Seasonal and interannual variations of carbon fluxes at the Amazon Tall Tower Observatory (ATTO) site in 2014-2019

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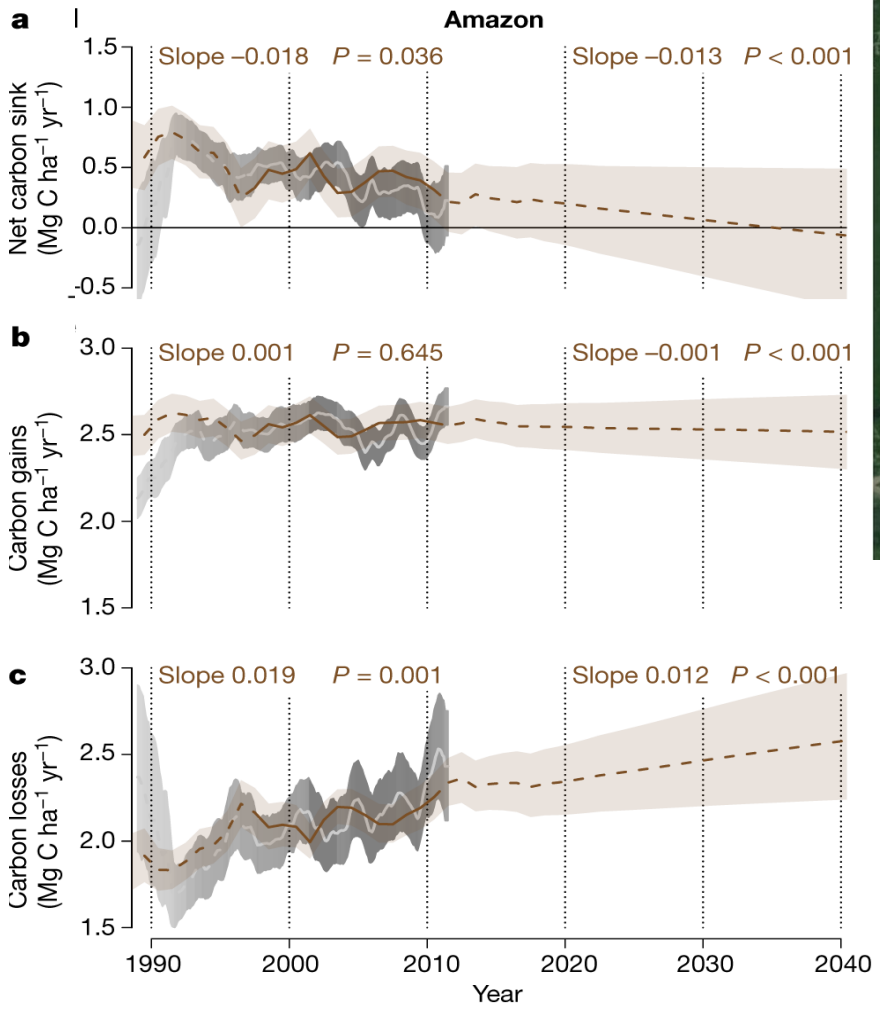
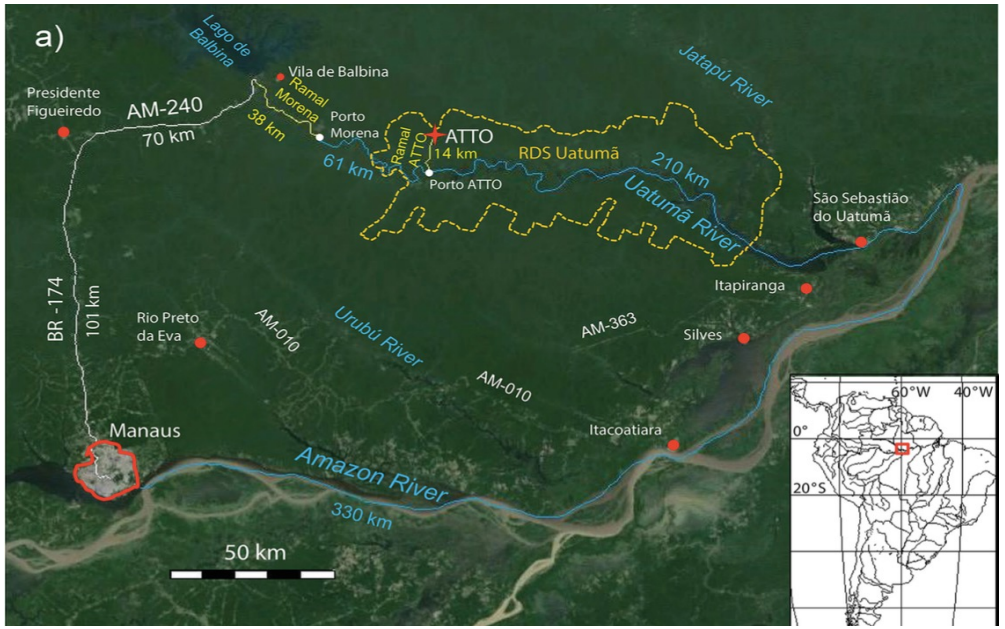
Background and ATTO site

