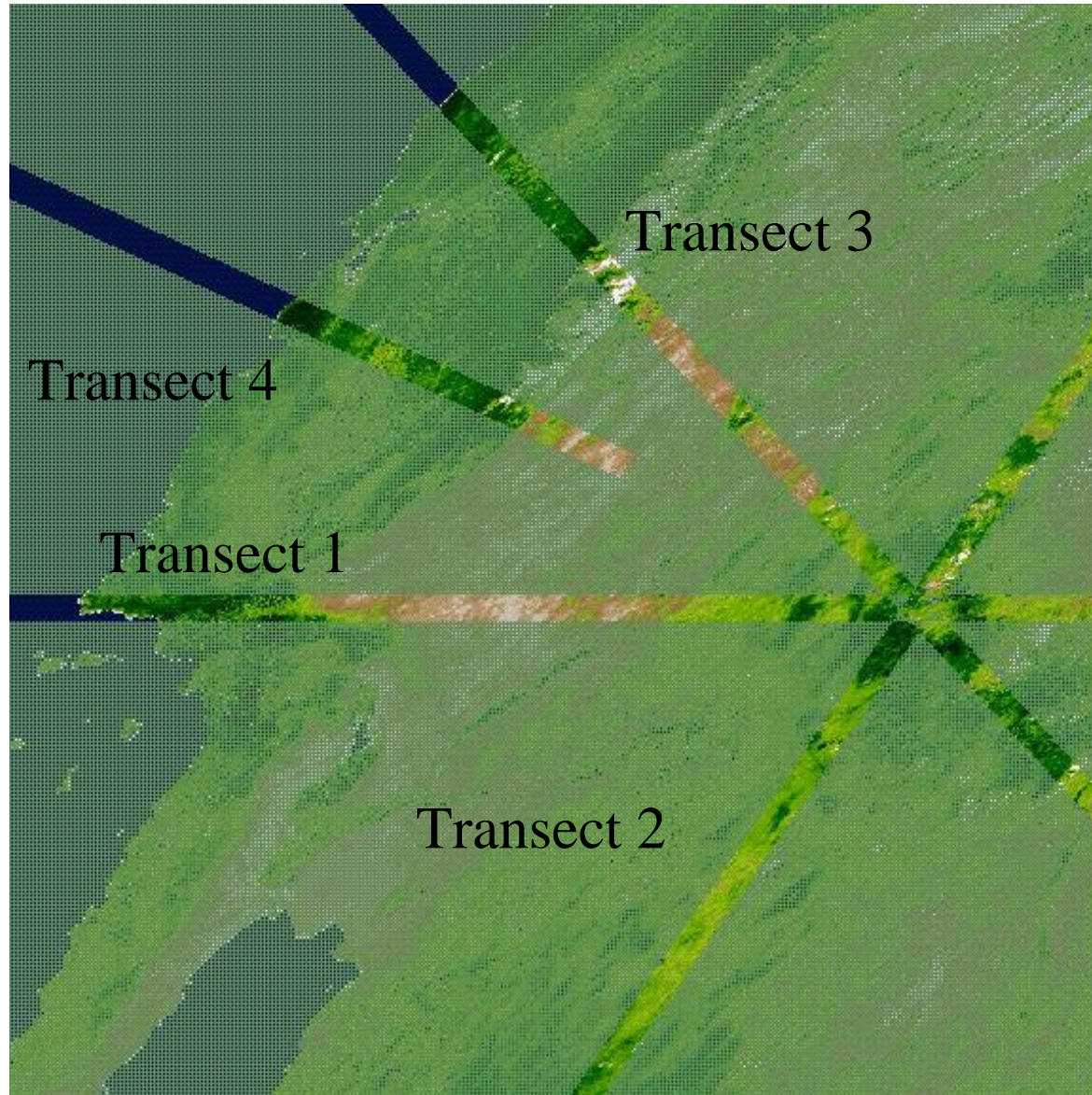


* α – 1 month ~ 1 year time lags with similar geometries.



