Spatial patterns of the canopy stress during 2005 drought in Amazonia

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***Oxford University Centre for the Environment**

LBA-ECO 11th Science Team Meeting, Salvador - September, 2007

OVERVIEW

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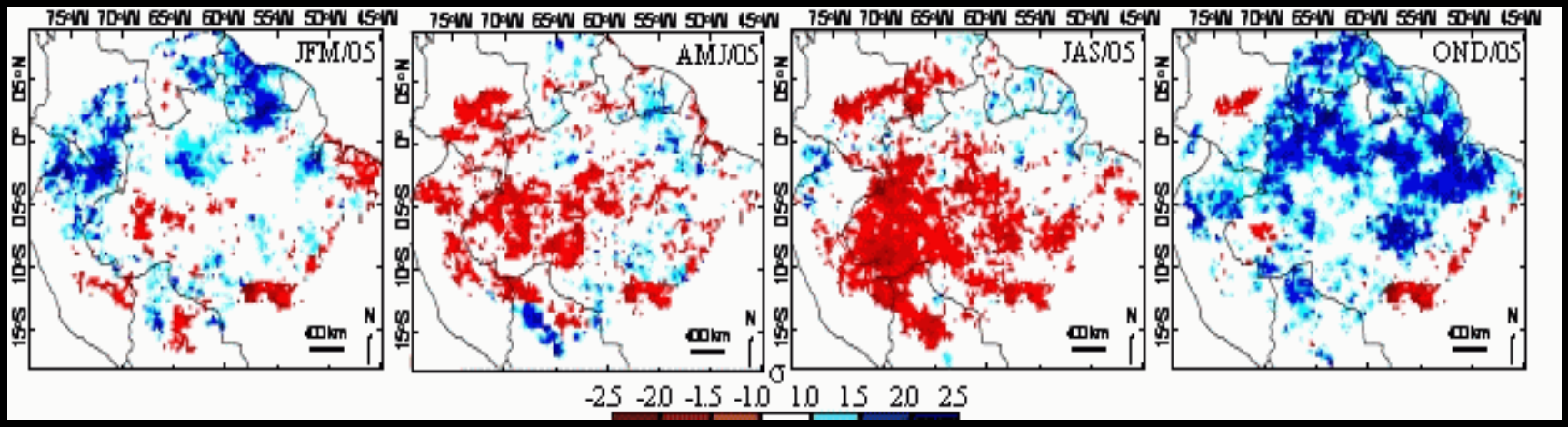

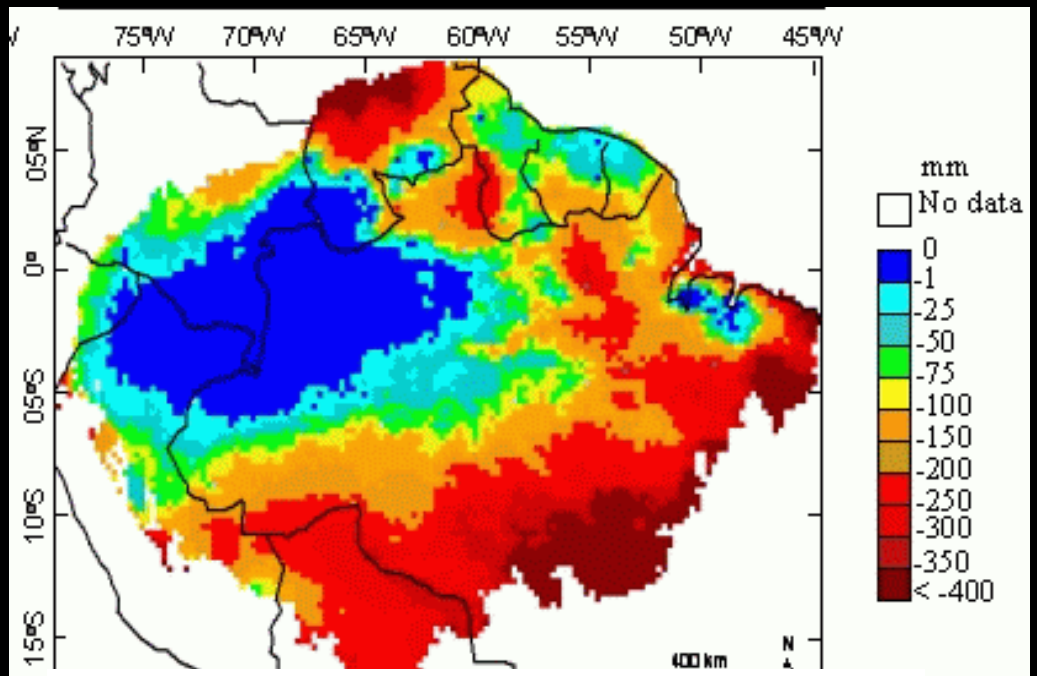

Mean Water deficit for the Amazon basin

Aragão et al, 2007, *GRL*

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This event brings an opportunity to better understand vegetation response to a drought occurrence in a temporal and spatial scale for a better knowledge of ecosystem functioning in a possible scenario for the future of the region, pointing out more susceptible areas.

Material & Methods

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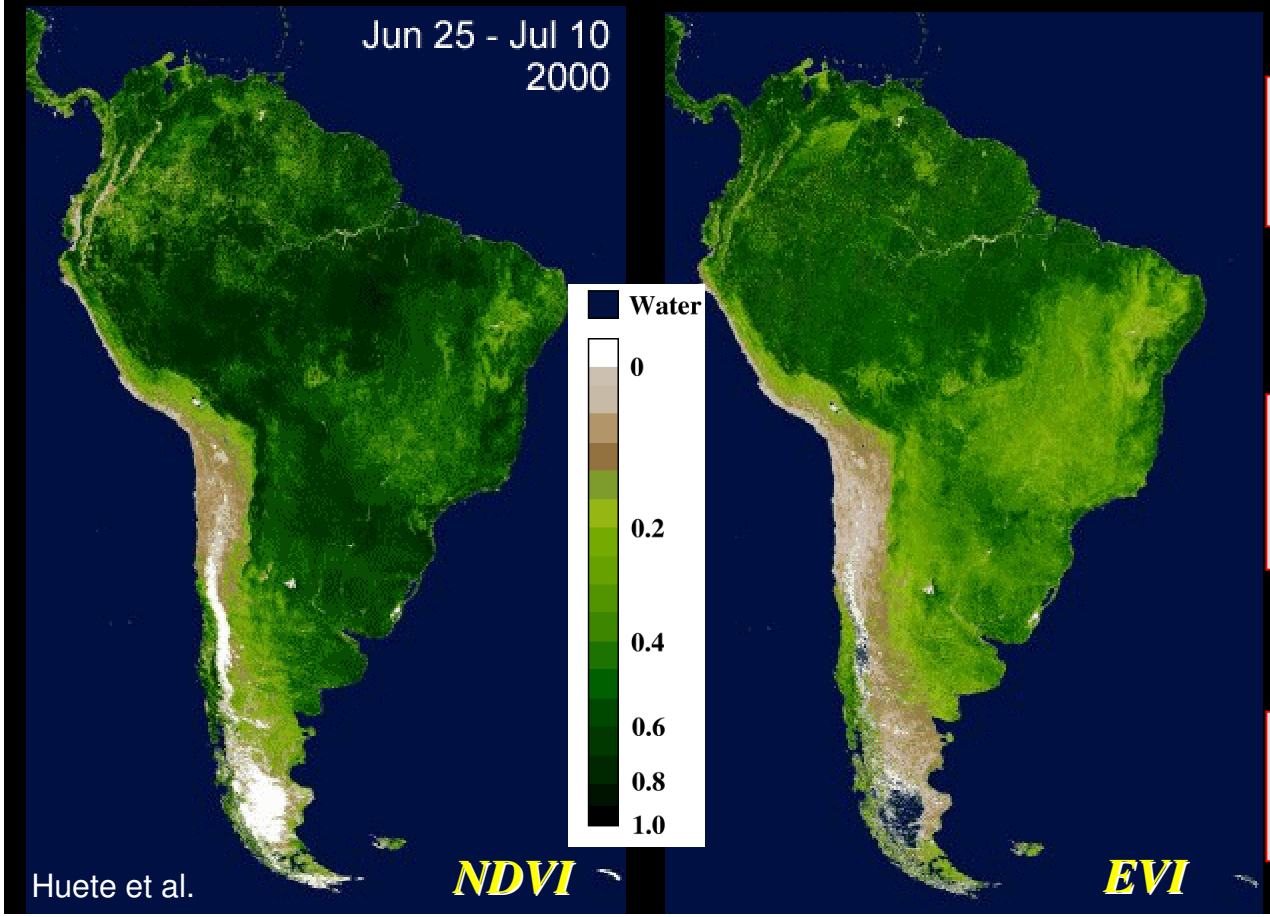
MOD13A2
2000-2006



Huete et al.

NDVI =

(NIR – RED) / (NIR + RED)

EVI =
G (NIR – R) /
(L +NIR+C1red+C2blue)

NDWI =

(NIR – SWIR) / (NIR + SWIR)

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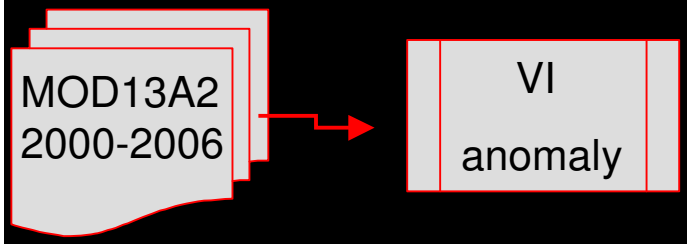

$$\text{VIanomaly}\ (i,j) = \frac{\text{VI}_{2005}(i,j) - \text{VI}_{(2000:2006)}(i,j)}{\sigma_{(2000:2006)}(i,j)}$$

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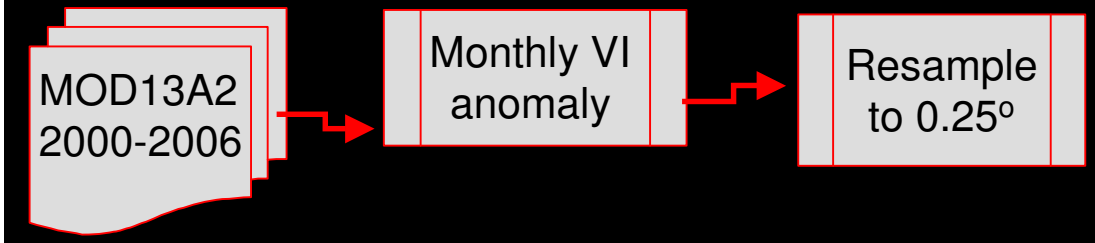

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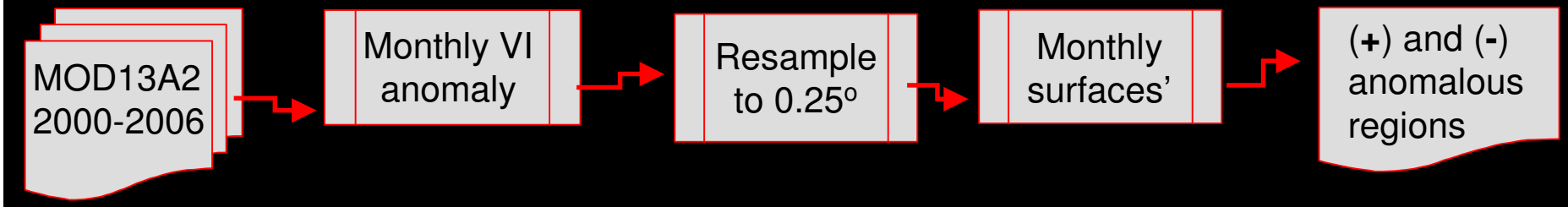

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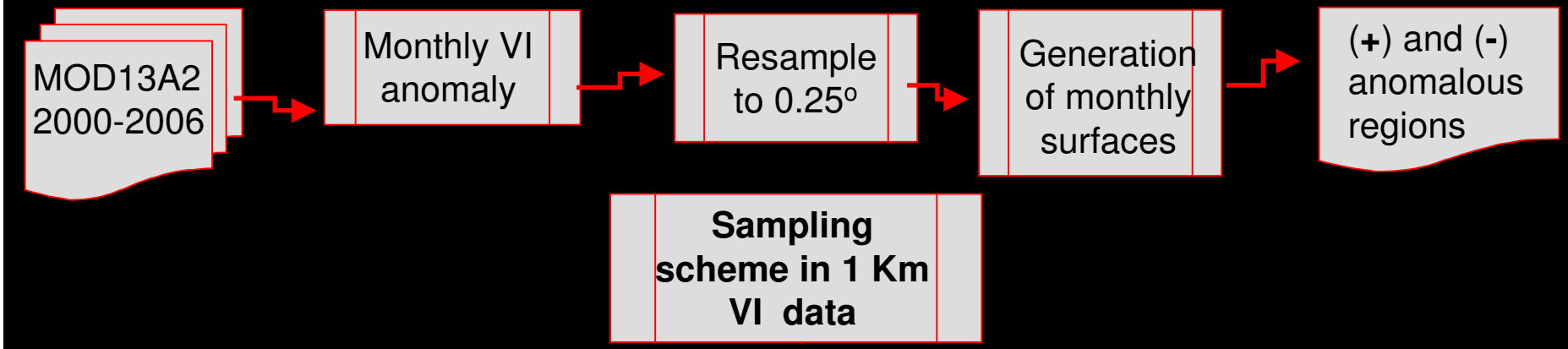

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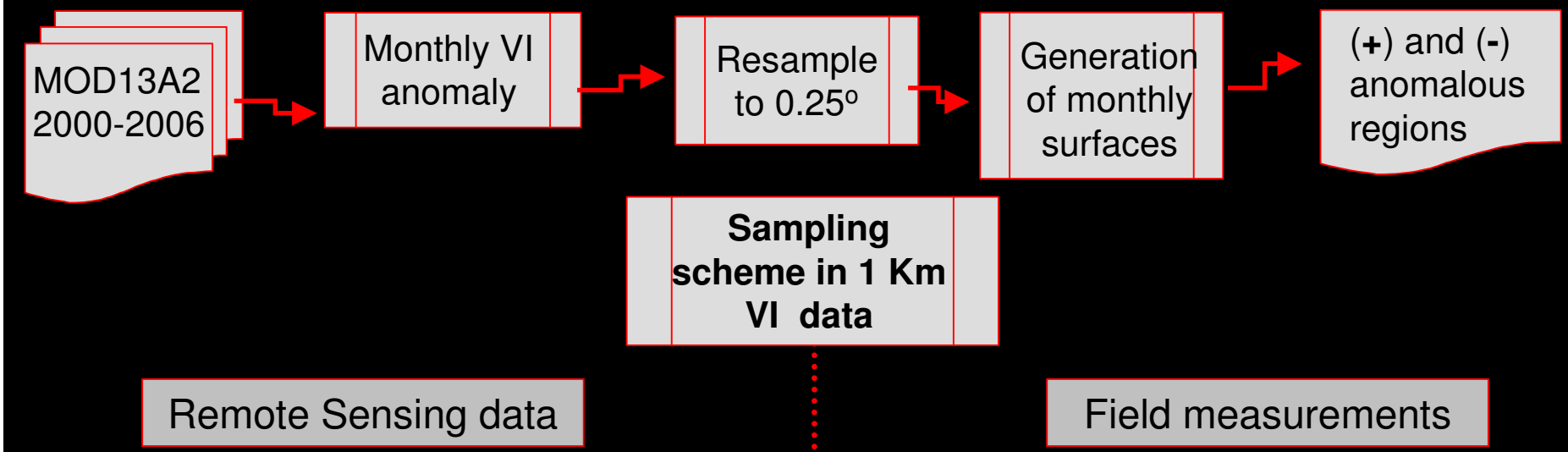

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MOD13A2 2000-2006 → Monthly VI anomaly → Resample to 0.25º → Generation of monthly surfaces → (+) and (-) anomalous regions

Sampling scheme in 1 Km VI data

Remote Sensing data

Field measurements

1- Are the VIs anomalous regions related to Rainfall and Radiation?

NDWI

NDVI

EVI

X

Rainfall (TRMM)

Radiation (CPTEC)

Material & Methods

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Sampling scheme in 1 Km VI data

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1- Are the VIs anomalous regions related to Rainfall and Radiation?

NDWI

NDVI

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Rainfall (TRMM)

Radiation (CPTEC)

Field measurements

1- Are the VIs reflecting the changes observed in the field?

NDWI

NDVI

EVI

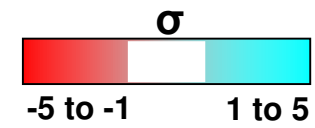
X

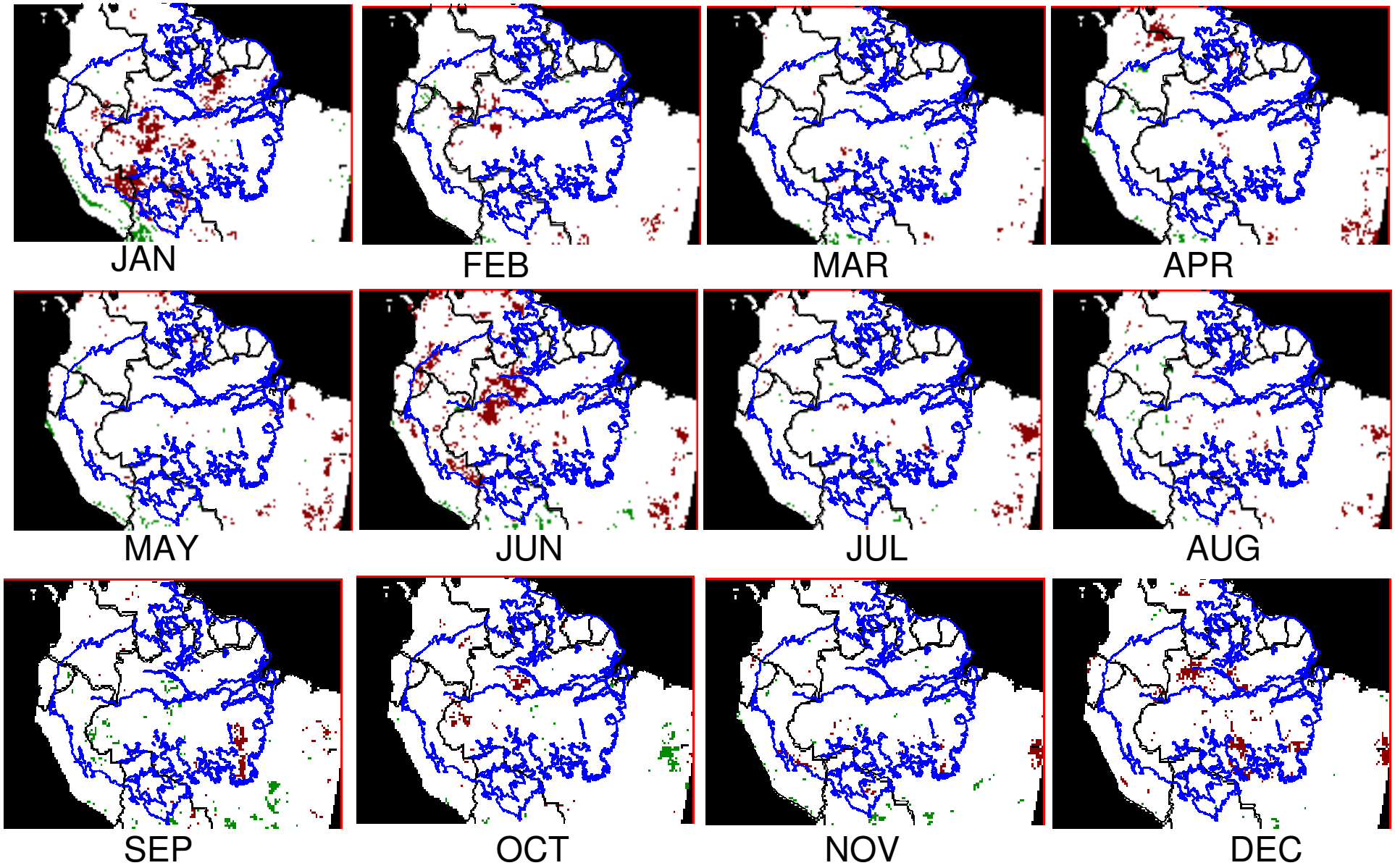
Litterfall (Zaphire site, Colombia)

LAI (under processing)

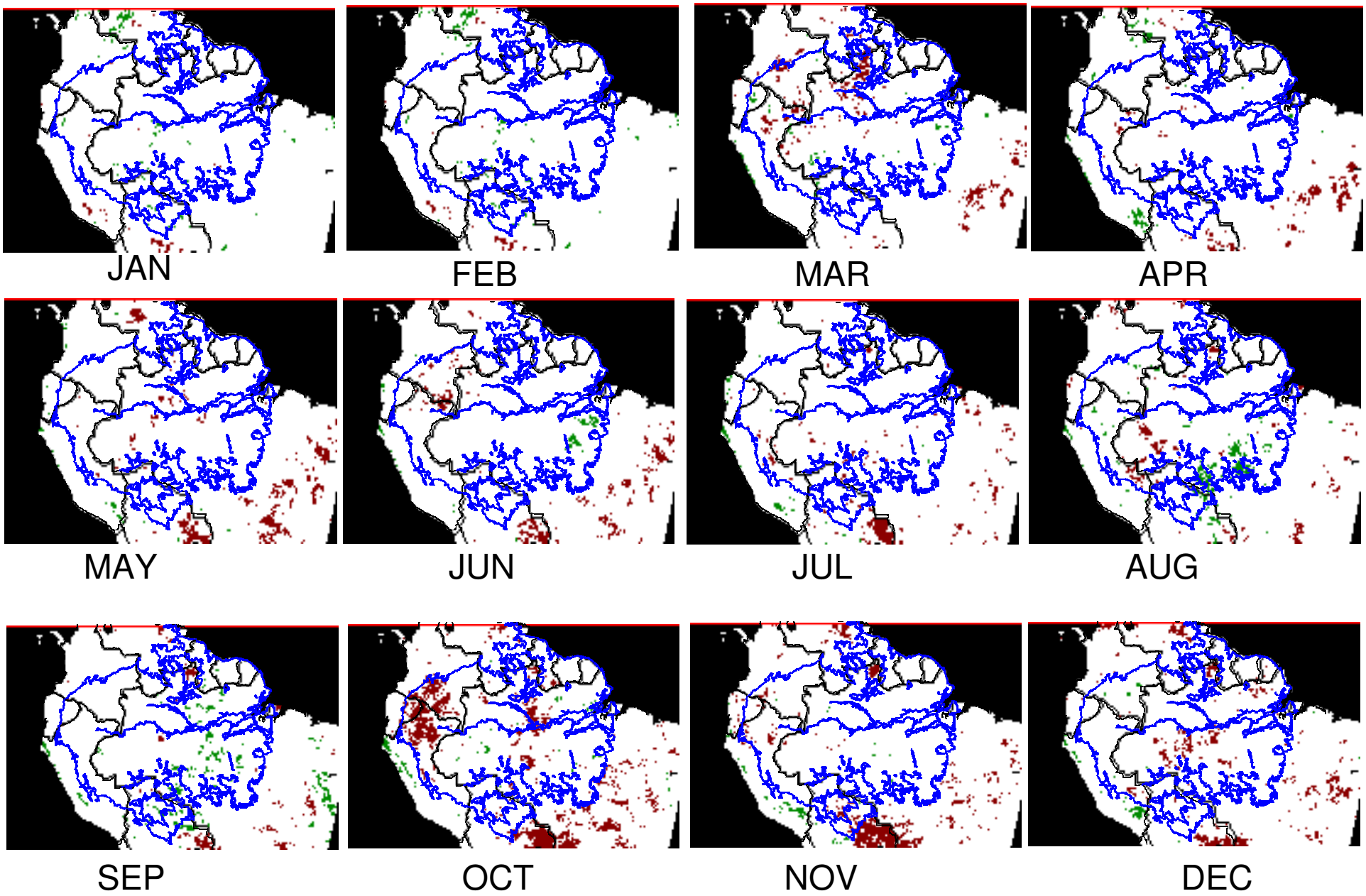
1 ha plot with 25 litter collectors' ; 1 x 0.5 m each

Results: *NDWI ANOMALY* ***2001*** *0.25°*

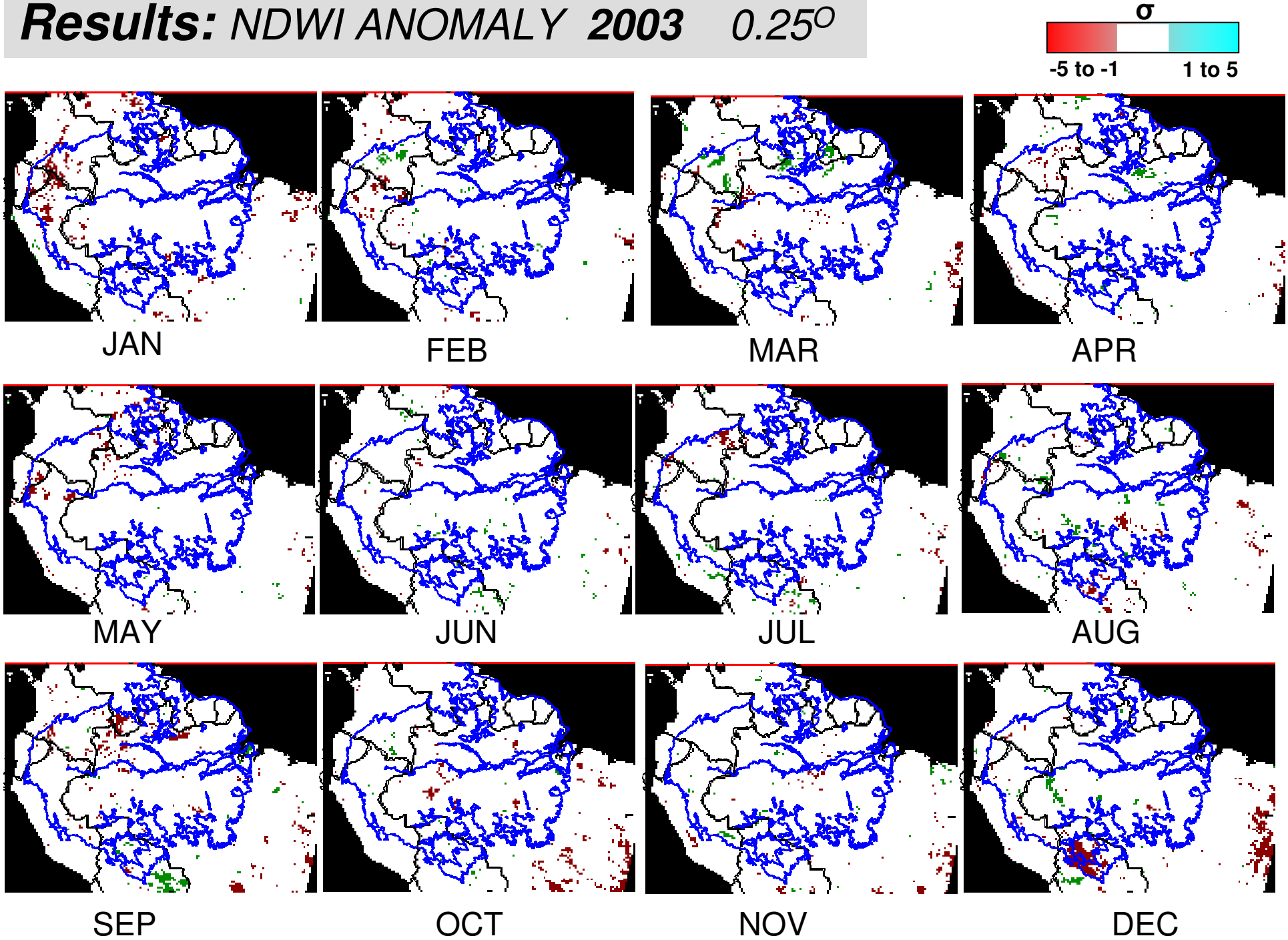




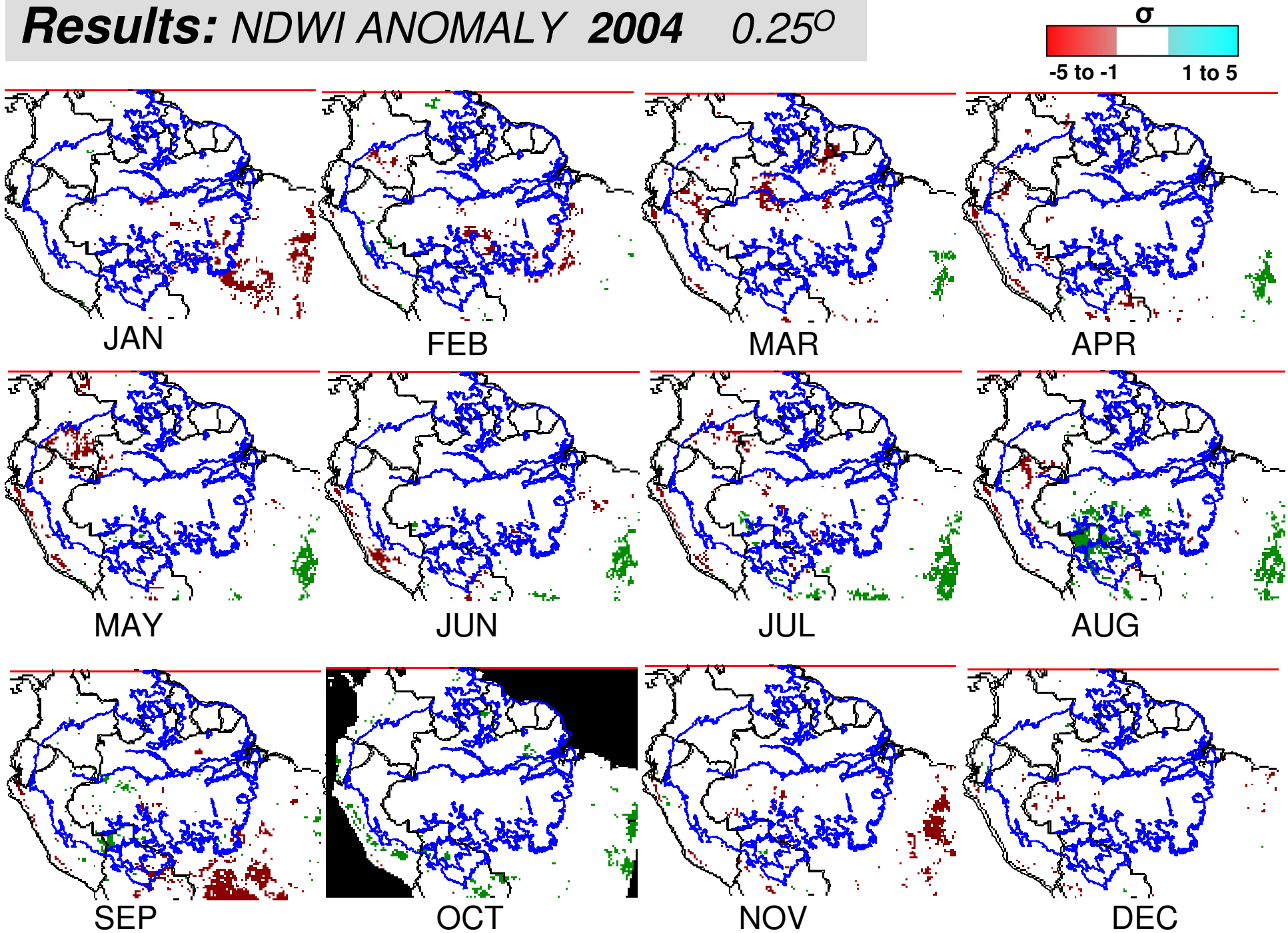
Results: *NDWI ANOMALY* ***2002*** *0.25°*



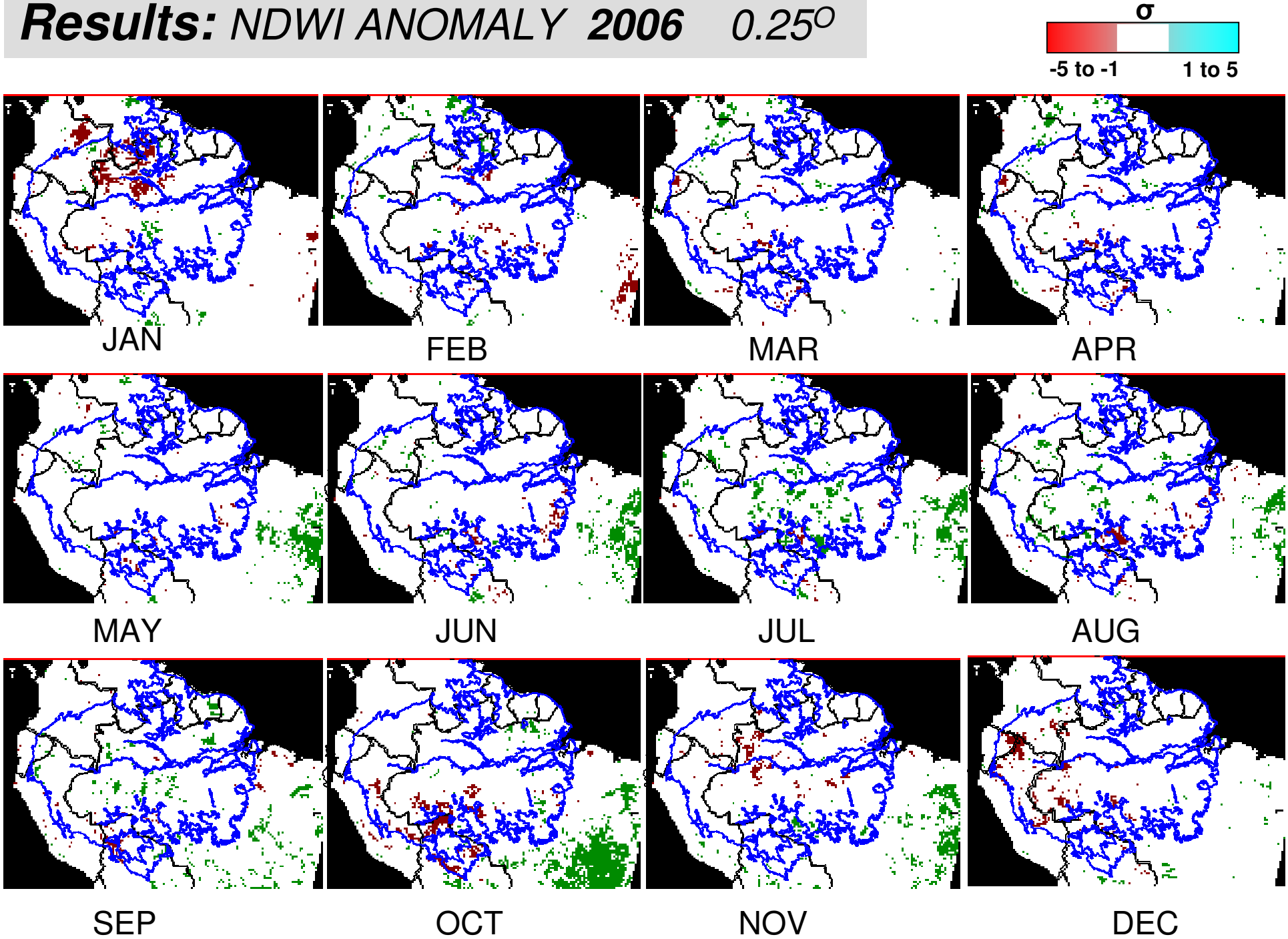
Results: *NDWI ANOMALY* ***2003*** *0.25°*



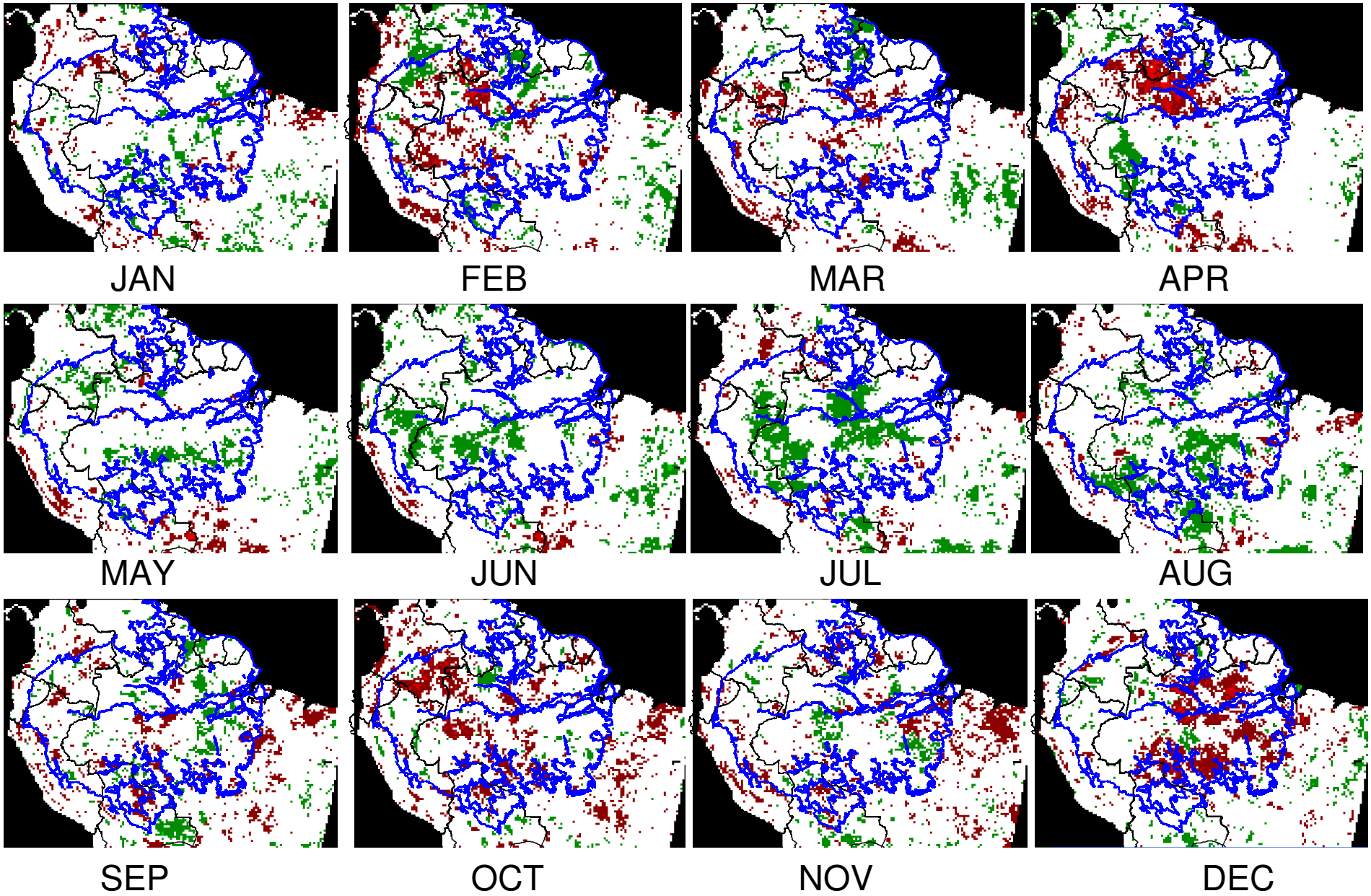
Results: *NDWI ANOMALY* ***2004*** *0.25°*



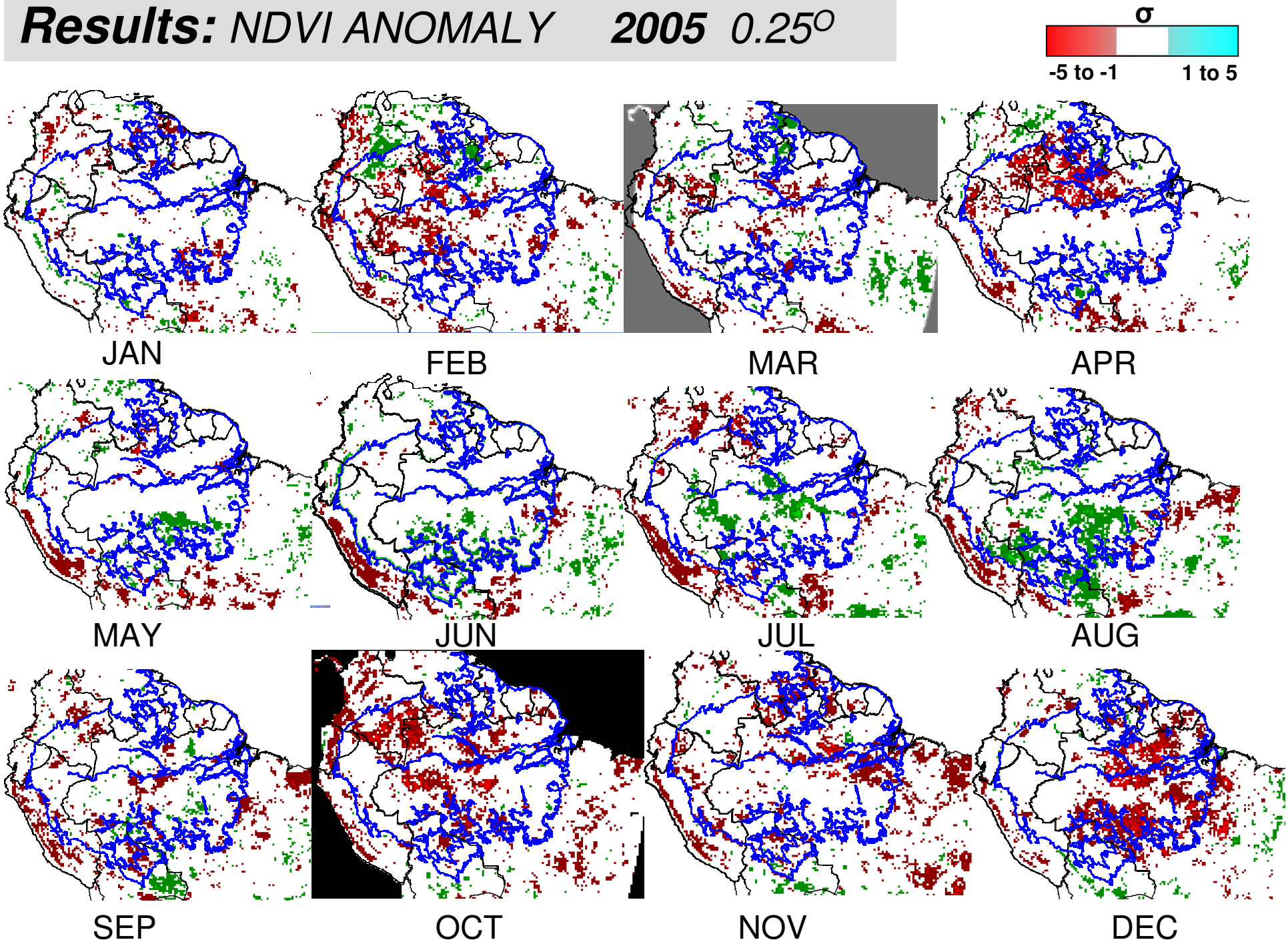
Results: *NDWI ANOMALY* ***2006*** *0.25°*



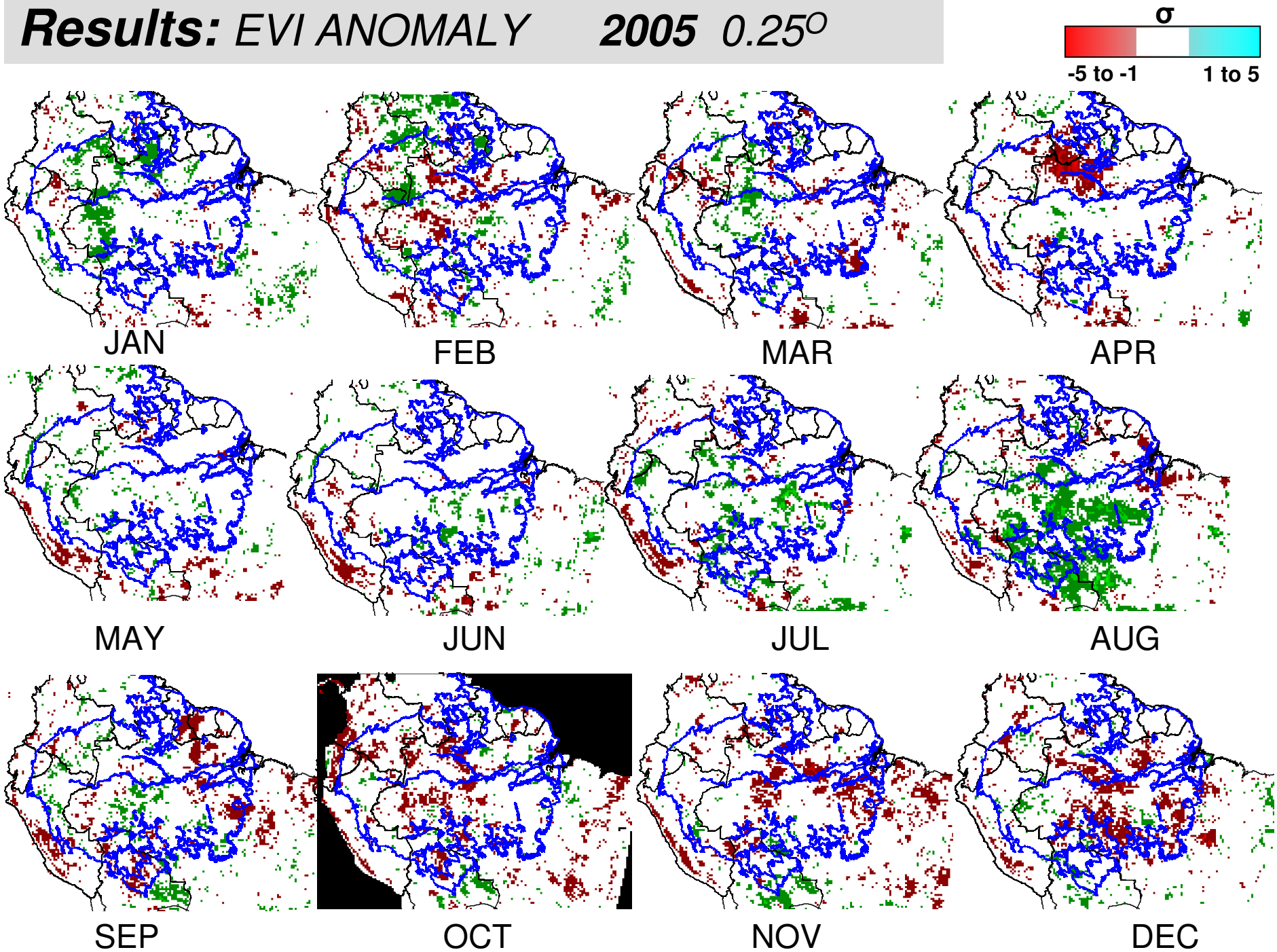
Results: *NDWI ANOMALY* ***2005*** *0.25°*



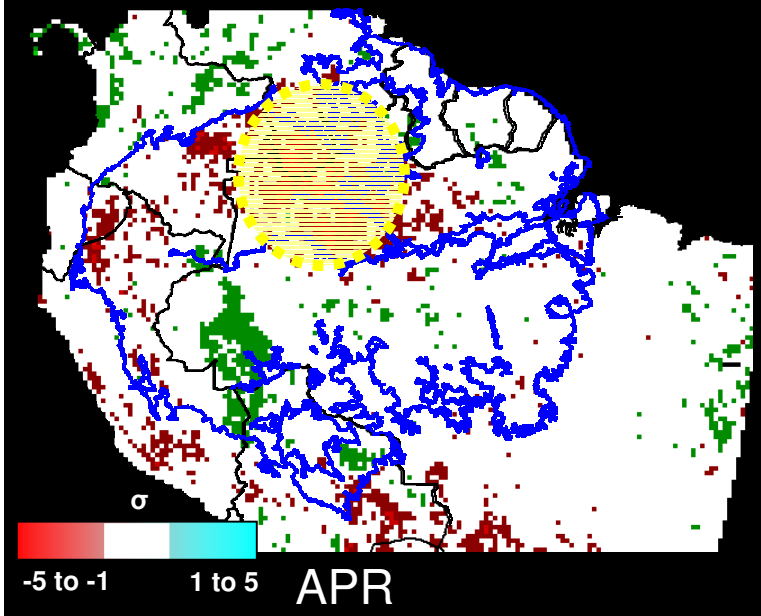
Results: *NDVI ANOMALY* ***2005*** *0.25°*