MODIS Vegetation Index performance





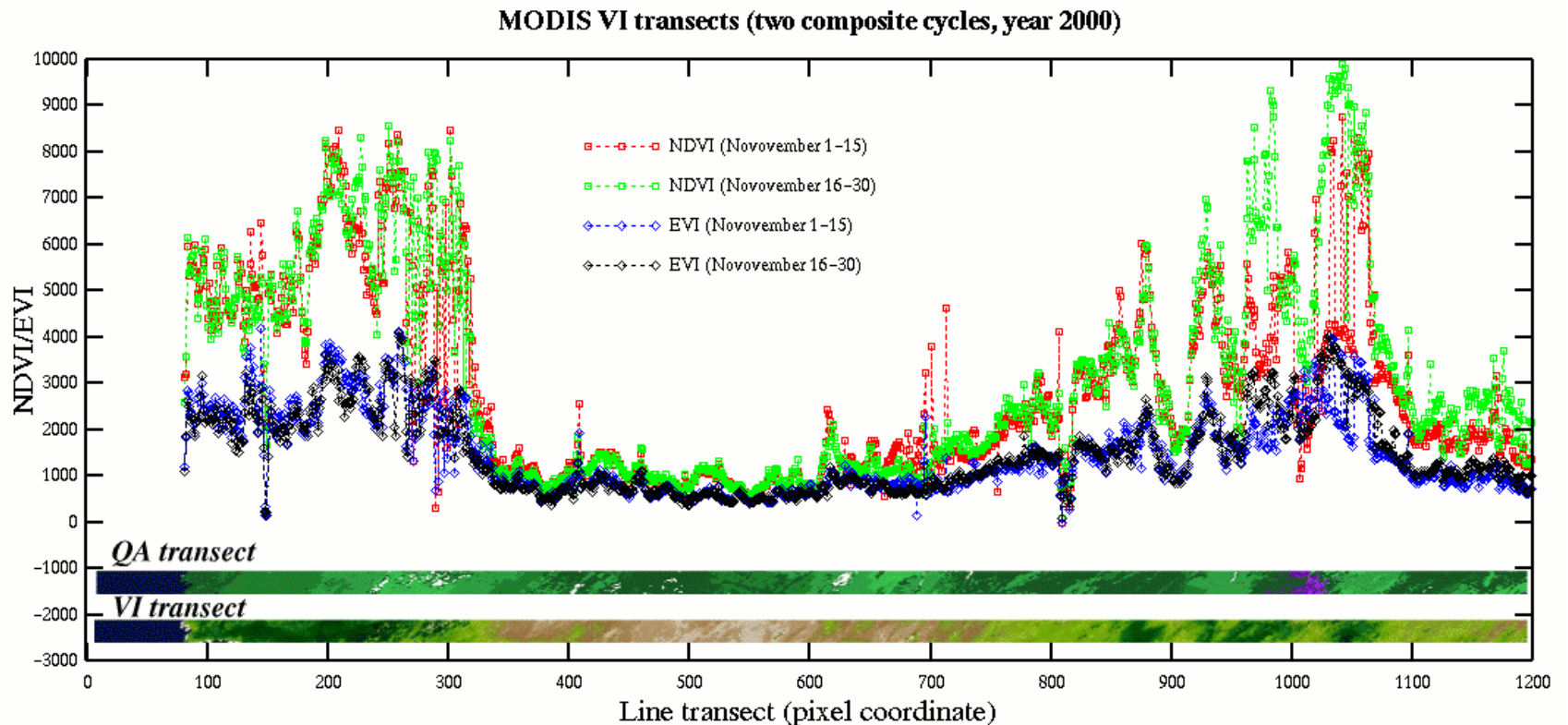
Transect 4

Transect 1

Transect 2

Transect 3

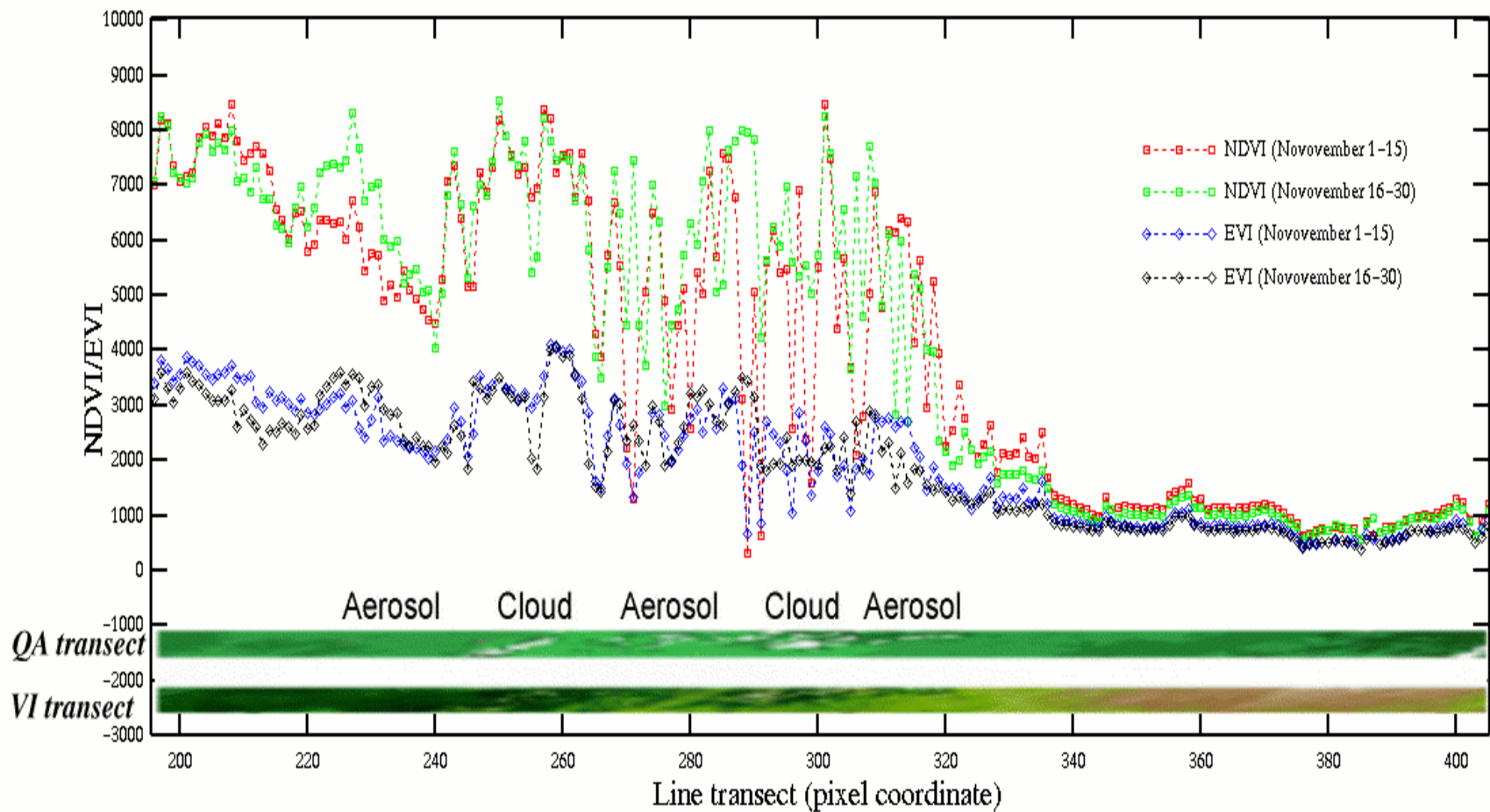
Transect 1: This transect spans different vegetation types under different atmosphere conditions. It also show the response of both VIs to aerosol, clouds, snow and vegetation activities)



Transect 1 (pixel 200 to 400):

Medium to high aerosol is prevalent in this section of the Transect. EVI response is more stable and shows more resistance to aerosol. NDVI on the other hand is very unstable.

MODIS VI transects (two composite cycles, year 2000)





VI Validation

- VI products are provisionally validated, however,
- Vegetation Indices are widely used in regional to global applications,
- It is these intended uses or product **outputs**, that need to be validated,
- Product **inputs**, however, propagate into the overall uncertainty of the VI (atmosphere correction, residual clouds, calibration)



Next Steps in Validation

- Summer 2001 campaigns in Brazil and Argentina need to be analyzed,
- BRDF and cloud effects remain in the compositing routine,
- Snow/ice problems persist in both VI's,
- Assessment of feasibility of using snow product and BRDF products.