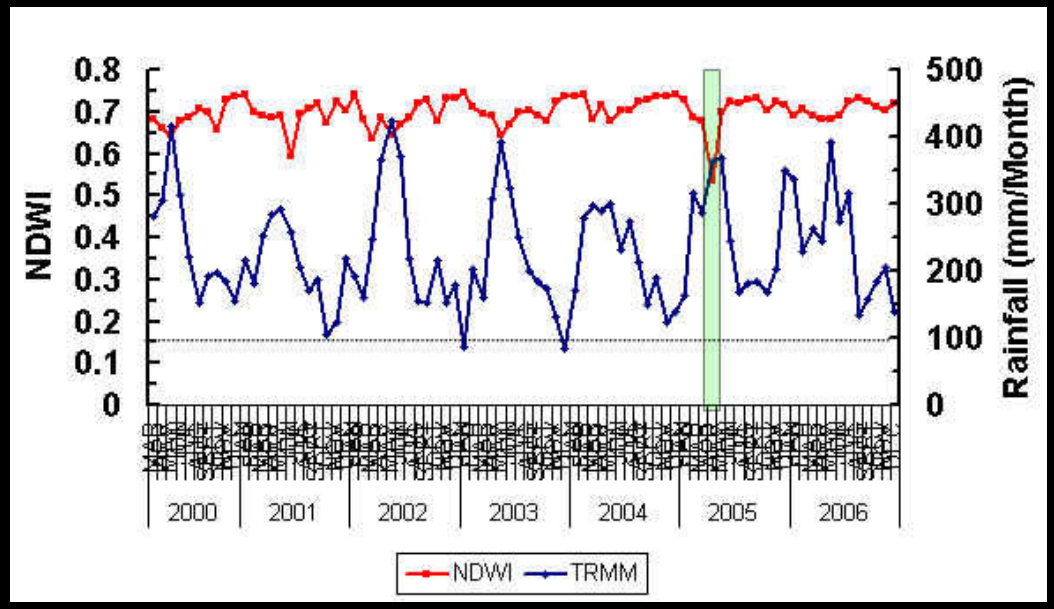


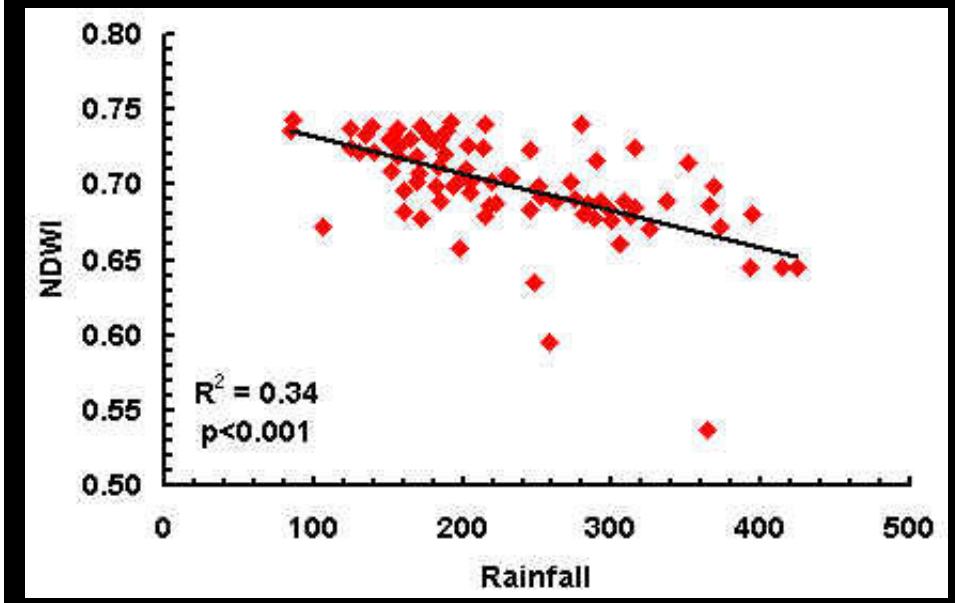
Results: *EVI ANOMALY* **2005** *0.25°*

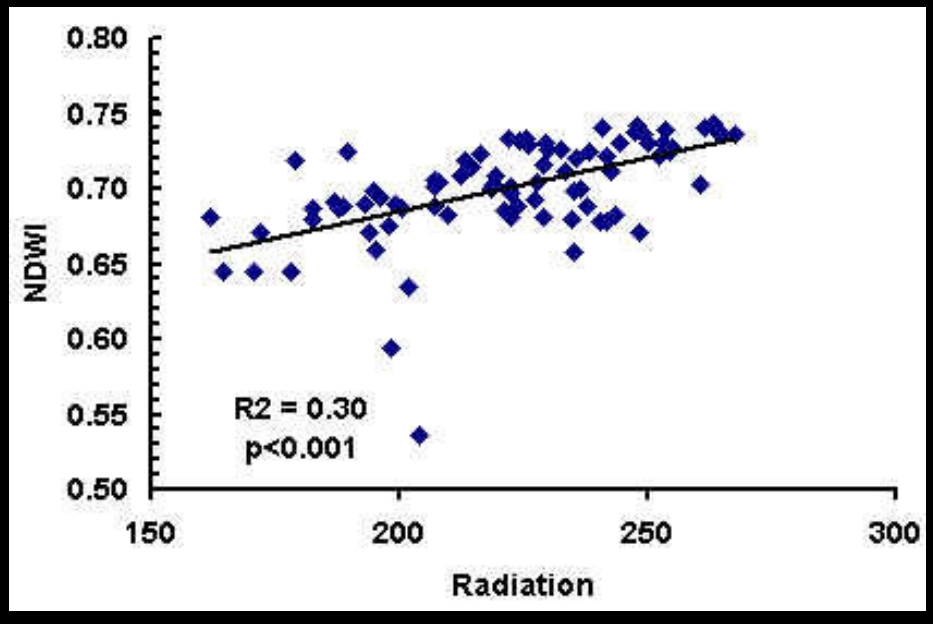


Results: *Remote Sensing data: NDWI*

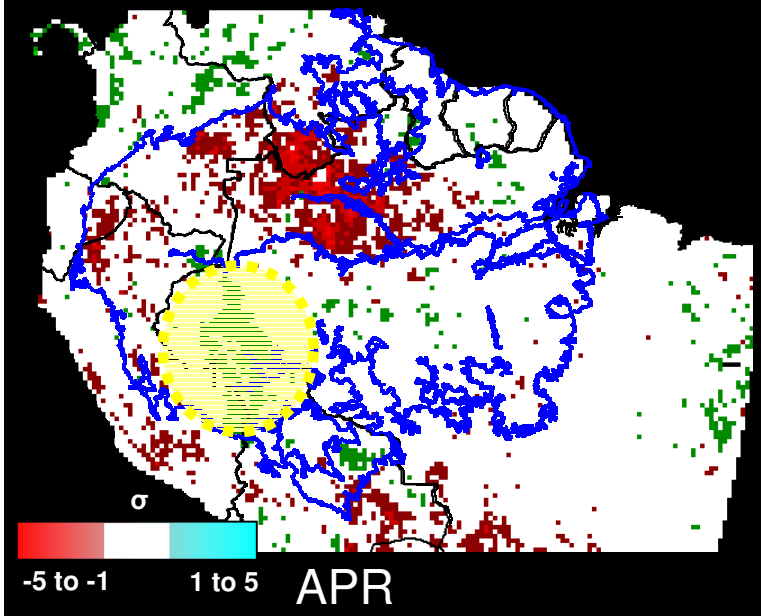


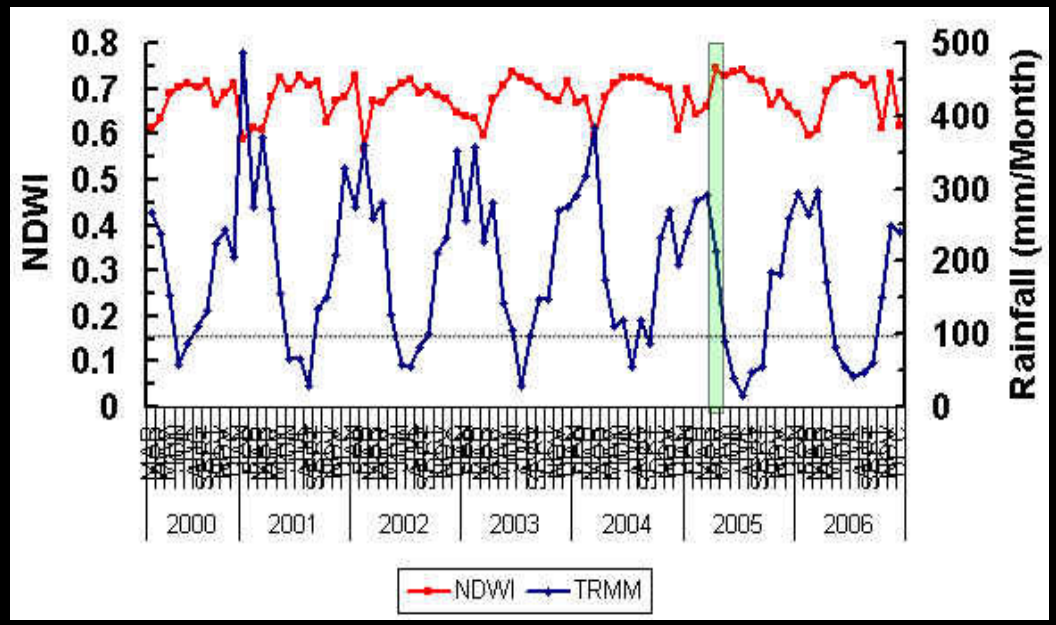


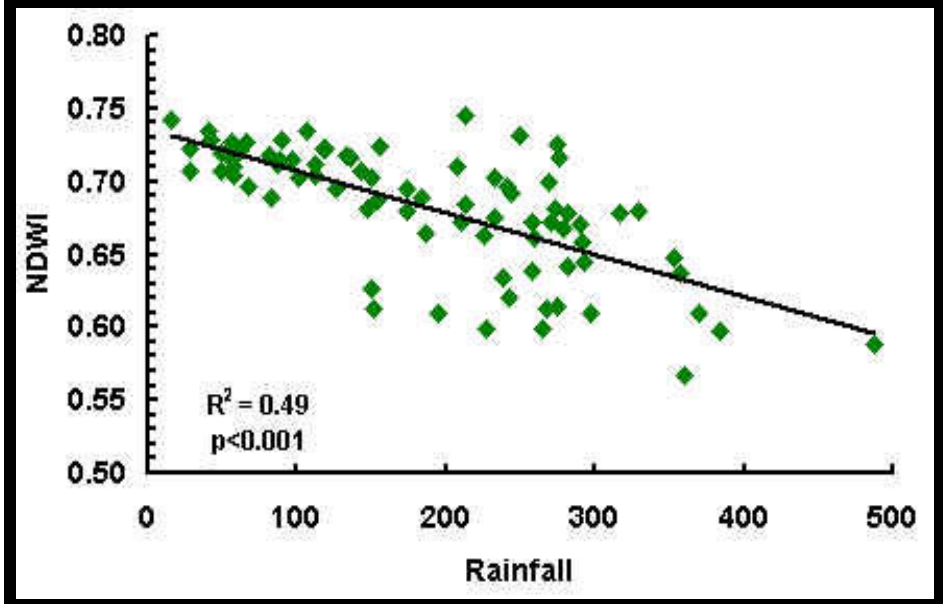


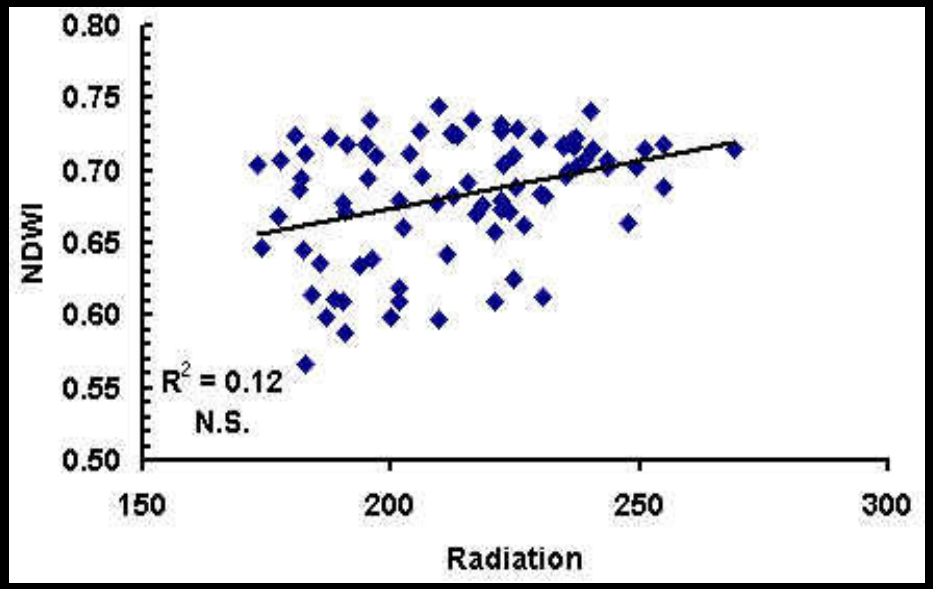


Results: *Remote Sensing data: NDWI*









Results: *Remote Sensing data: NDVI*

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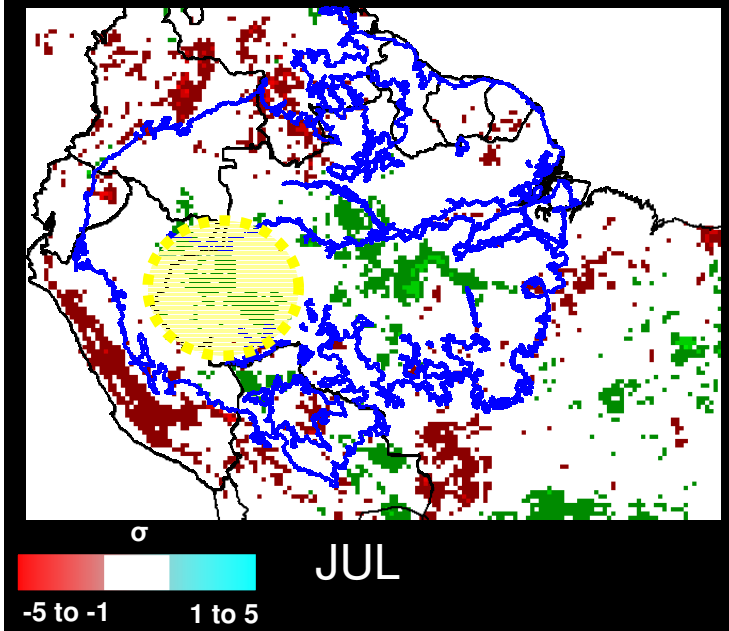

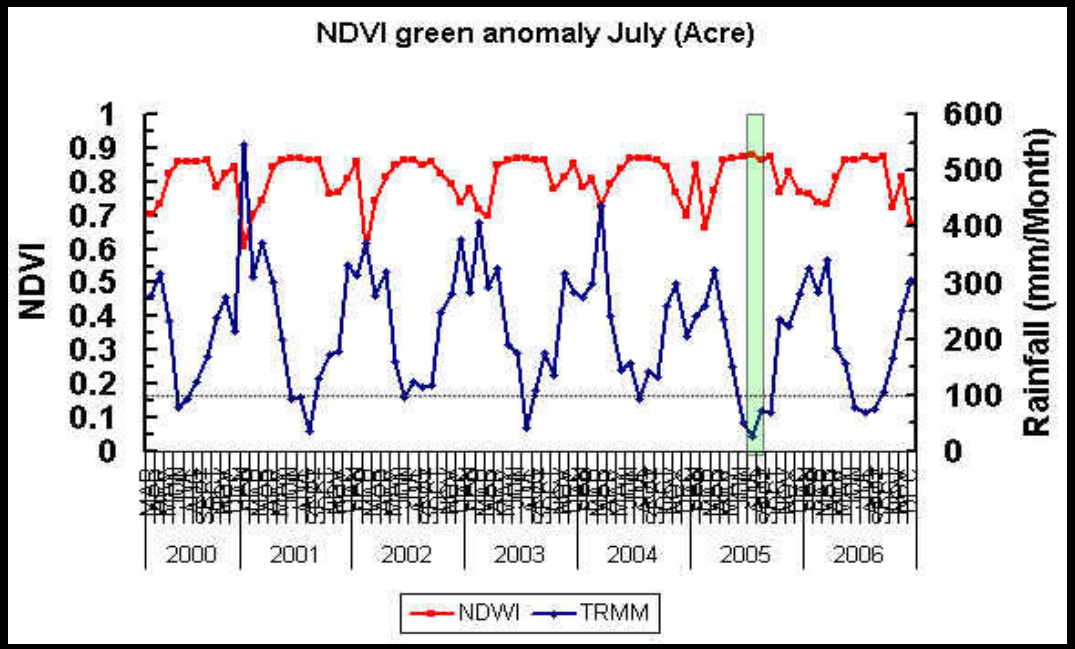

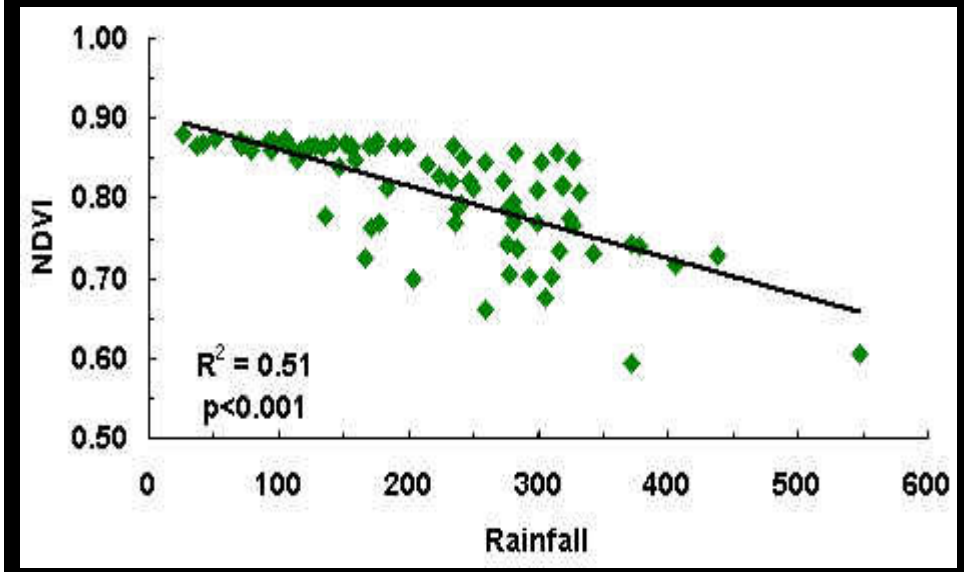

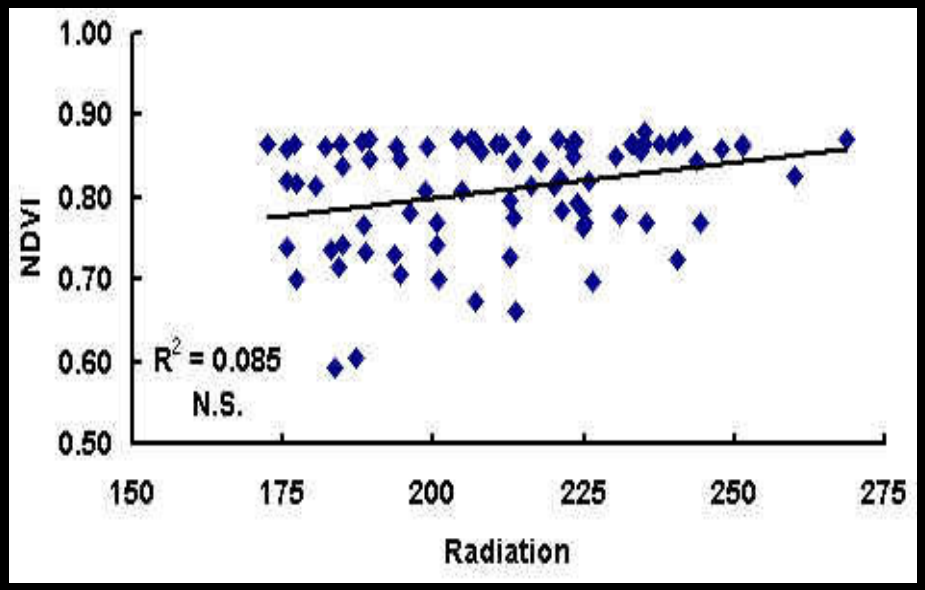

Results: *Remote Sensing data: EVI*

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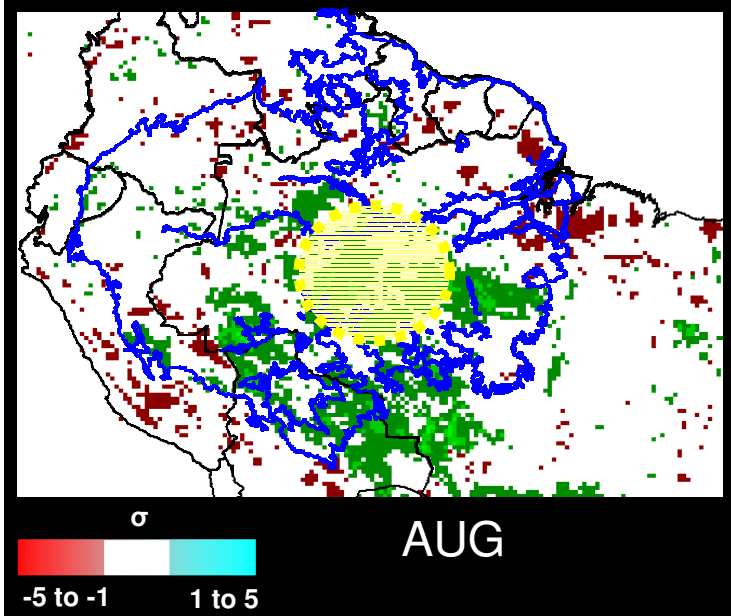
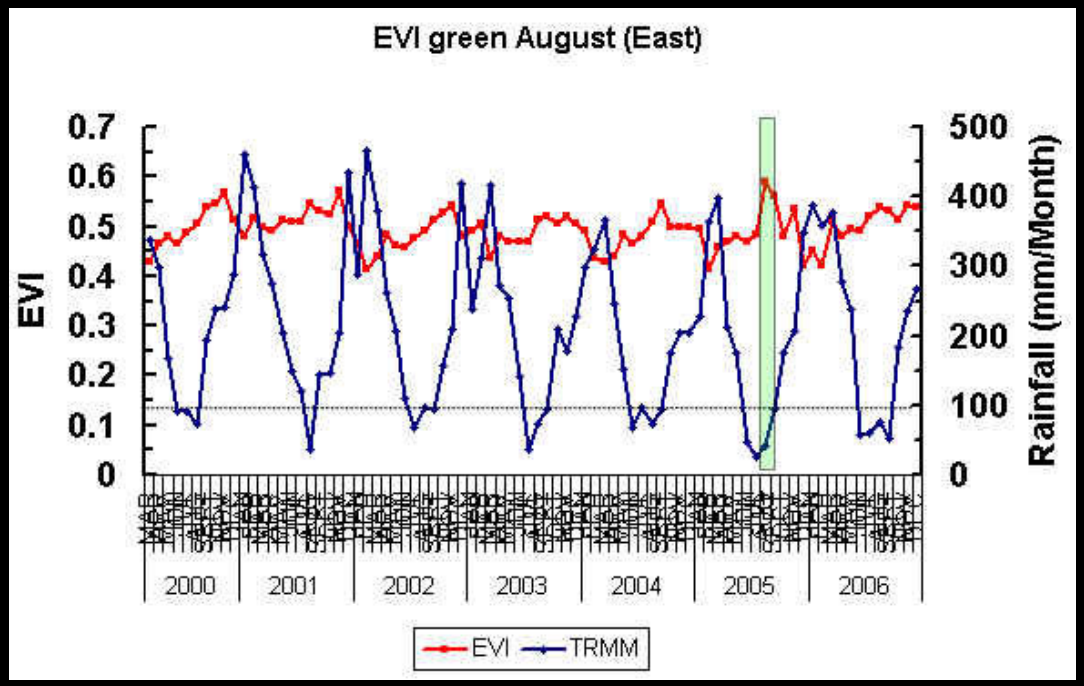
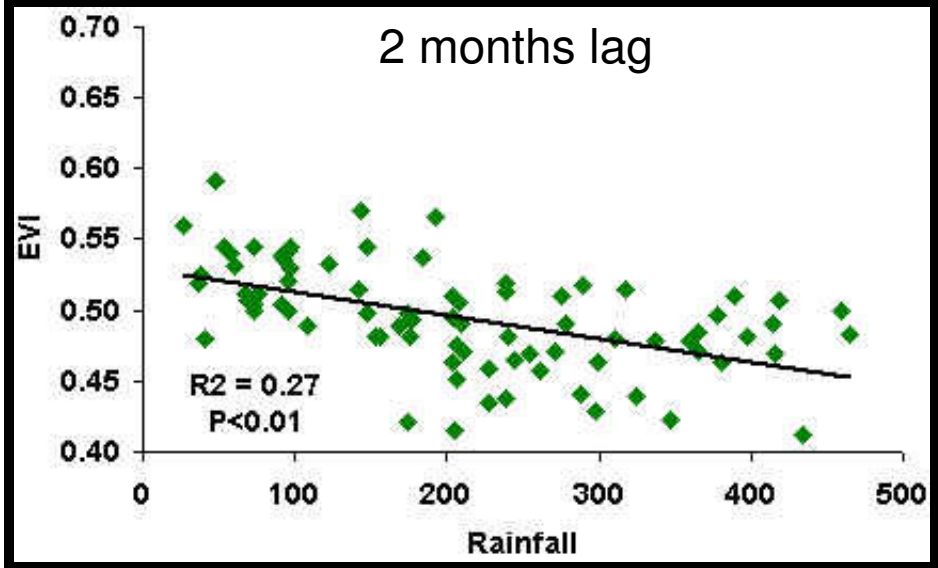
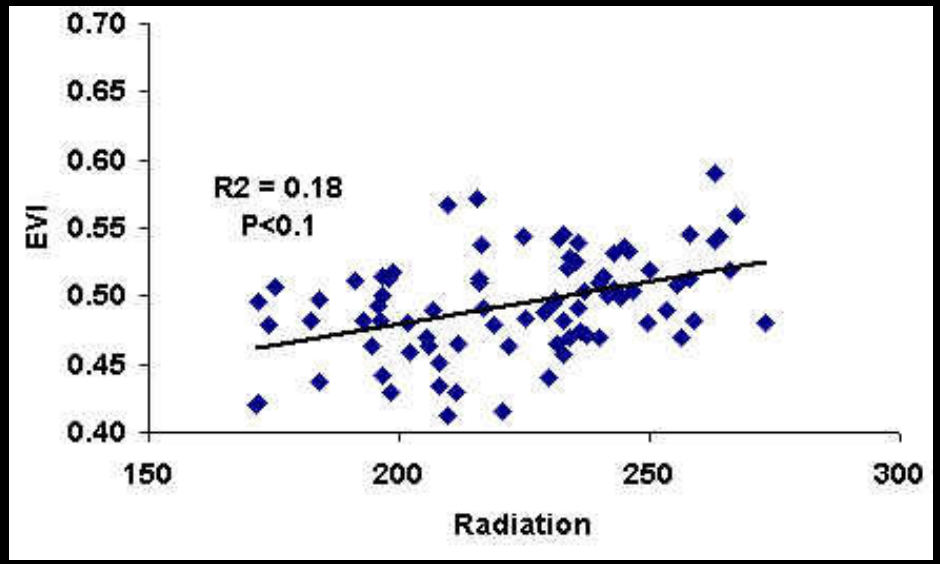
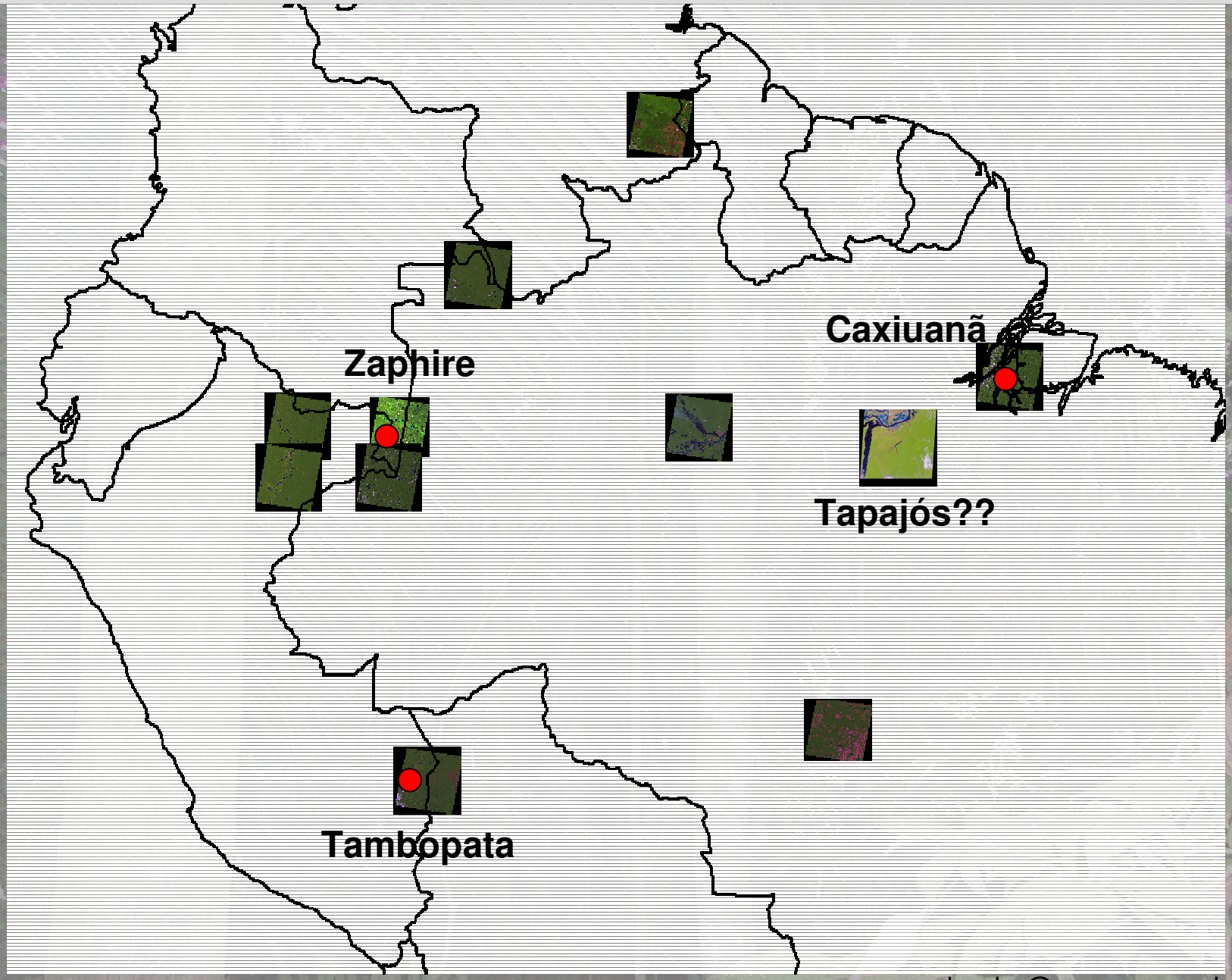








Results: Field data: Litterfall



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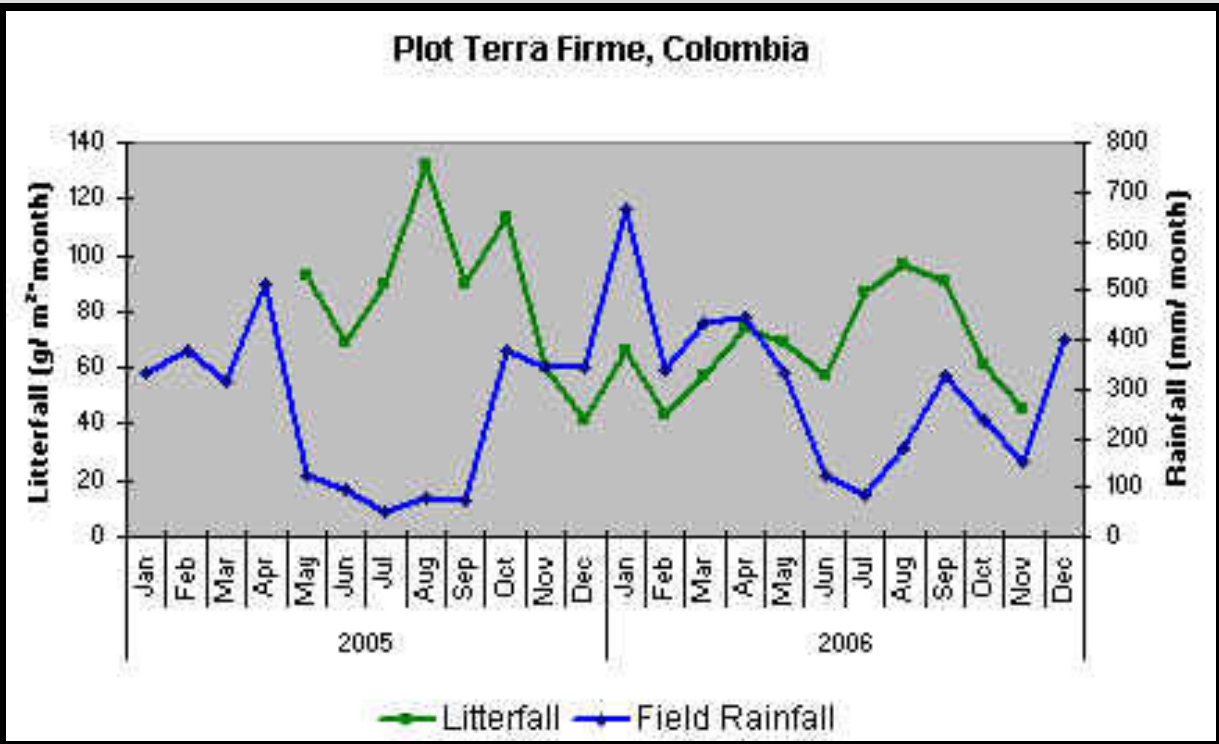

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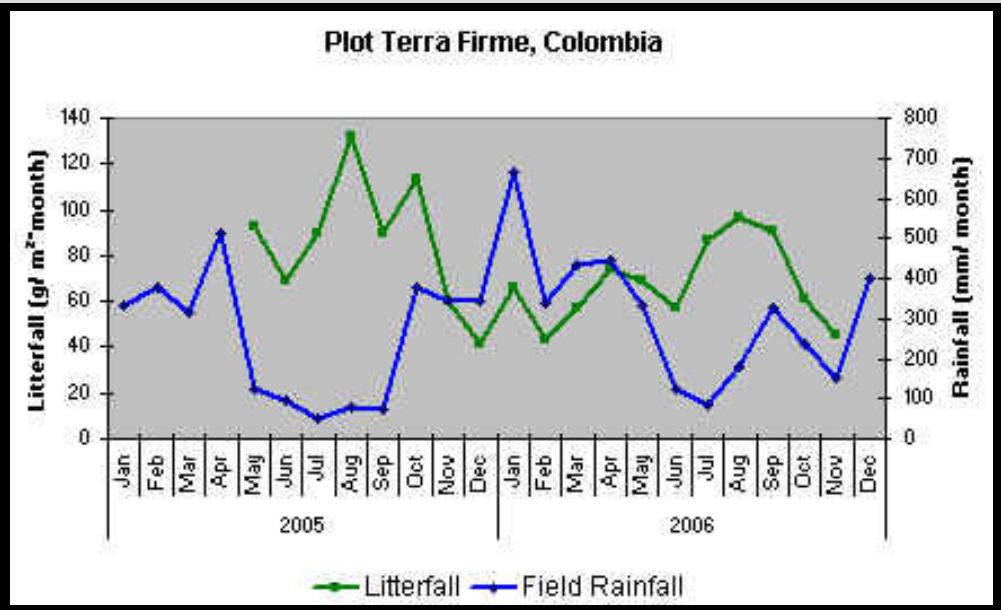

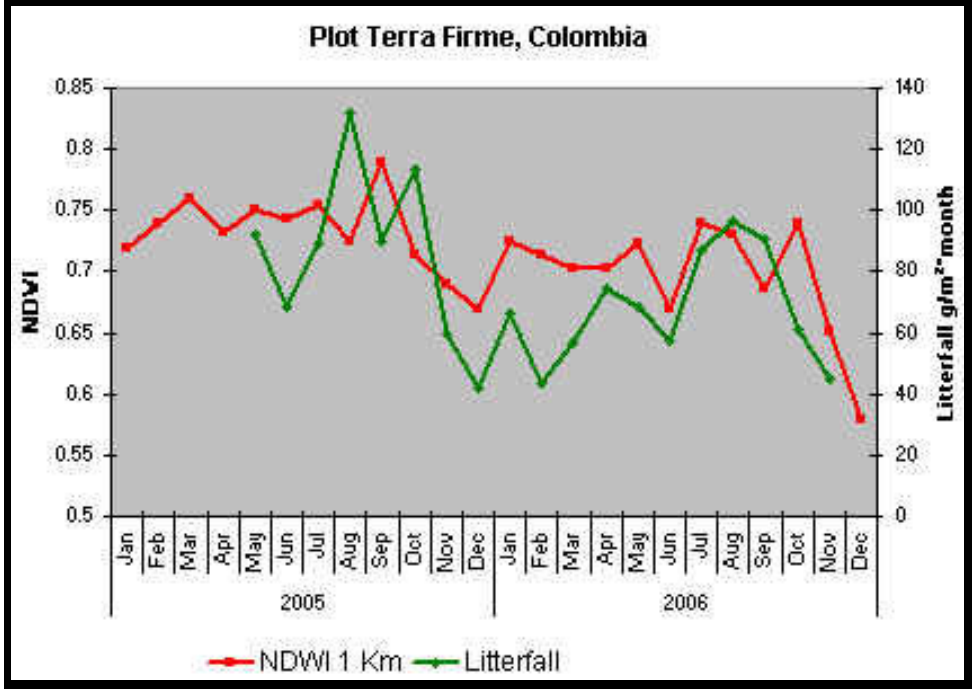

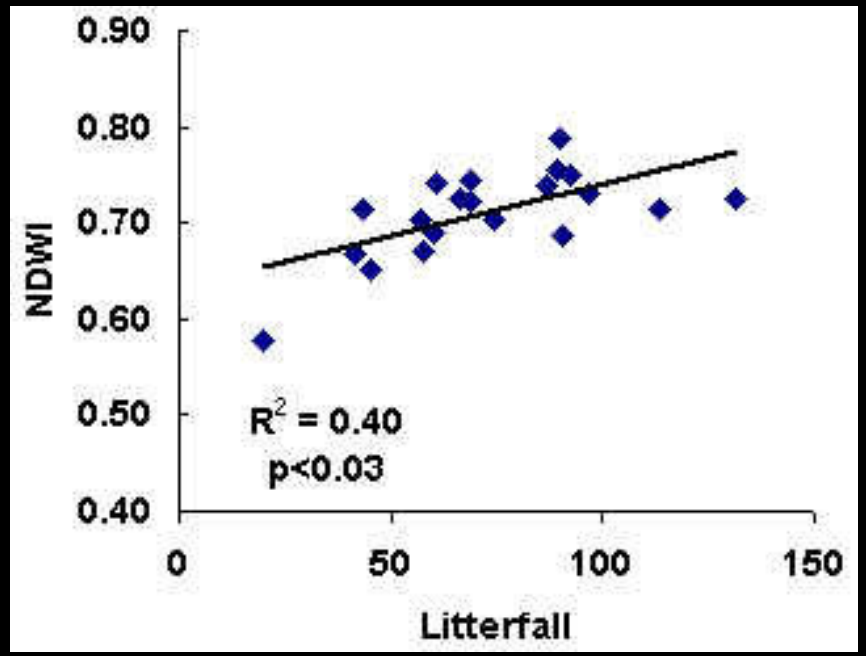

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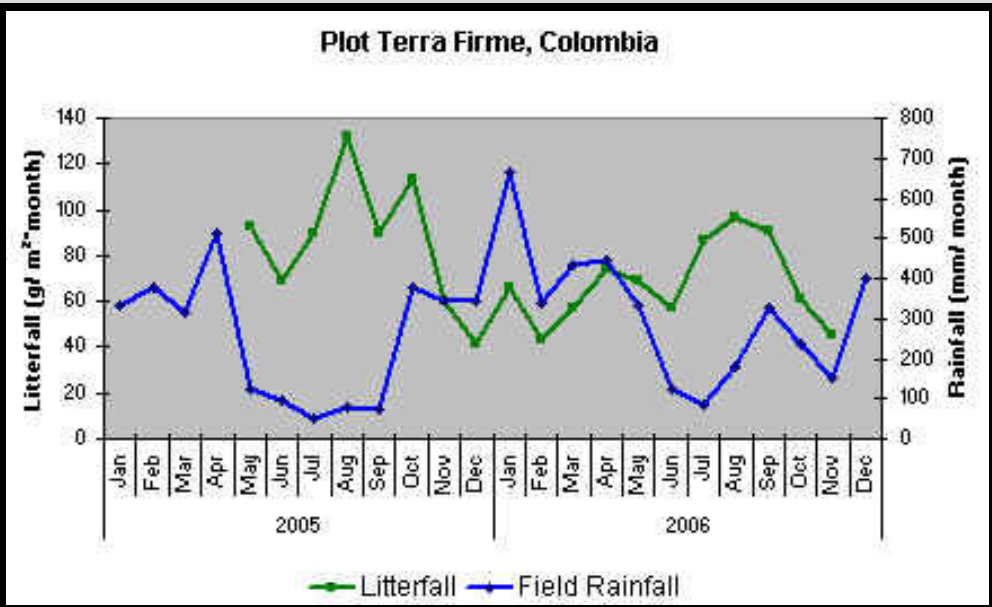

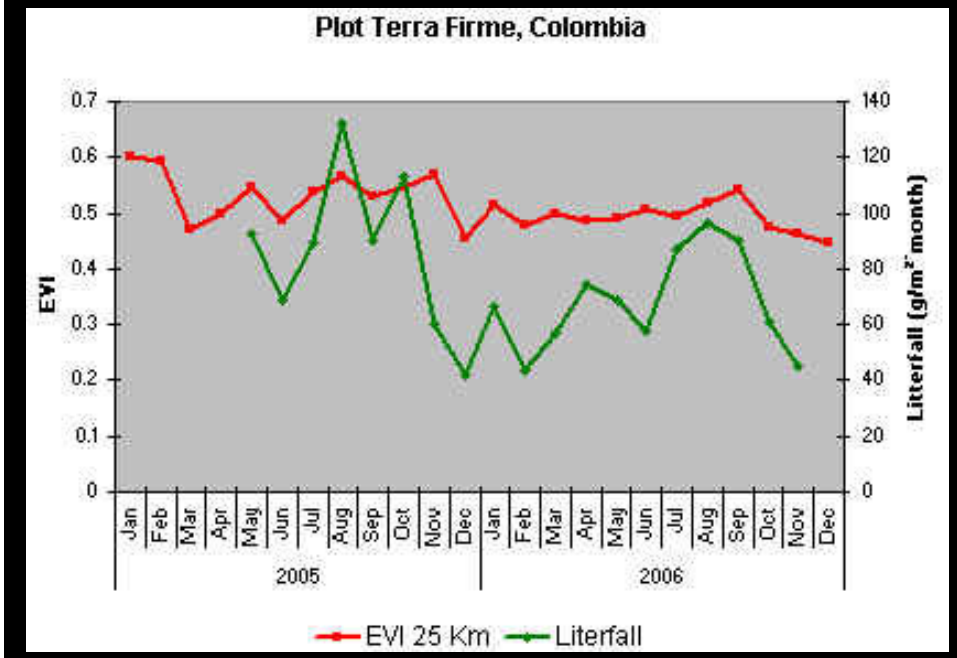

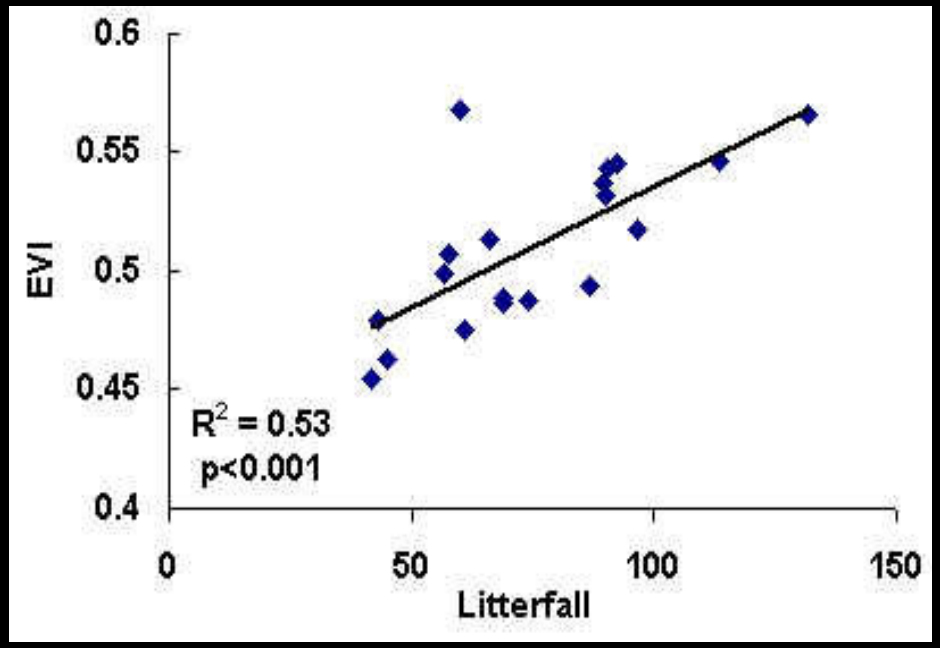

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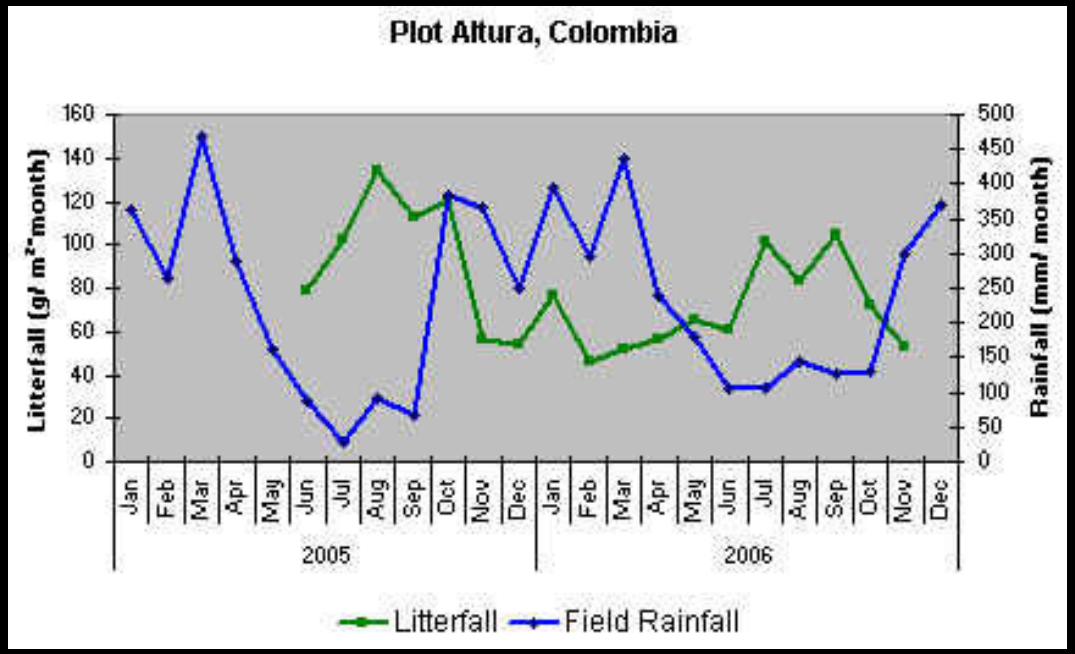

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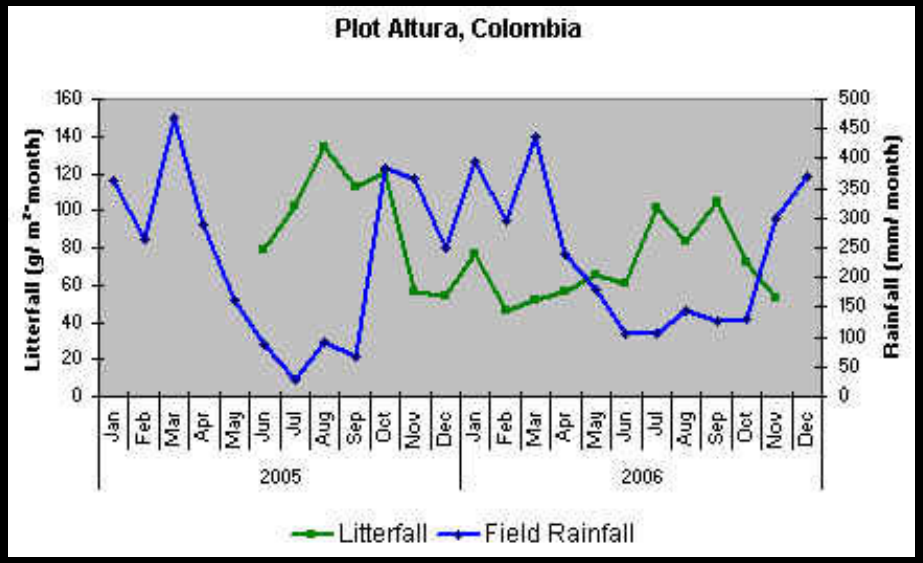

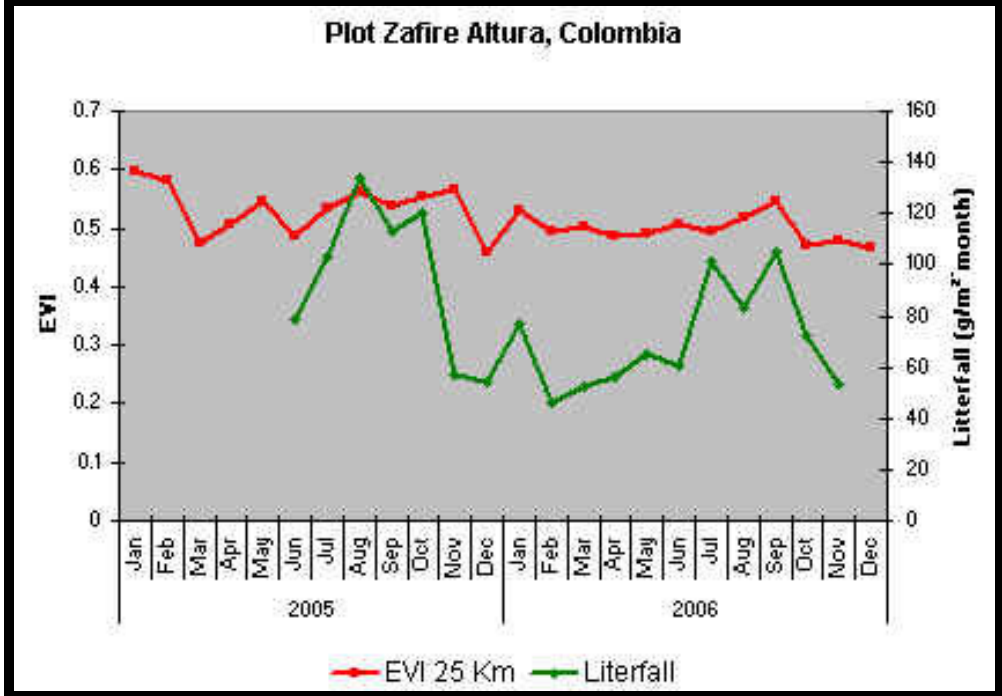

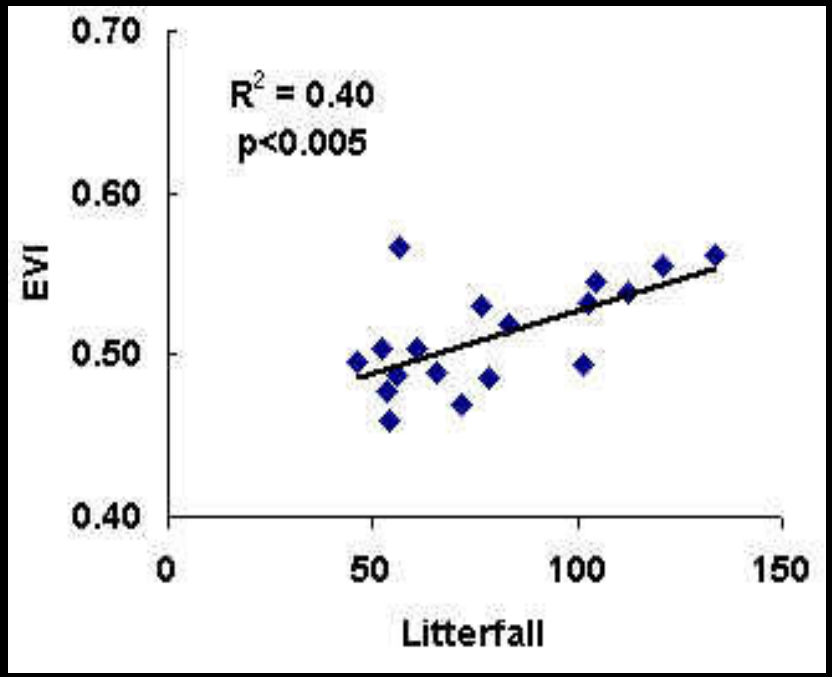

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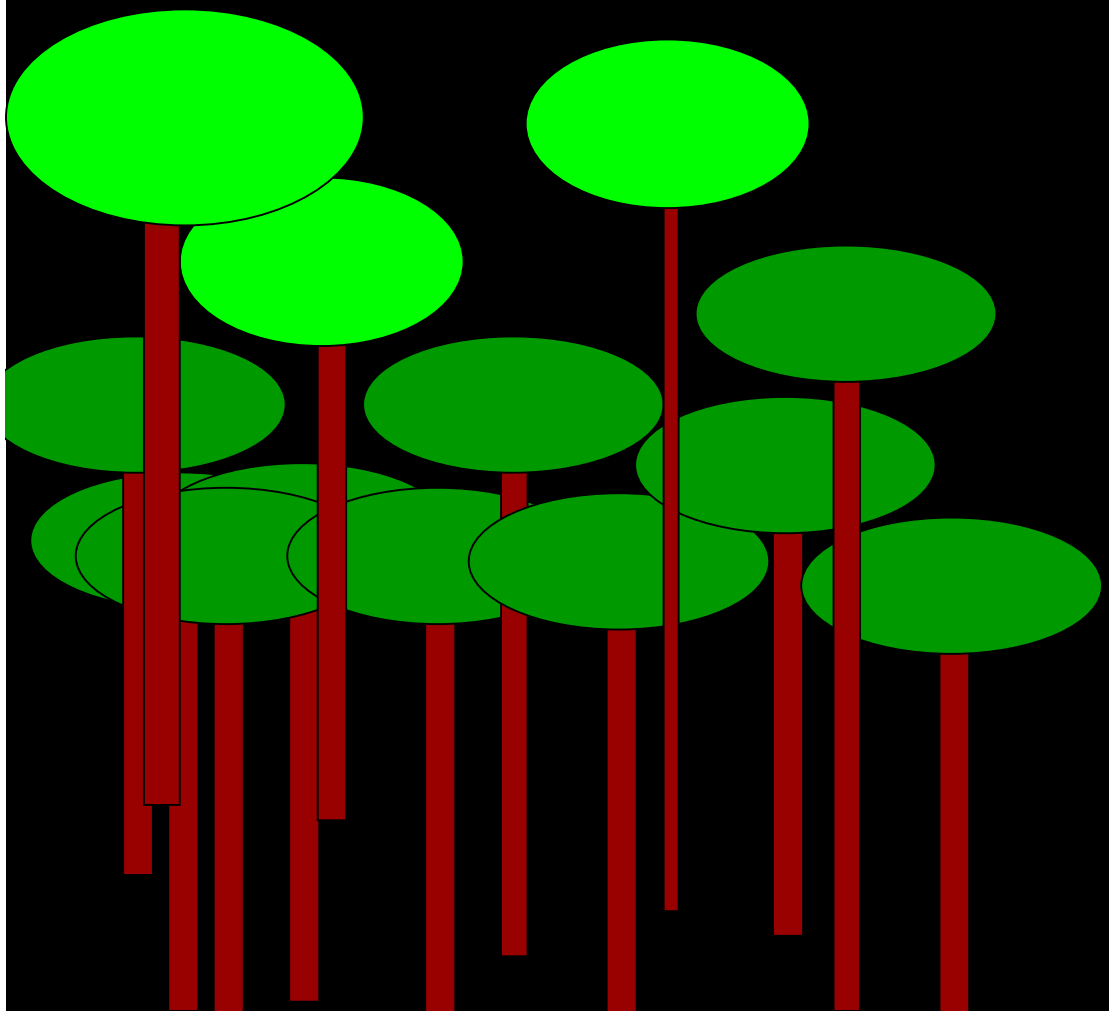
Hypothesis

Leaves of emergent trees have less chlorophyll than the others;



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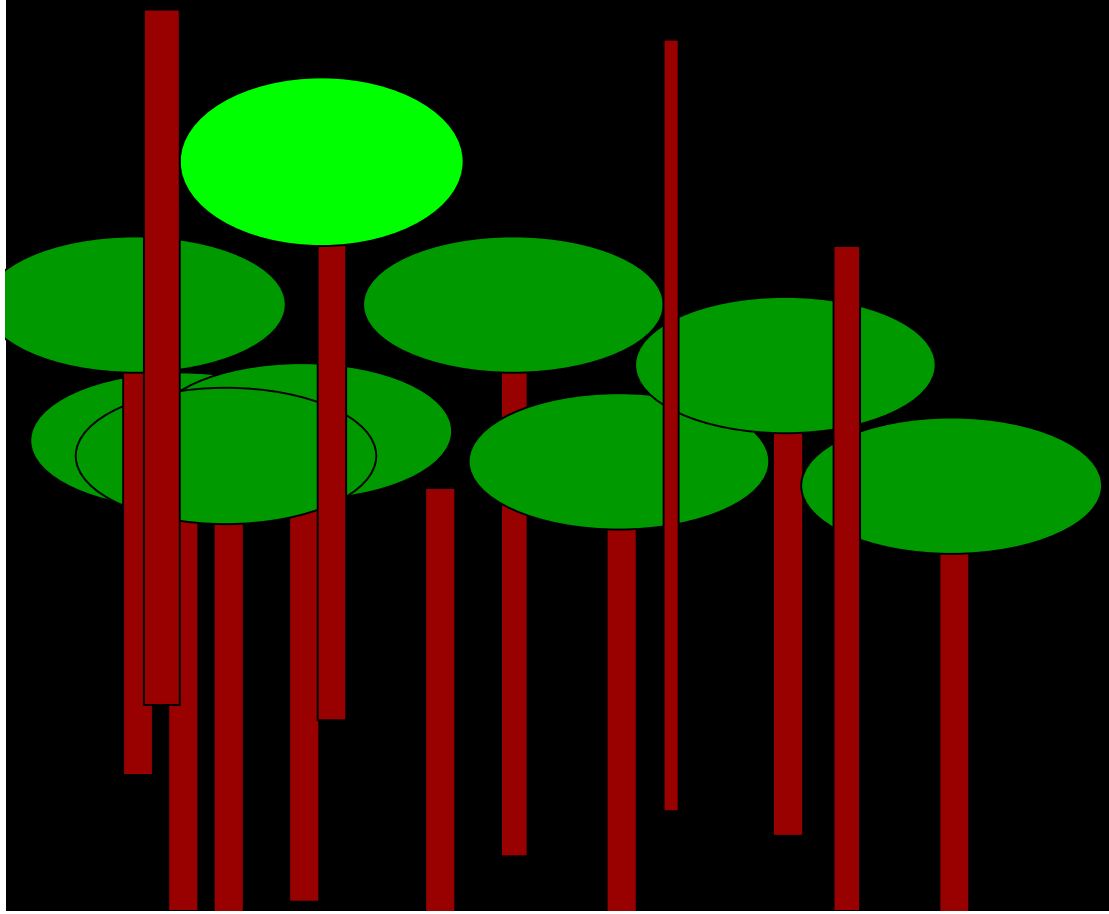
Hypothesis

Leaves of emergent trees have less chlorophyll than the others;

In the drought season, observed a bigger fall;



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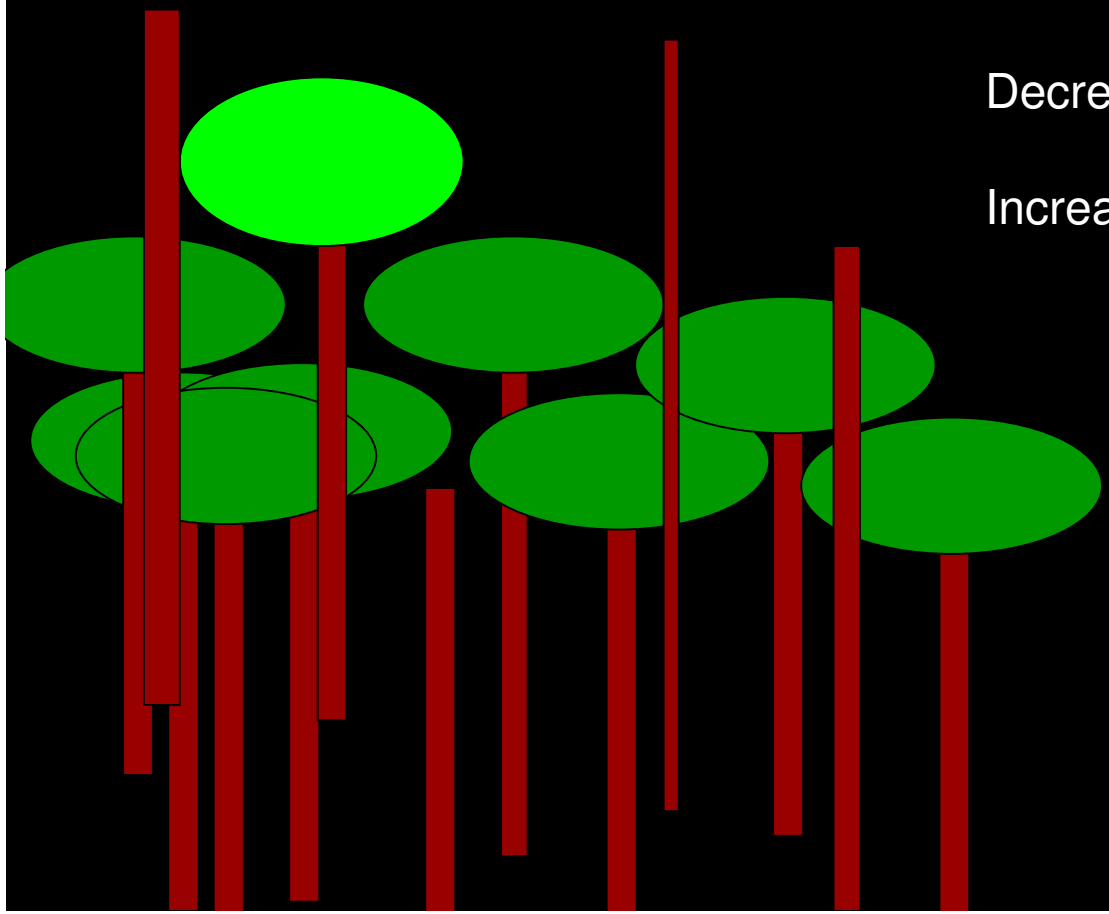
Hypothesis



Leaves of emergent trees have less chlorophyll than the others;

In the drought season, observed a bigger fall;

Decrease of roughness = less shade;

Increase in the signal of the VIs.

Preliminary Conclusions

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. VIs were sensitive to detect canopy stress in the 2005 drought:

Red and Green anomalies of NDWI, NDVI and EVI presented negative relationship with rainfall, and positive relationship with radiation;

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Suggesting that changes in the canopy structure affects Vis;

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. VIs were sensitive to detect canopy stress in the 2005 drought:

Red and Green anomalies of NDWI, NDVI and EVI presented negative relationship with rainfall, and positive relationship with radiation;

. VIs also presented a positive relationship with Litterfall data,

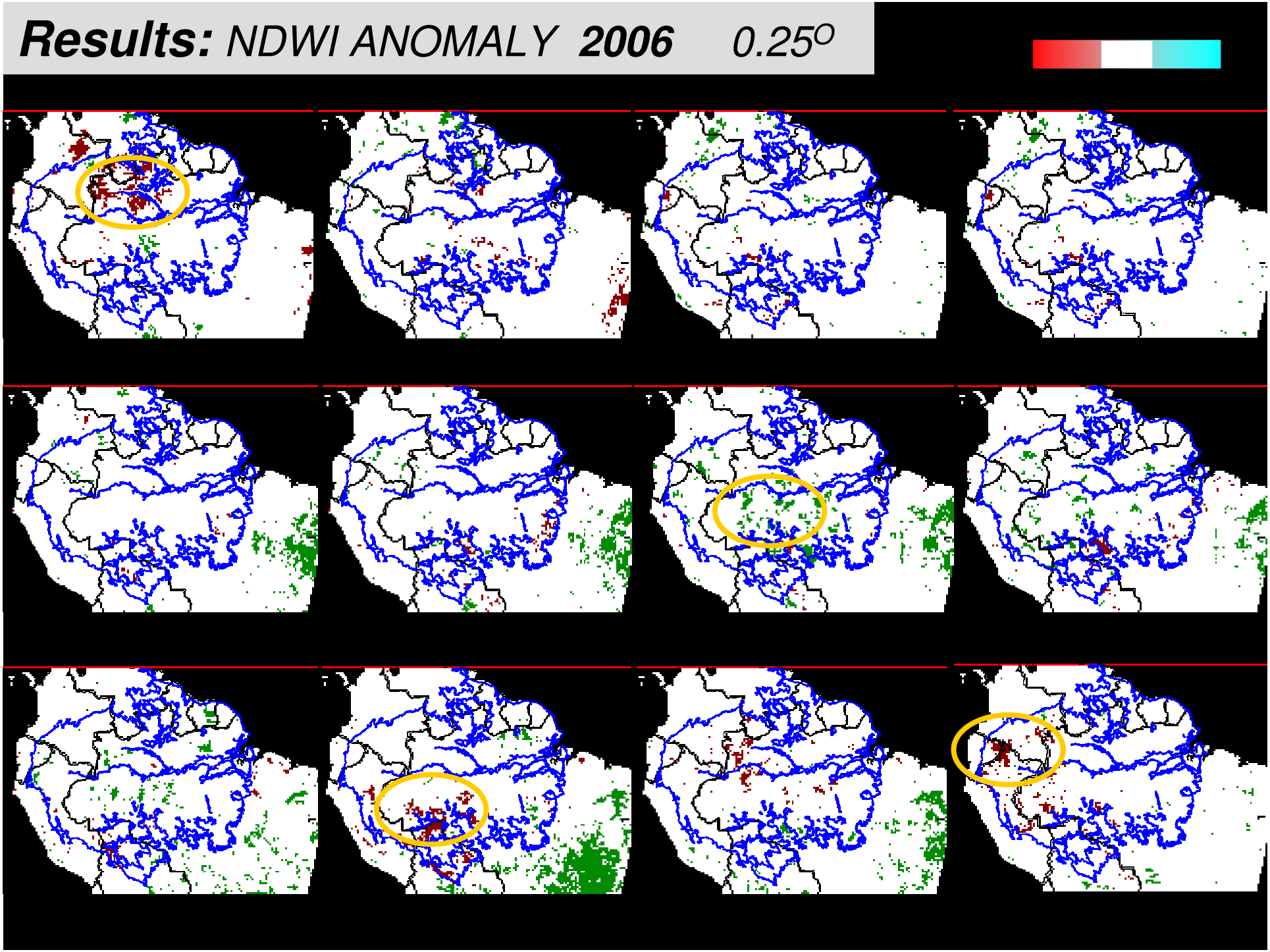
Suggesting that changes in the canopy structure affects Vis;

. The spatial analysis showed VIs anomaly in areas that were not directly affected by the meteorological water deficit, pointing out more susceptible areas of forest physiognomies to a drought event;

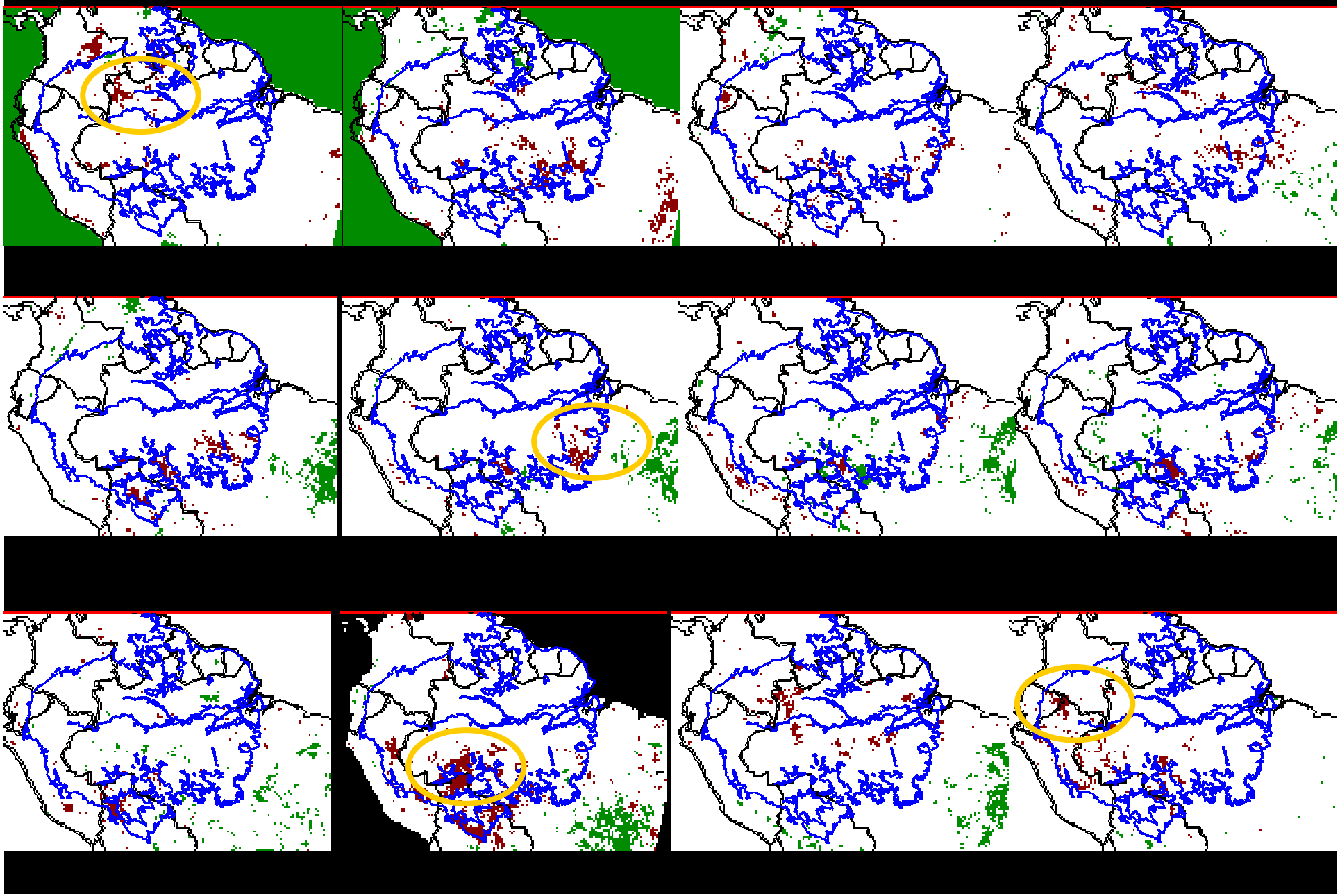
. We would like to test the litterfall data for others sites…

Liana Anderson would like to thank the *Brazilian* government for the *PhD* Scholarship and *LBA* for the travel support.

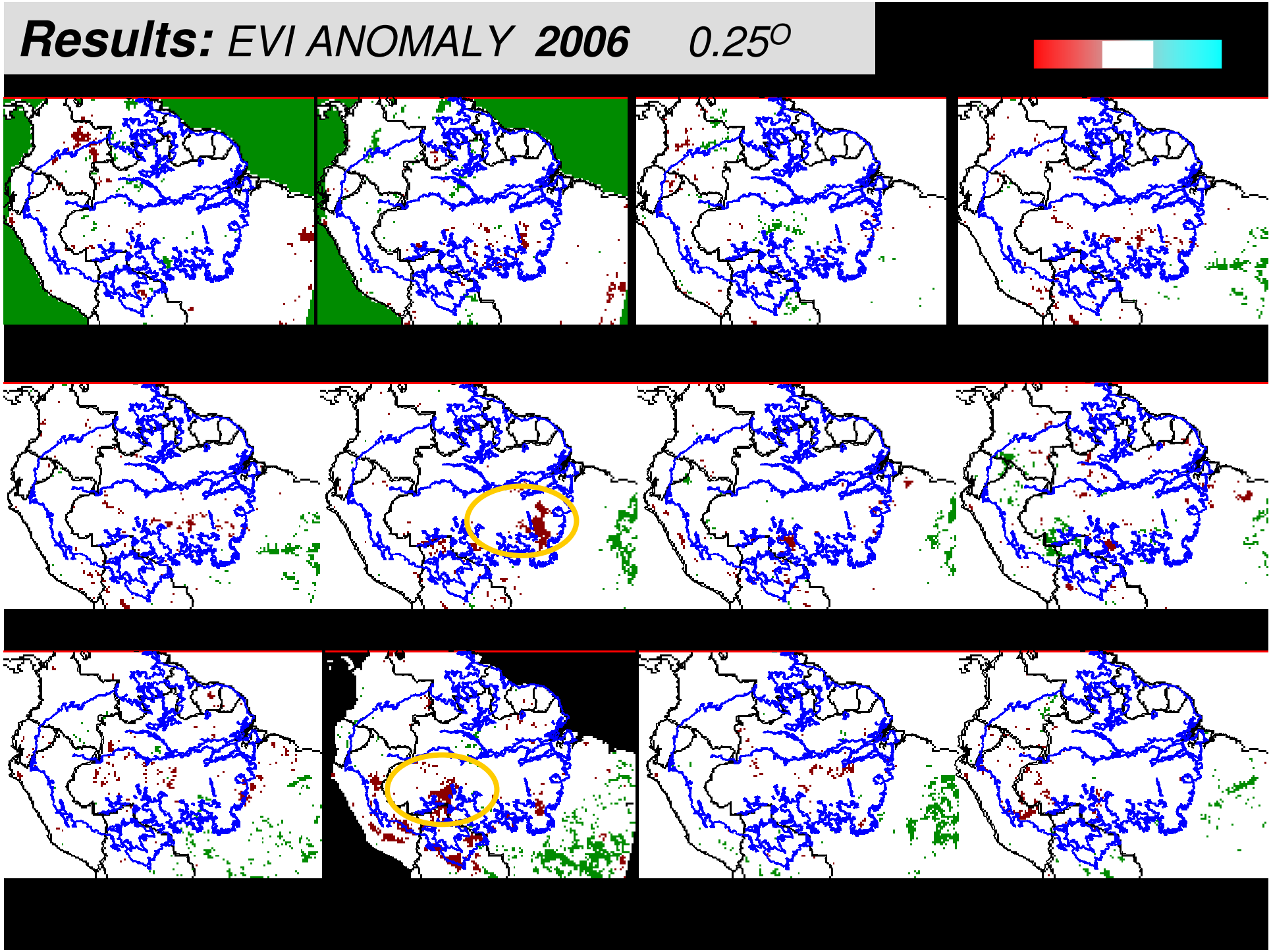
Results: *NDWI ANOMALY* ***2006*** *0.25°*



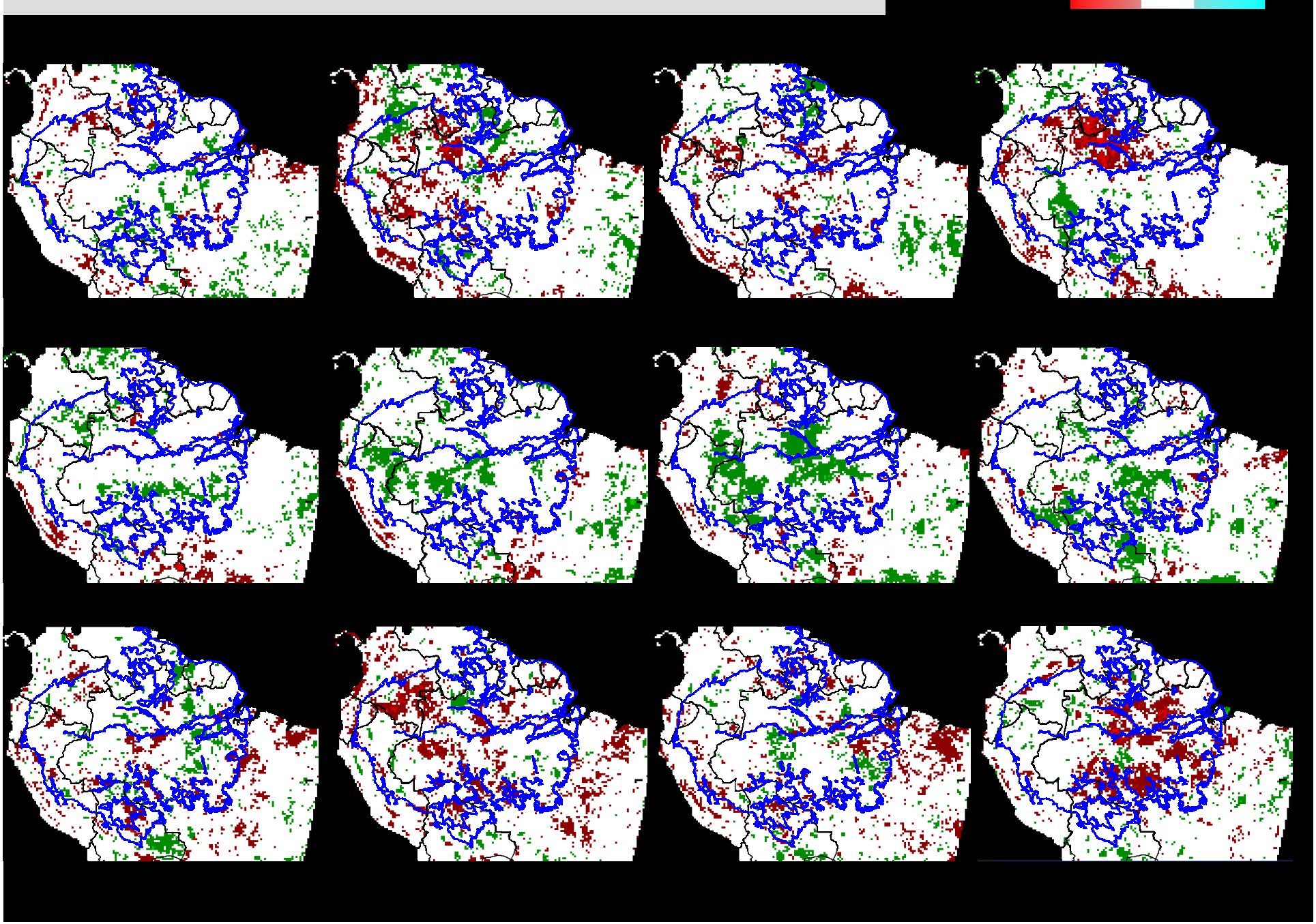
Results: *NDVI ANOMALY* ***2006*** *0.25°*



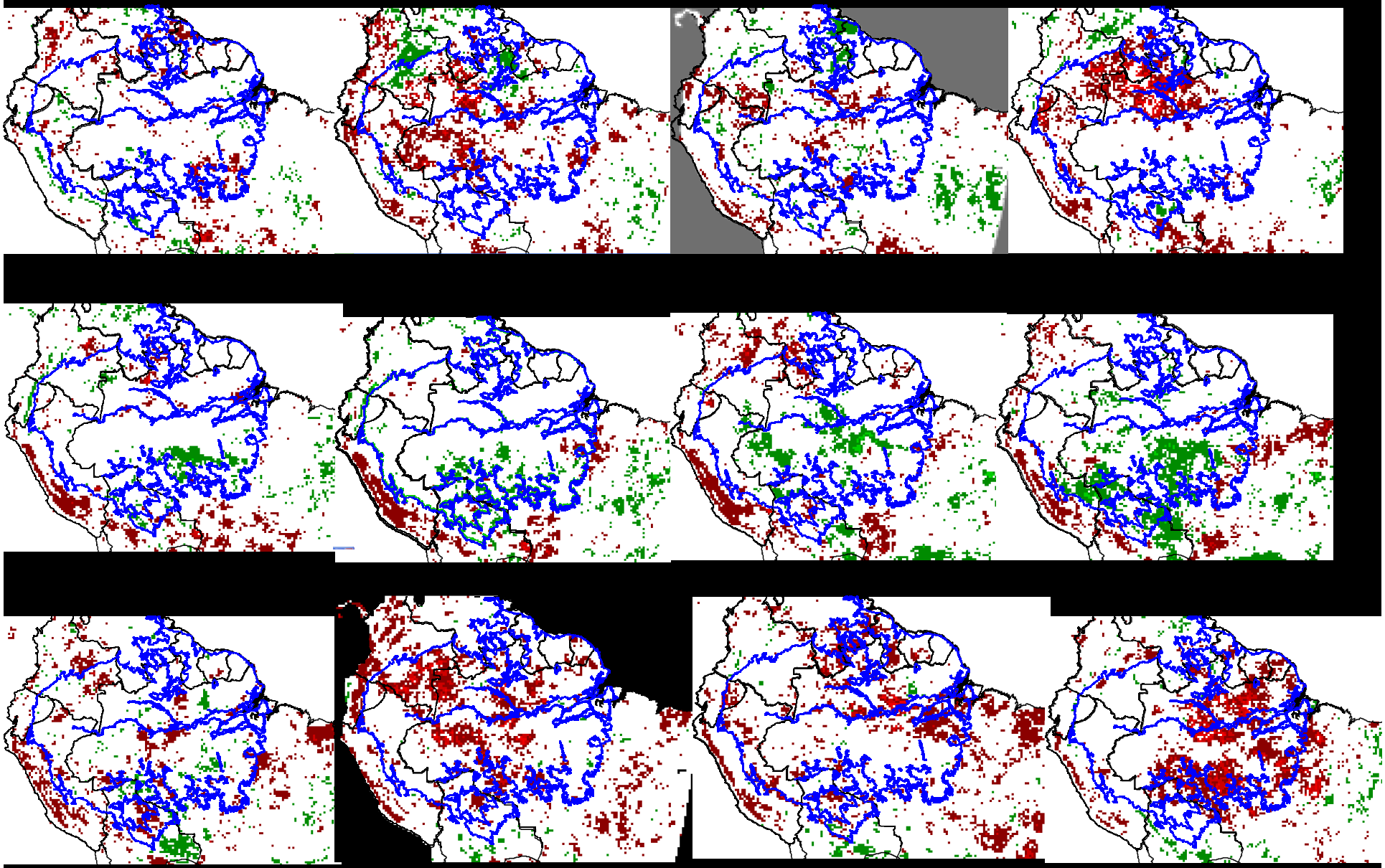
Results: *EVI ANOMALY* ***2006*** *0.25°*



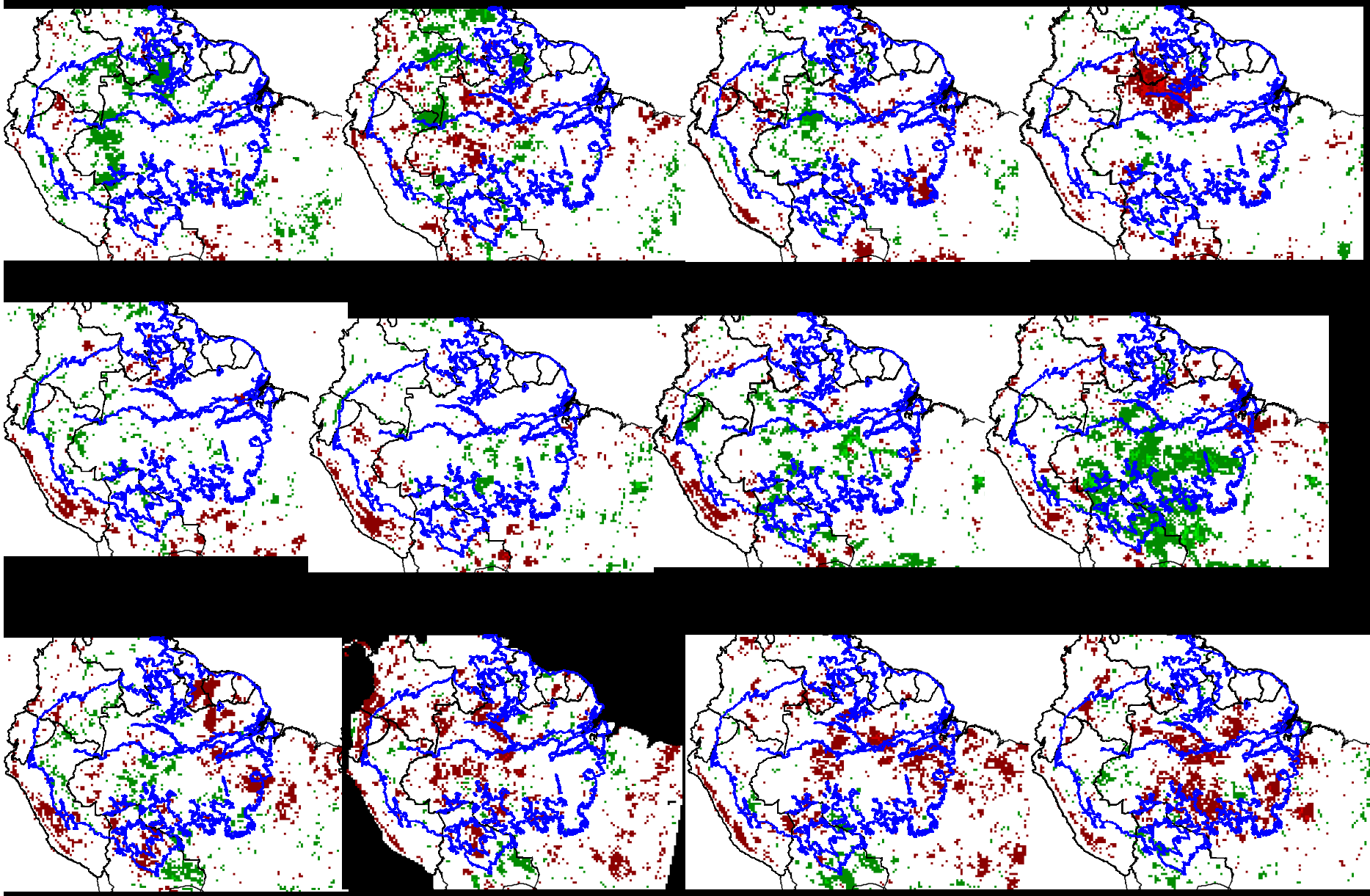
Results: *NDWI ANOMALY* ***2005*** *0.25°*



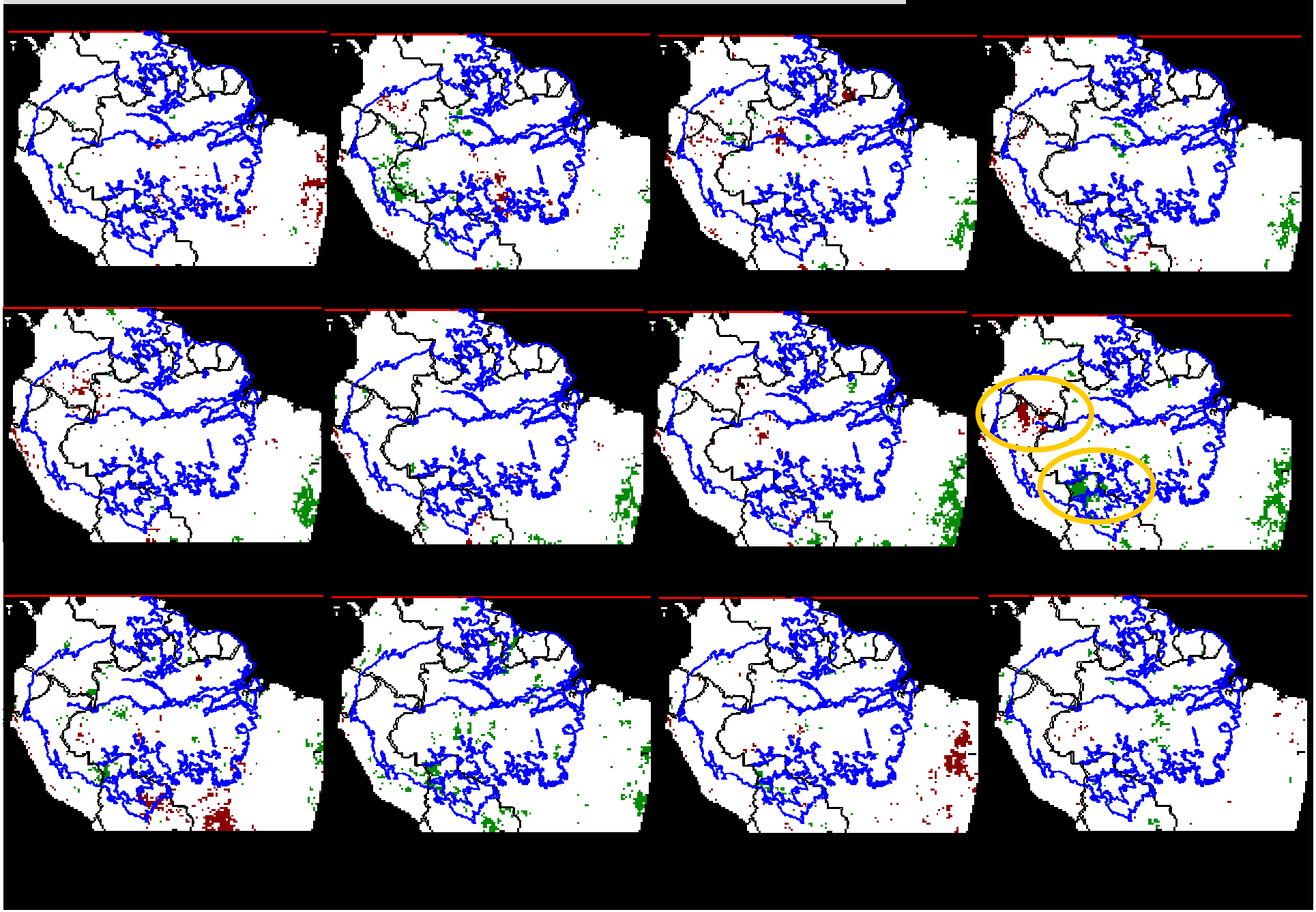
Results: *NDVI ANOMALY* ***2005*** *0.25°*



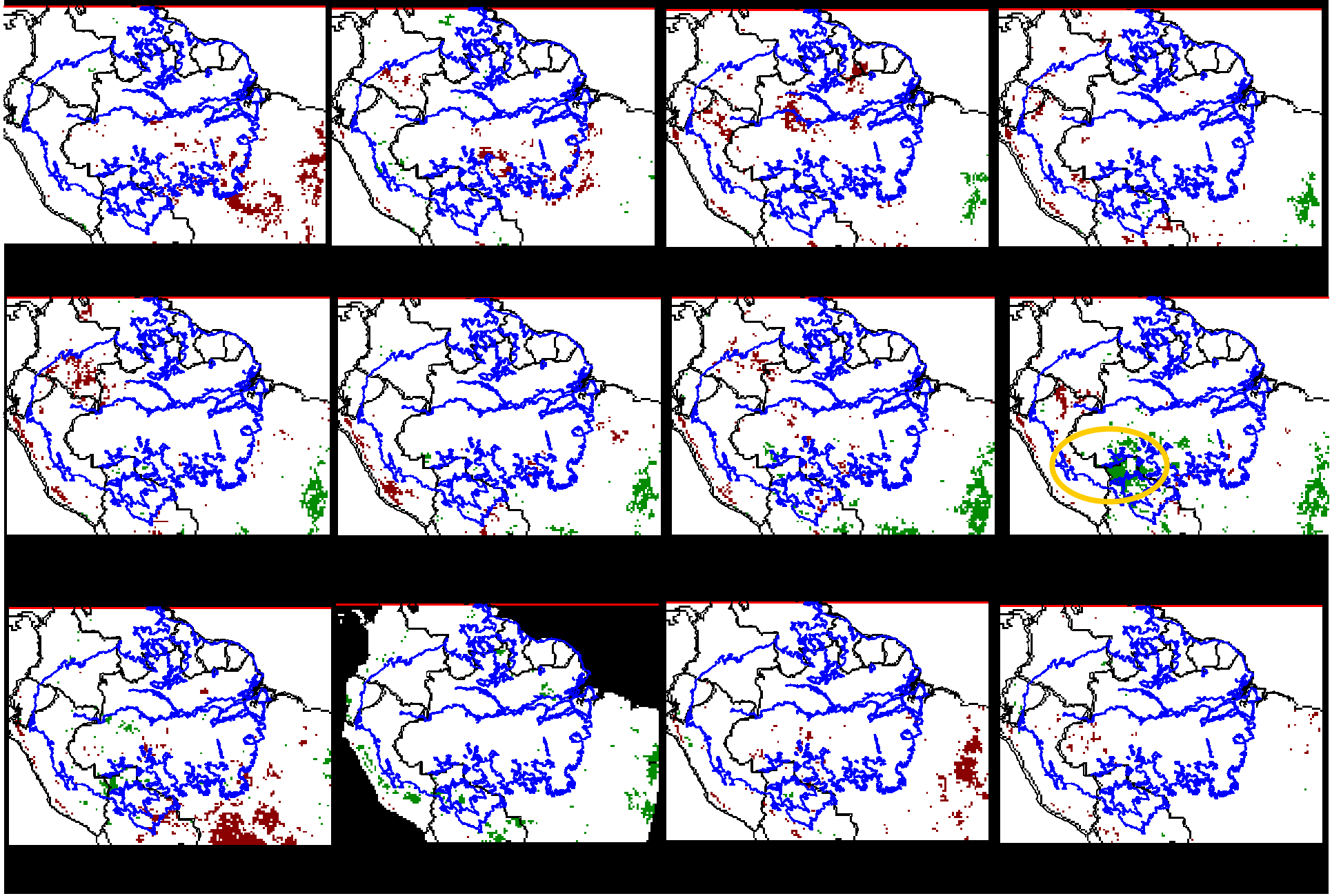
Results: *EVI ANOMALY* ***2005*** *0.25°*



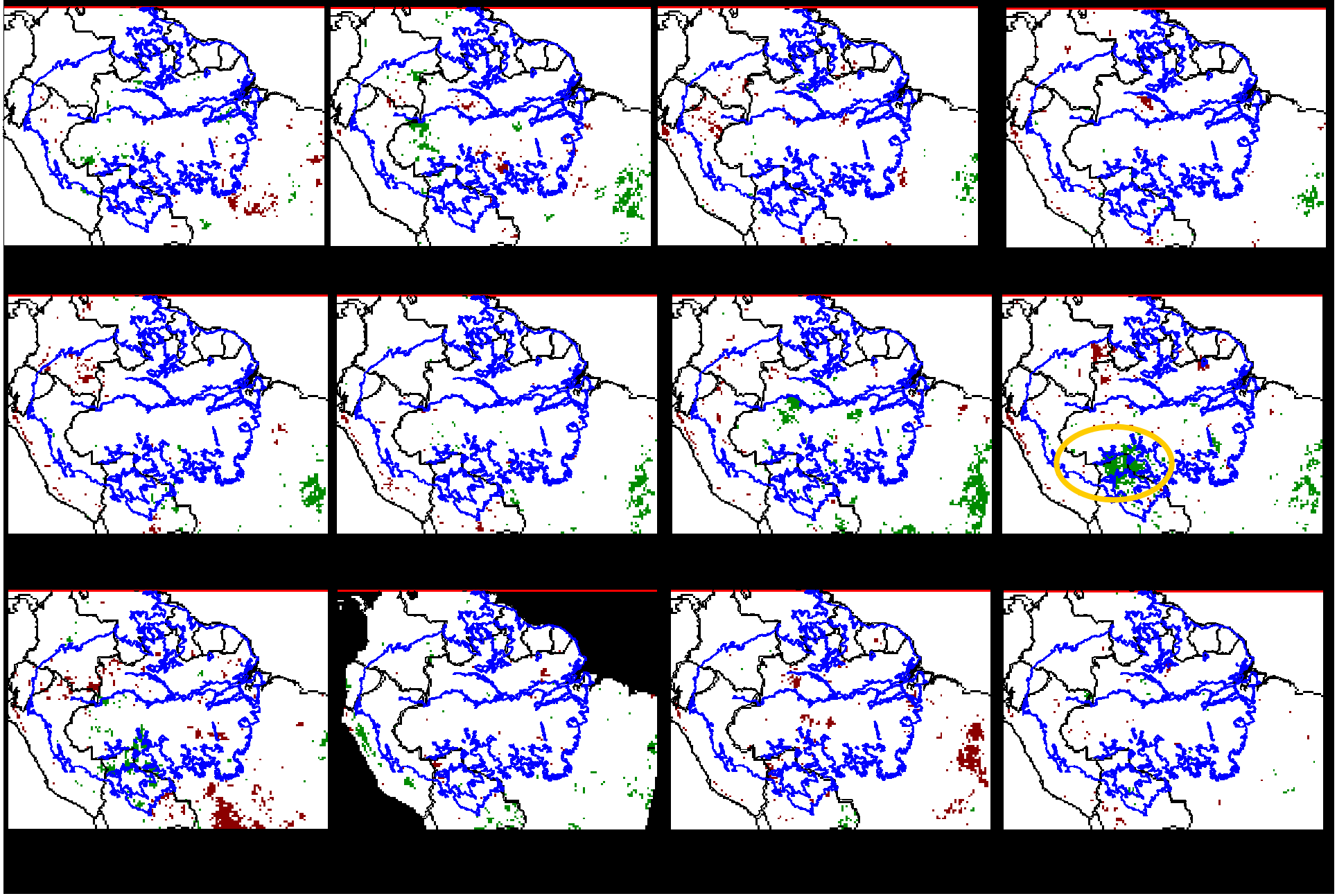
Results: *NDWI ANOMALY* ***2004*** *0.25^{O}*



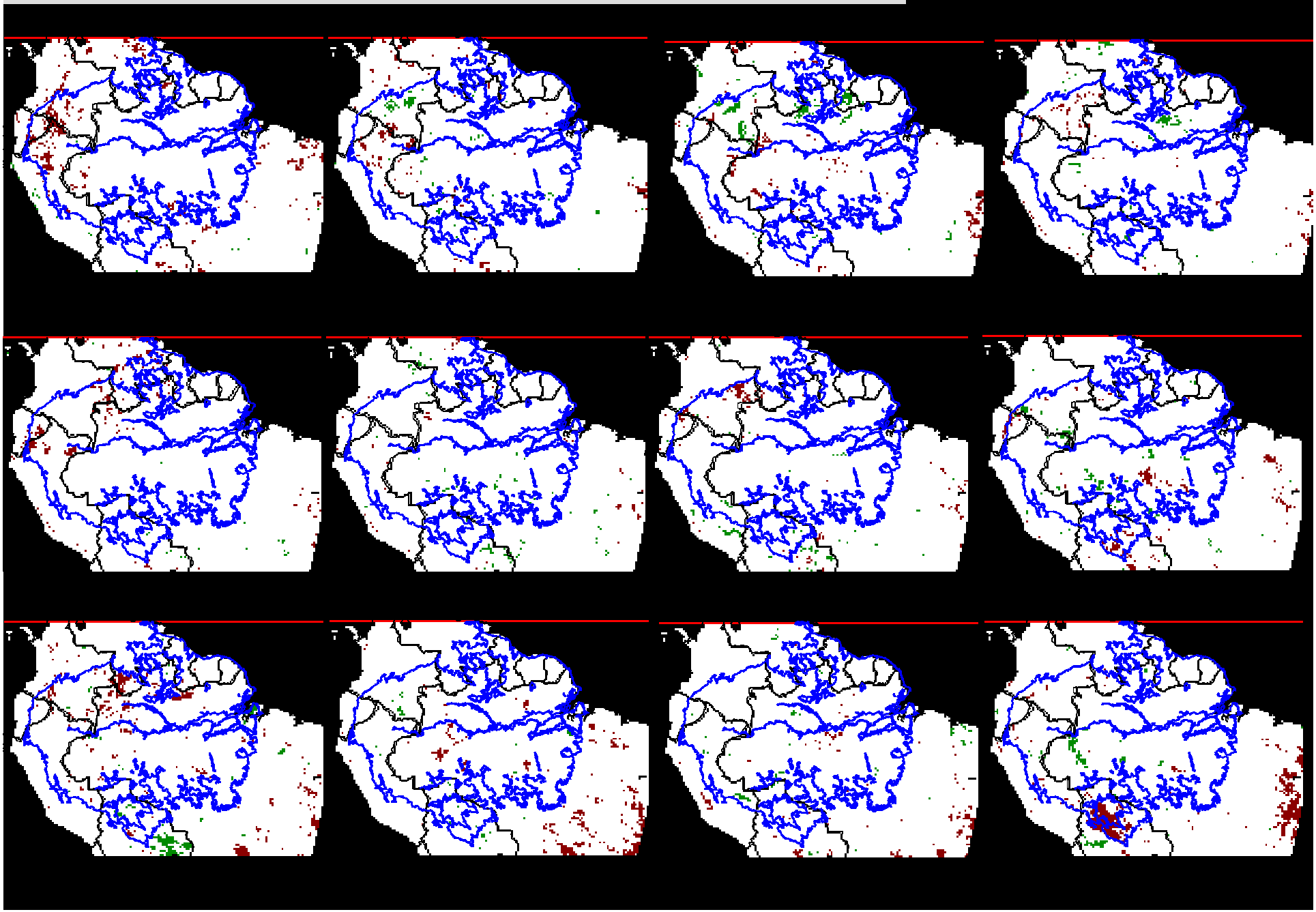
Results: *NDVI ANOMALY* ***2004*** *0.25°*



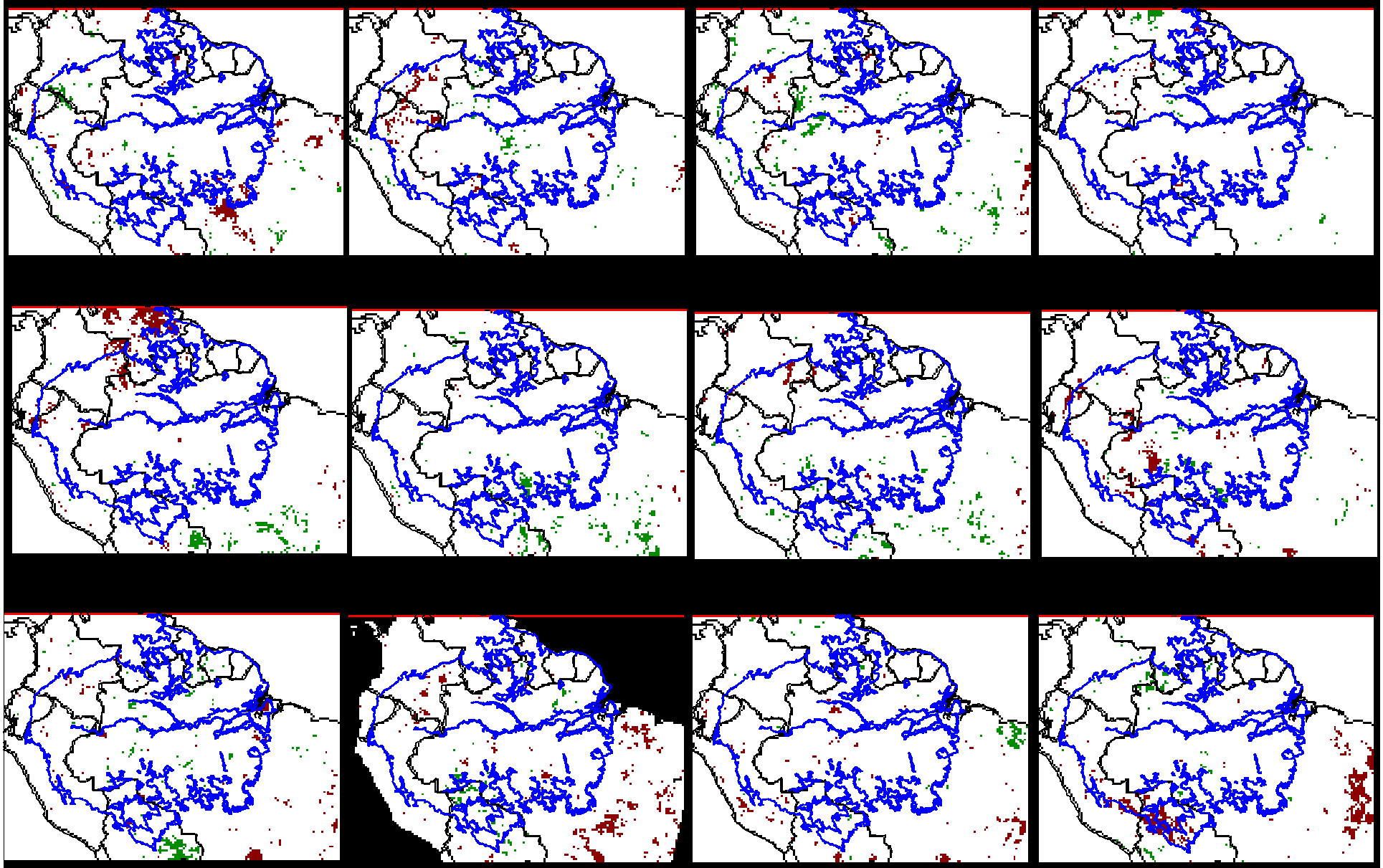
Results: *EVI ANOMALY* ***2004*** *0.25°*



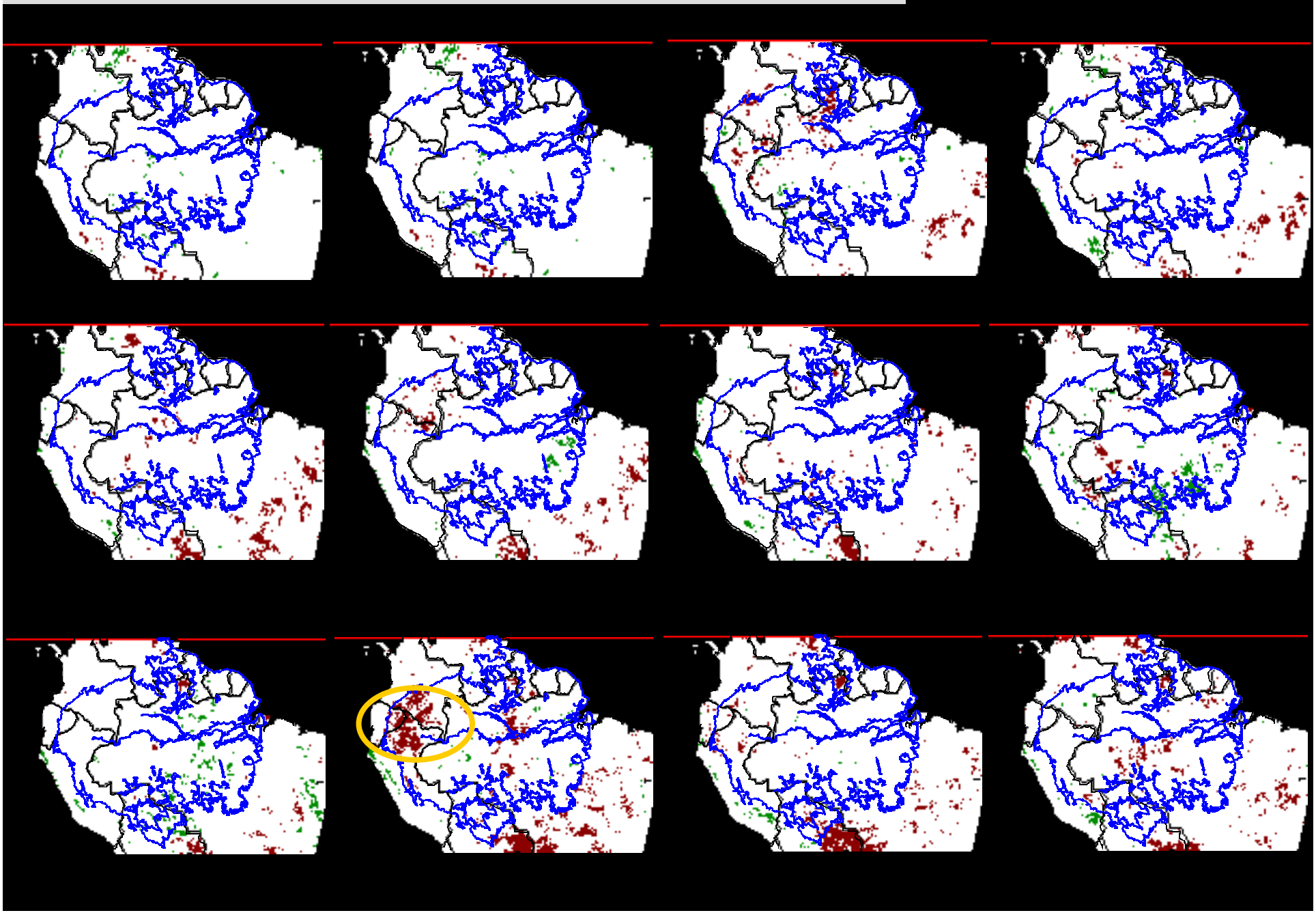
Results: *NDWI ANOMALY* ***2003*** *0.25^{O}*



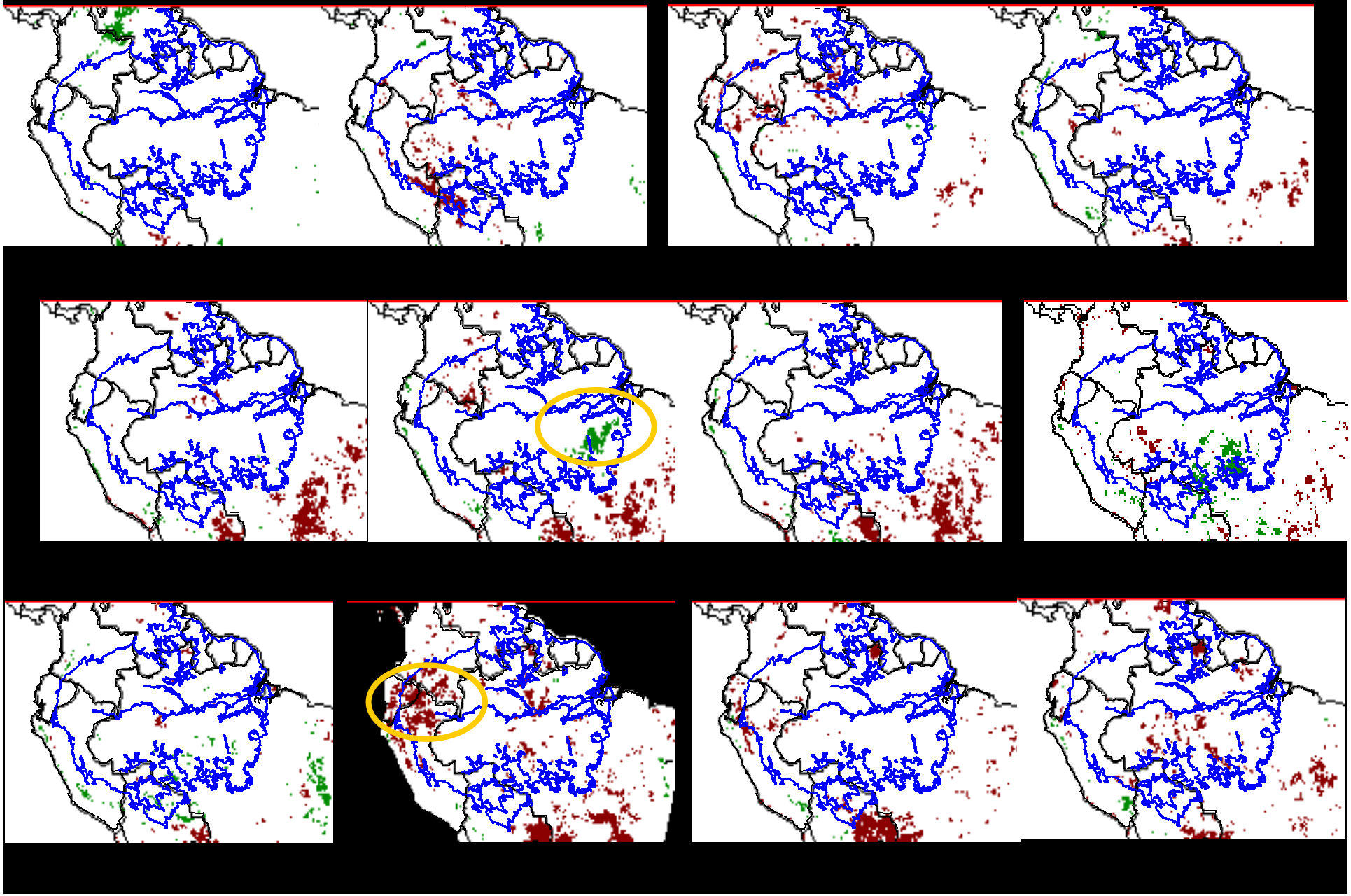
Results: *EVI ANOMALY* ***2003*** *0.25°*



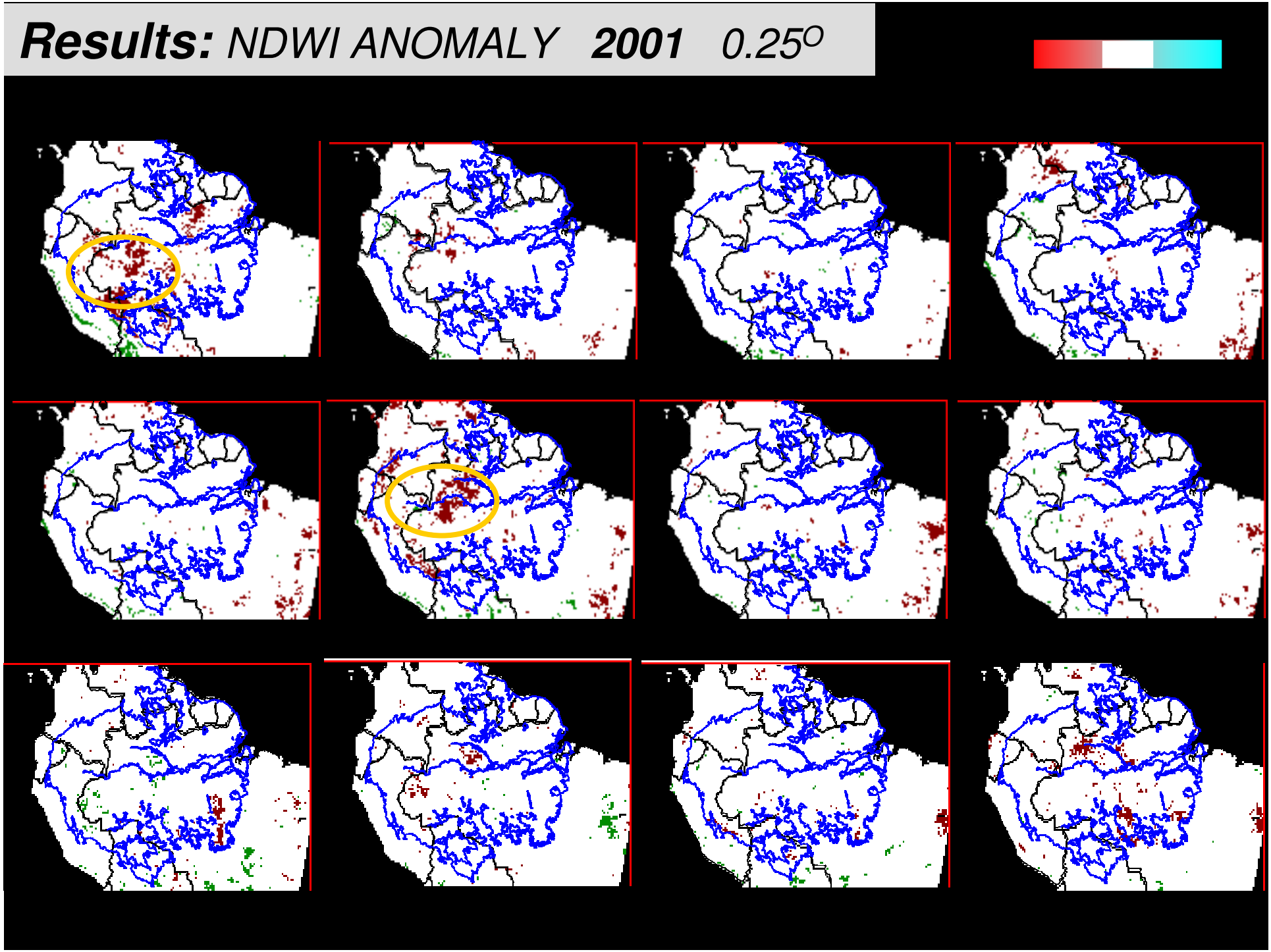
Results: *NDWI ANOMALY* ***2002*** *0.25°*



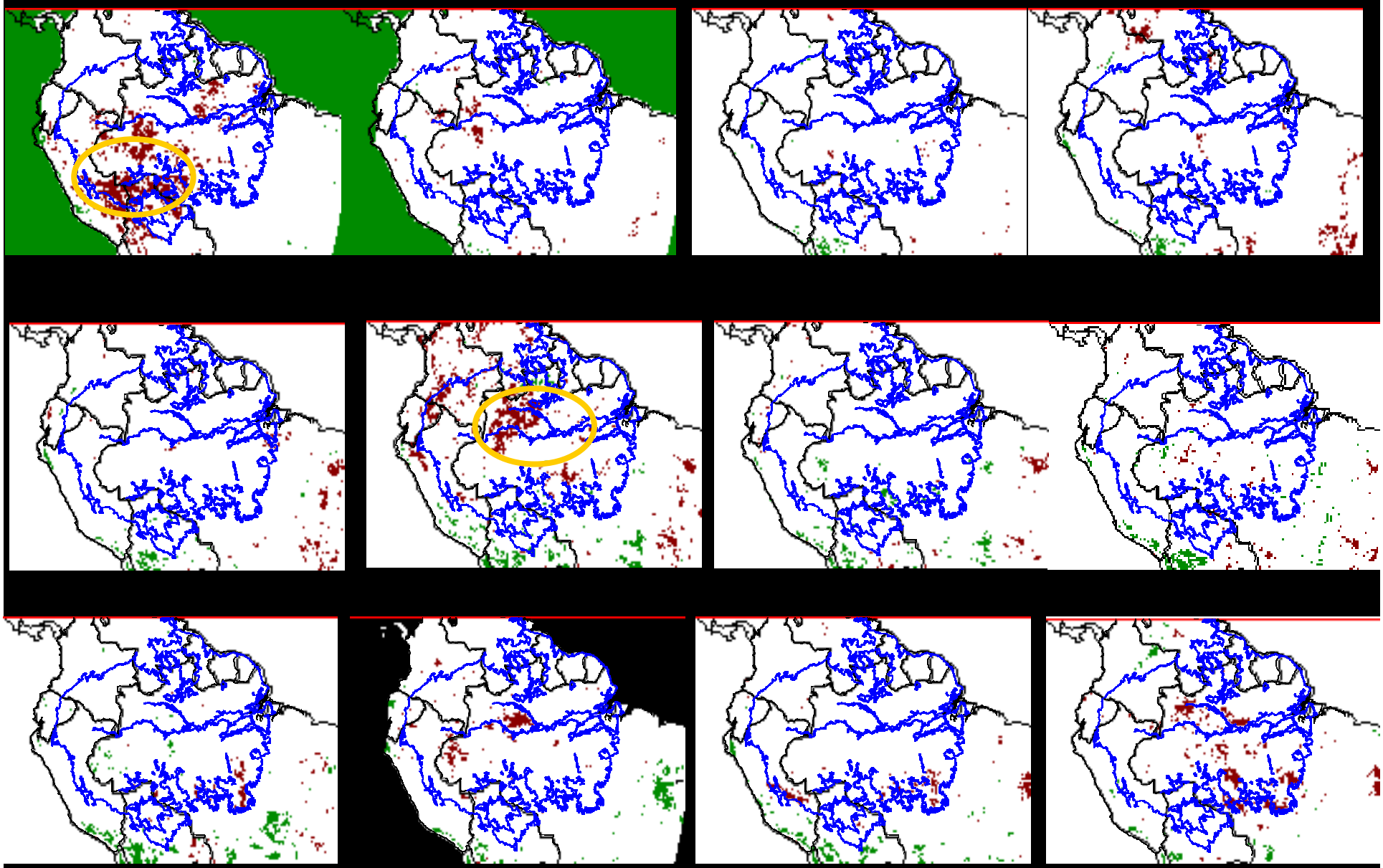
Results: *NDVI ANOMALY* ***2002*** *0.25°*



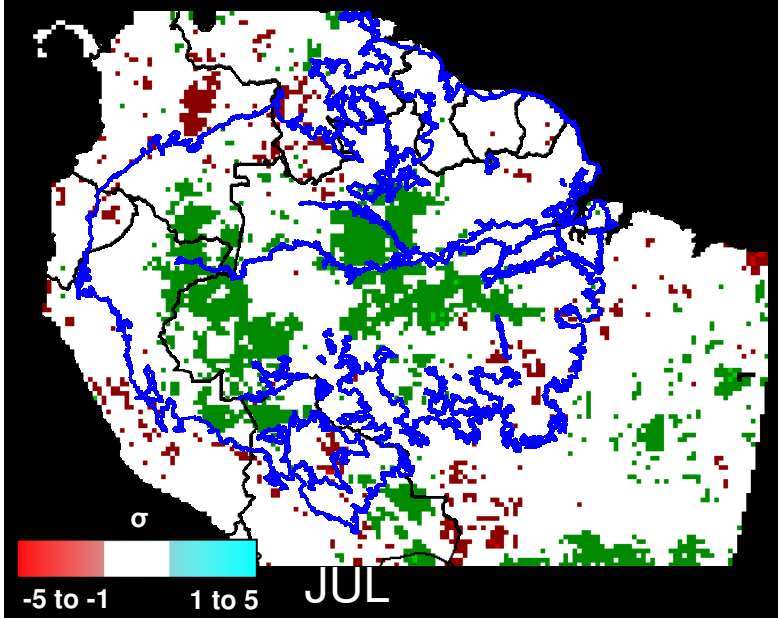
Results: *NDWI ANOMALY* ***2001*** *0.25°*

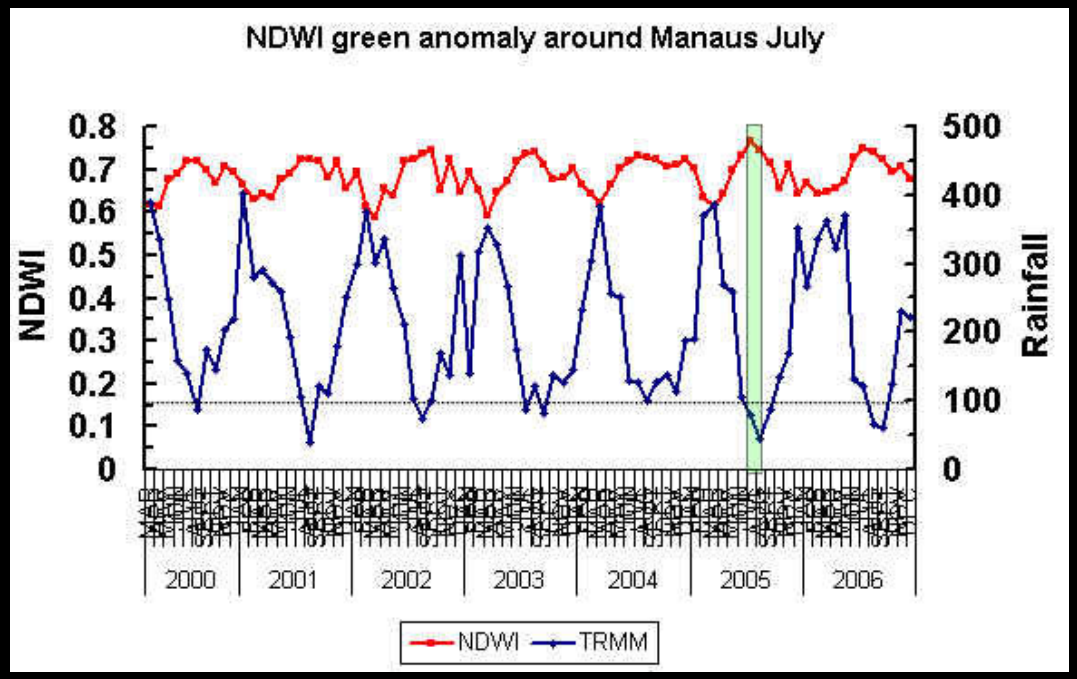


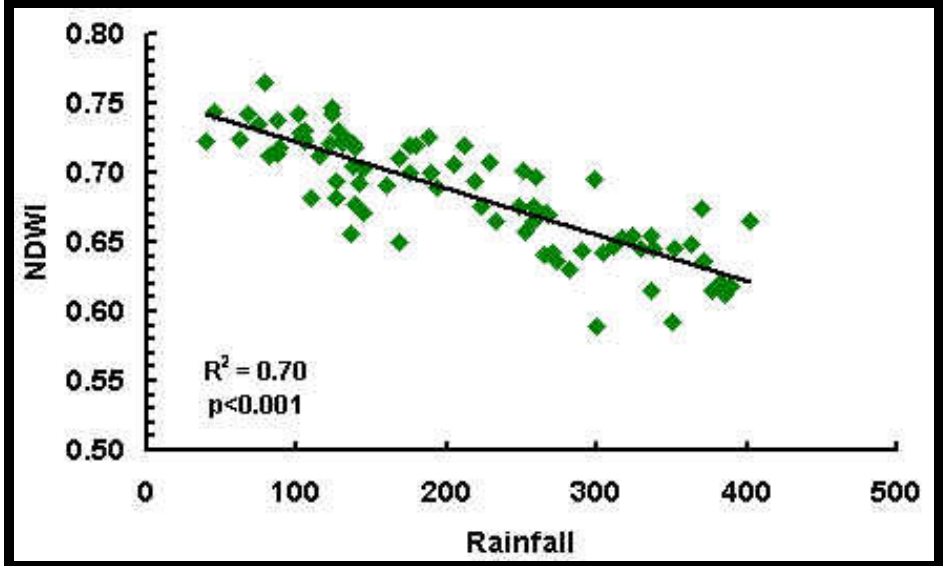
Results: *NDVI ANOMALY* ***2001*** *0.25°*

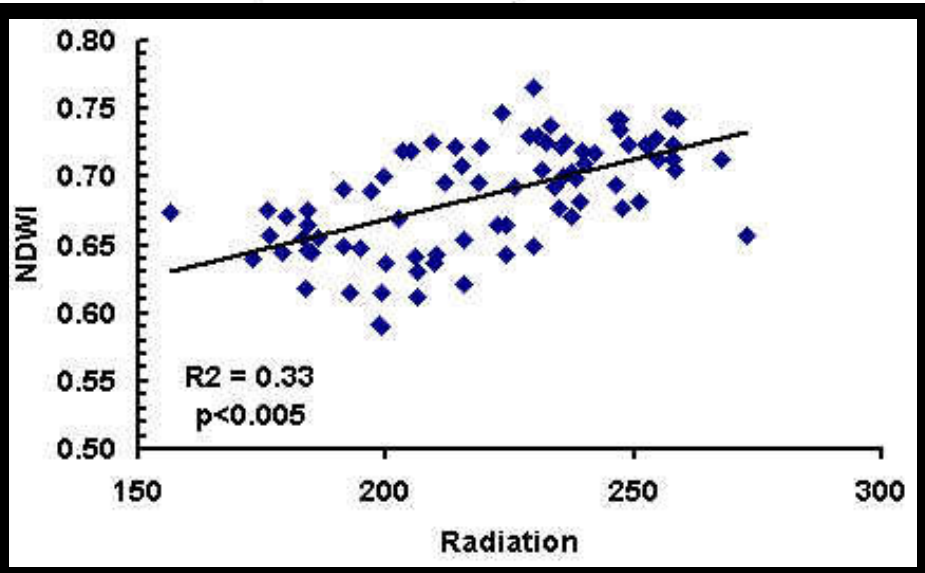


Results: *Remote Sensing data: NDWI*

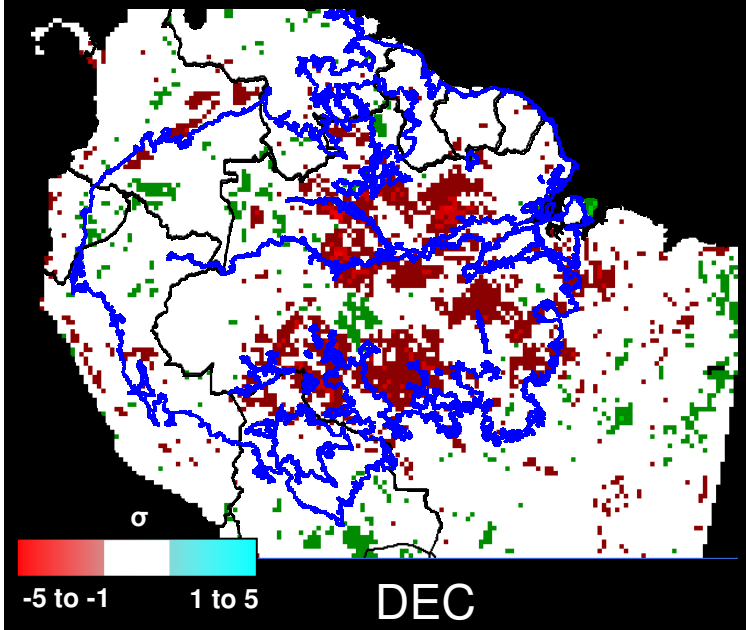


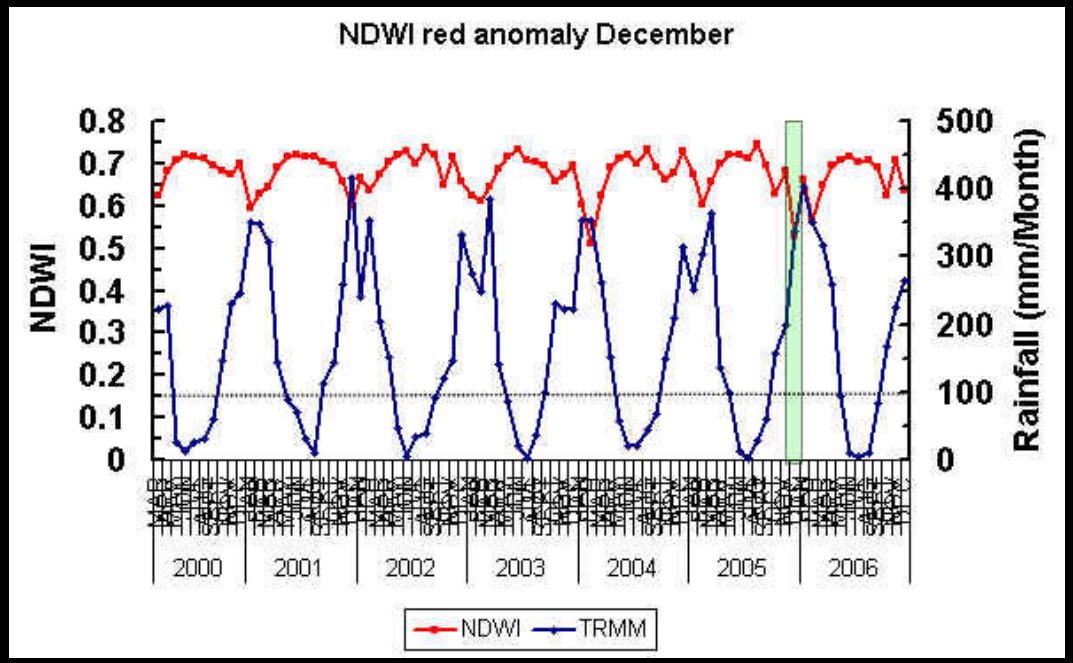


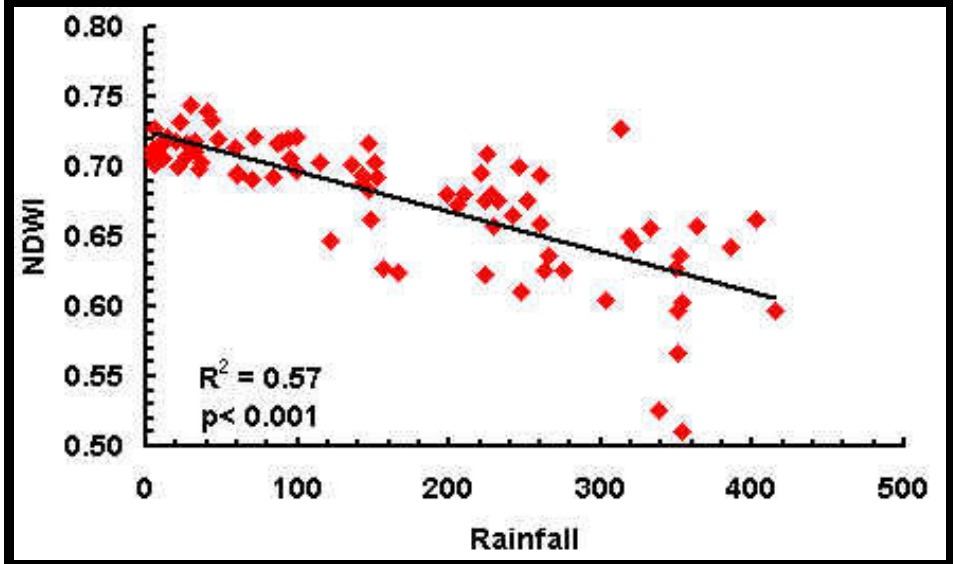


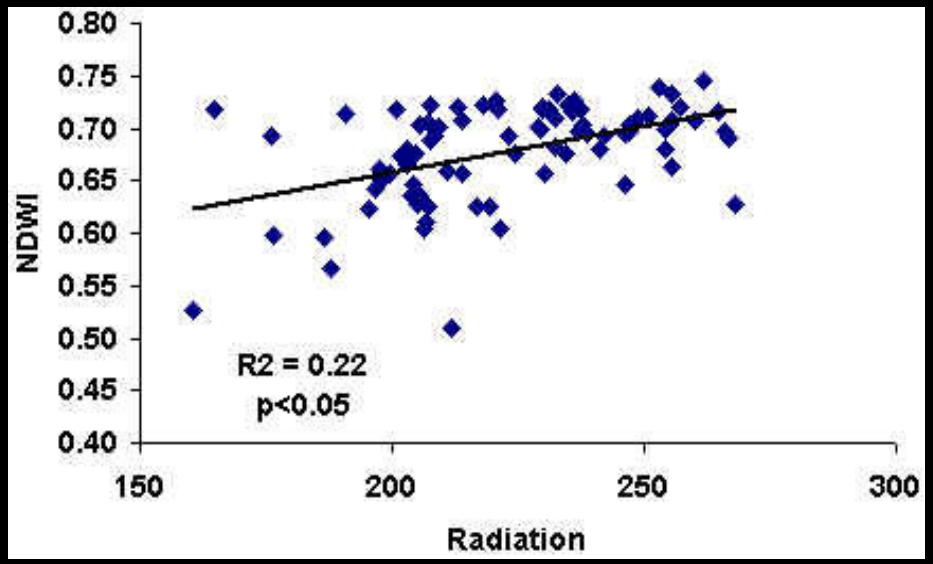


Results: *Remote Sensing data: NDWI*









Results: *Remote Sensing data: NDVI*

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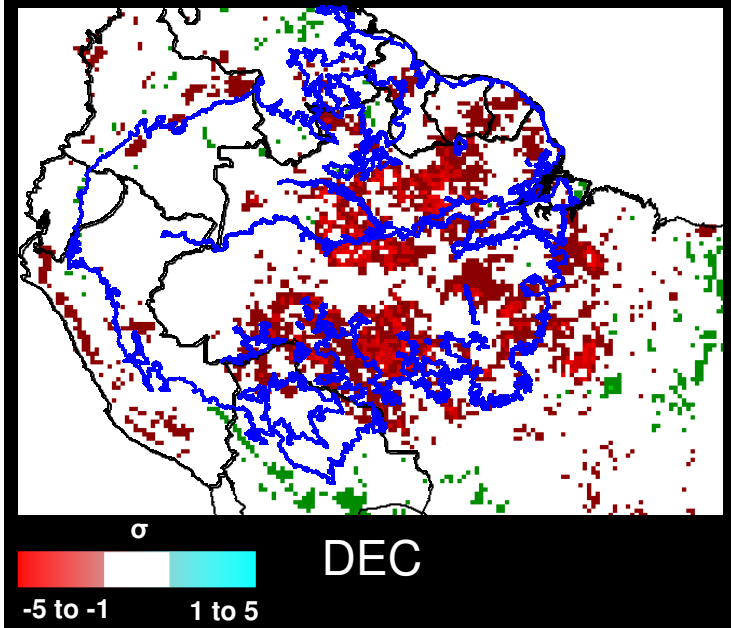
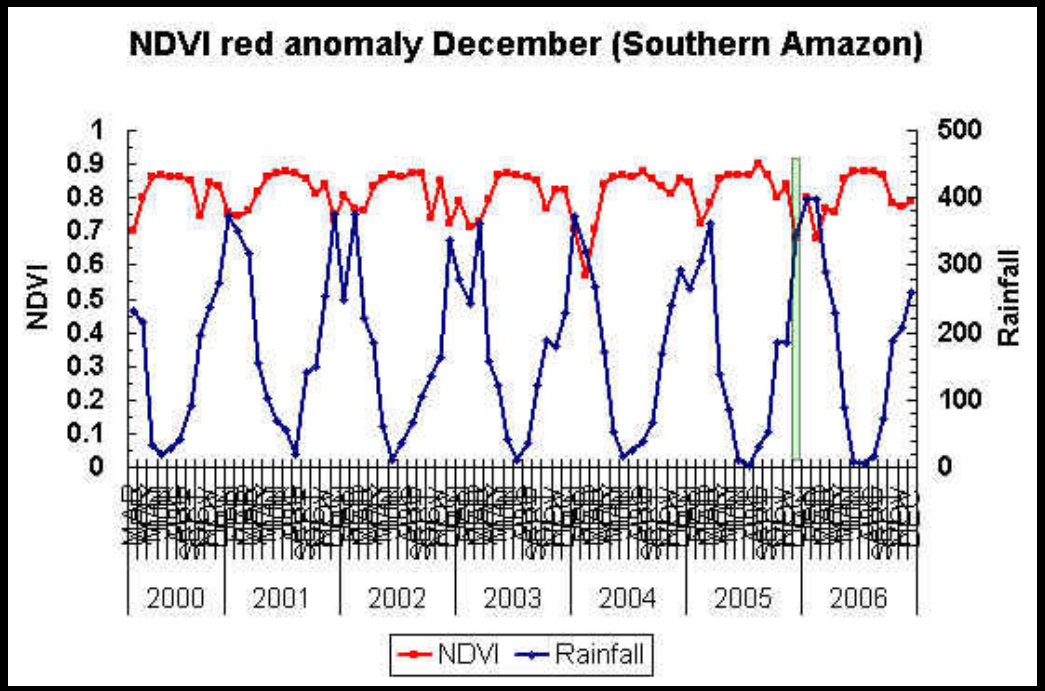
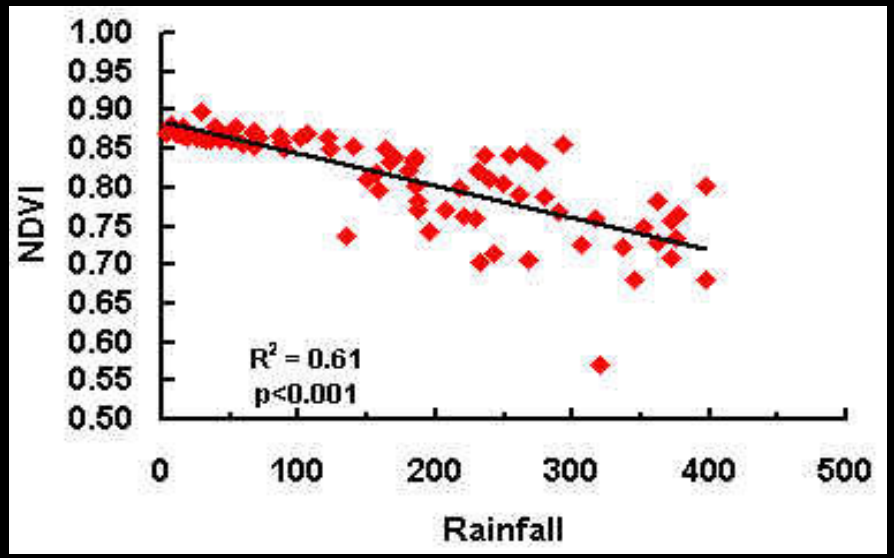
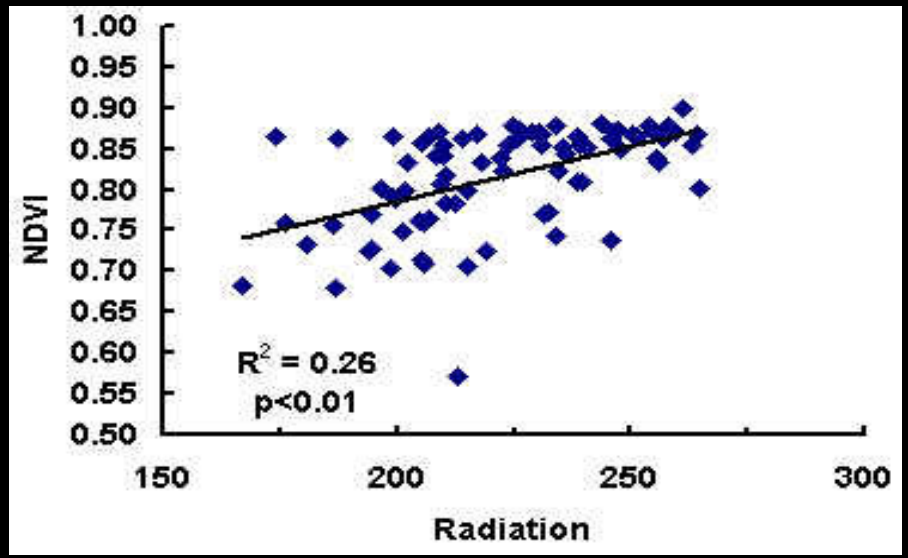
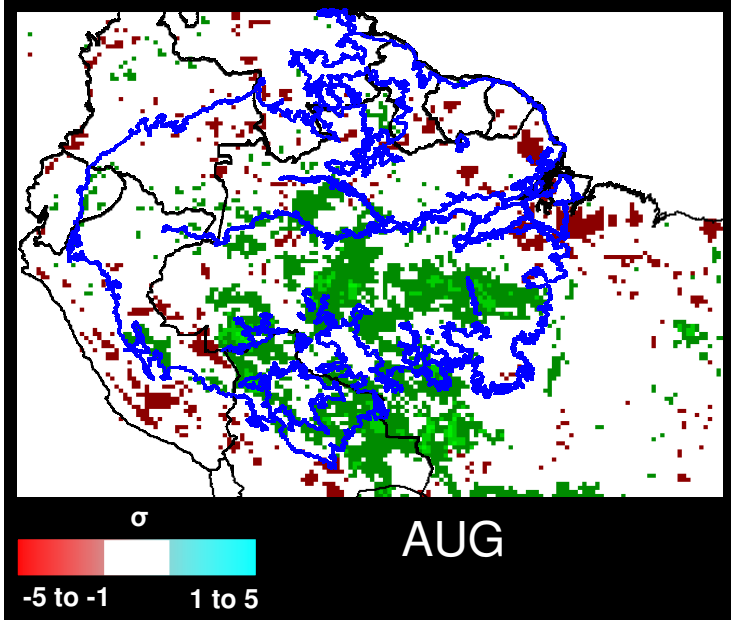
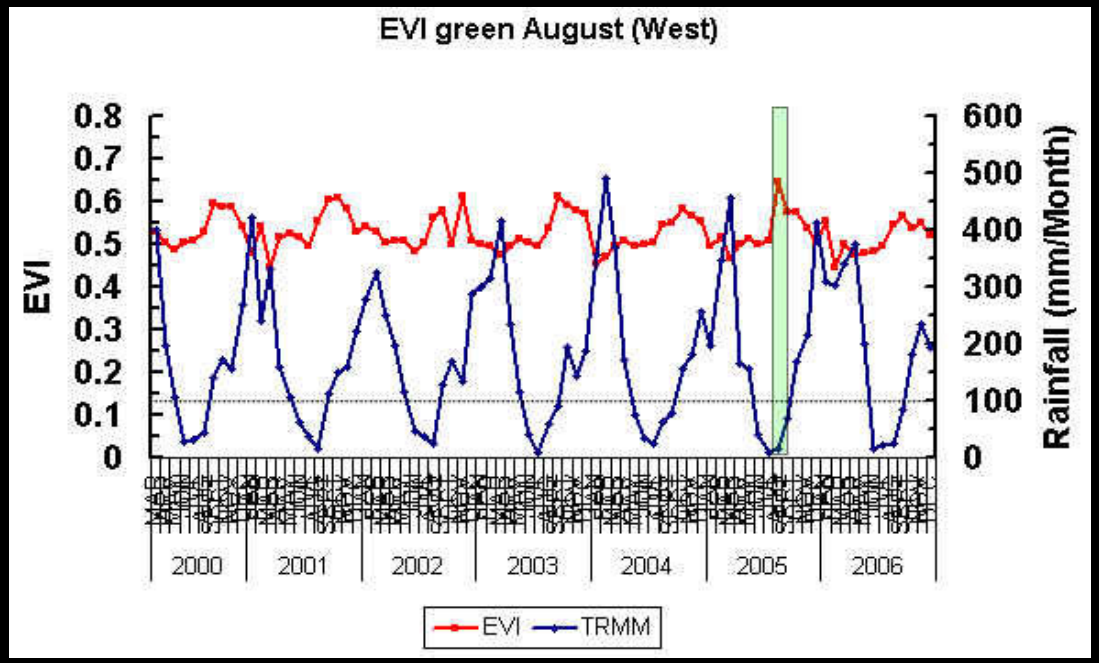
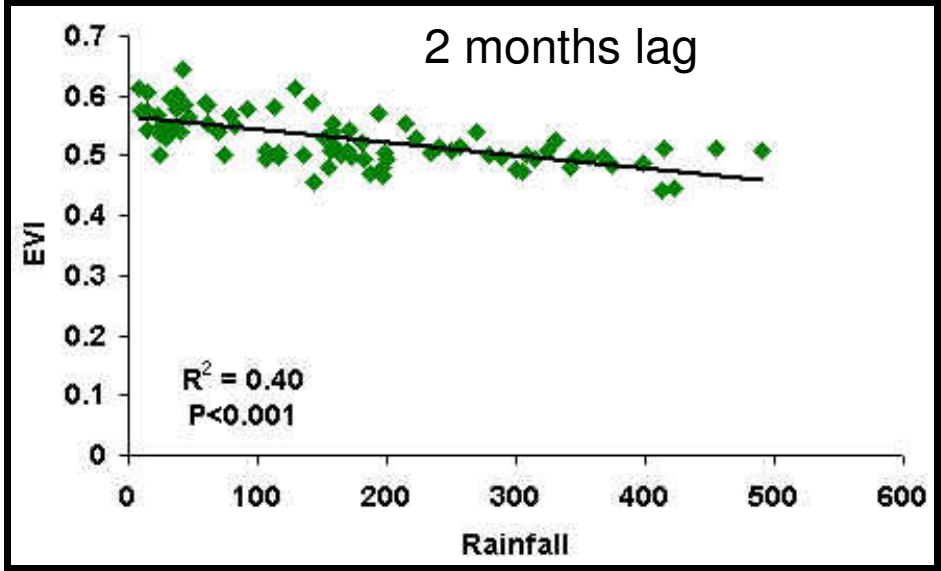
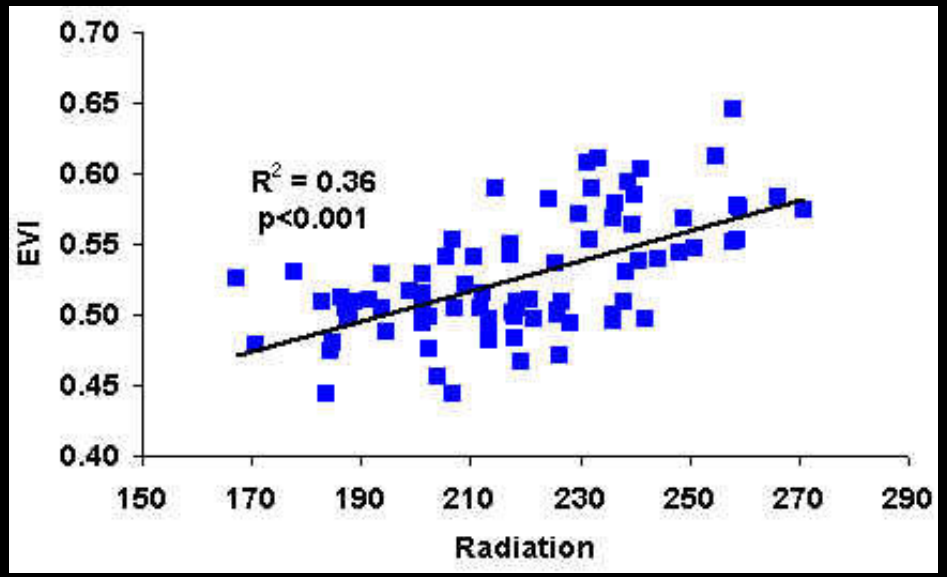








Results: *Remote Sensing data: EVI*

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