Carbon dynamics in Amazon rainforest



ATTO site



Objectives

1. assess net ecosystem exchanges (NEE), gross primary productivity (GPP), ecosystem respiration (R_{eco}) in the central Amazon rainforest in 2014-2019
2. assess seasonal factors for GPP, R_{eco}

(Andreae et al., 2015, ACP; Hubau et al., 2020, Nature)

Flux Observation at ATTO 80 m tower

- Turbulent flux measurements
- Eddy Covariance (EC) system

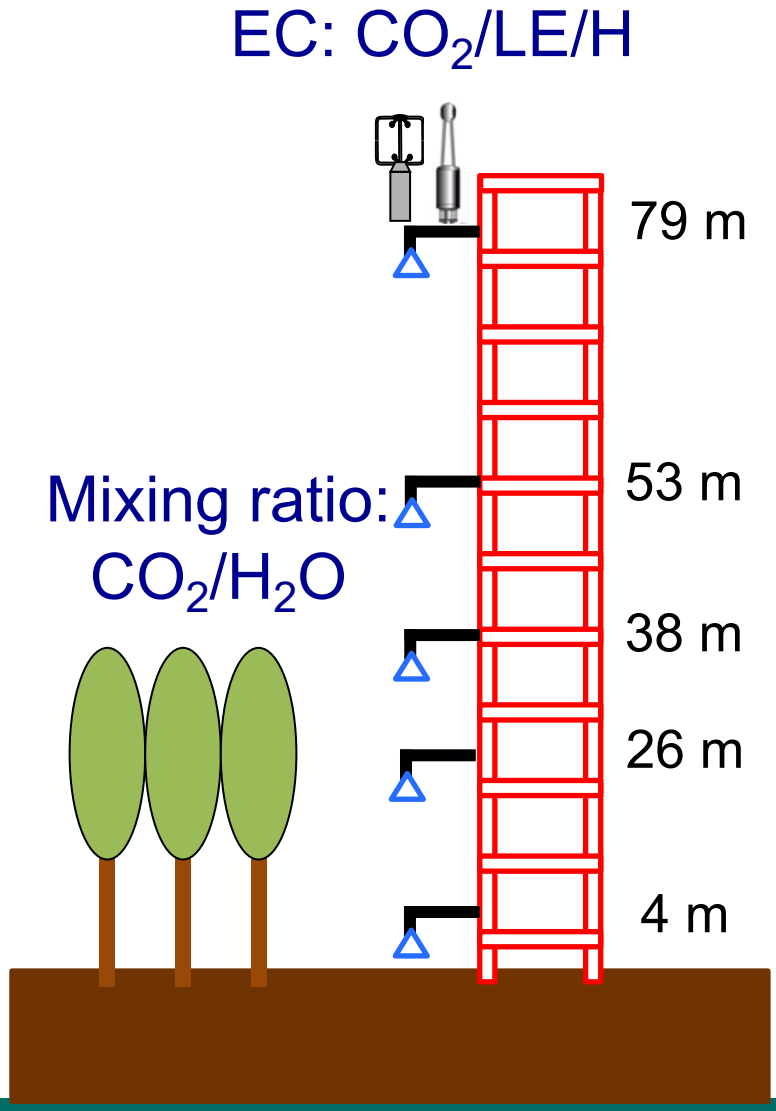
- Net flux = Turbulent flux + Storage flux

- NEE gap-filling
- Estimates of friction velocity thresholds (5th, 50th and 95th percentile)
- Marginal distribution sampling method by using the REddyProc package

(Reichstein et al., 2005, GCB; Wutzler et al., 2018, BG)

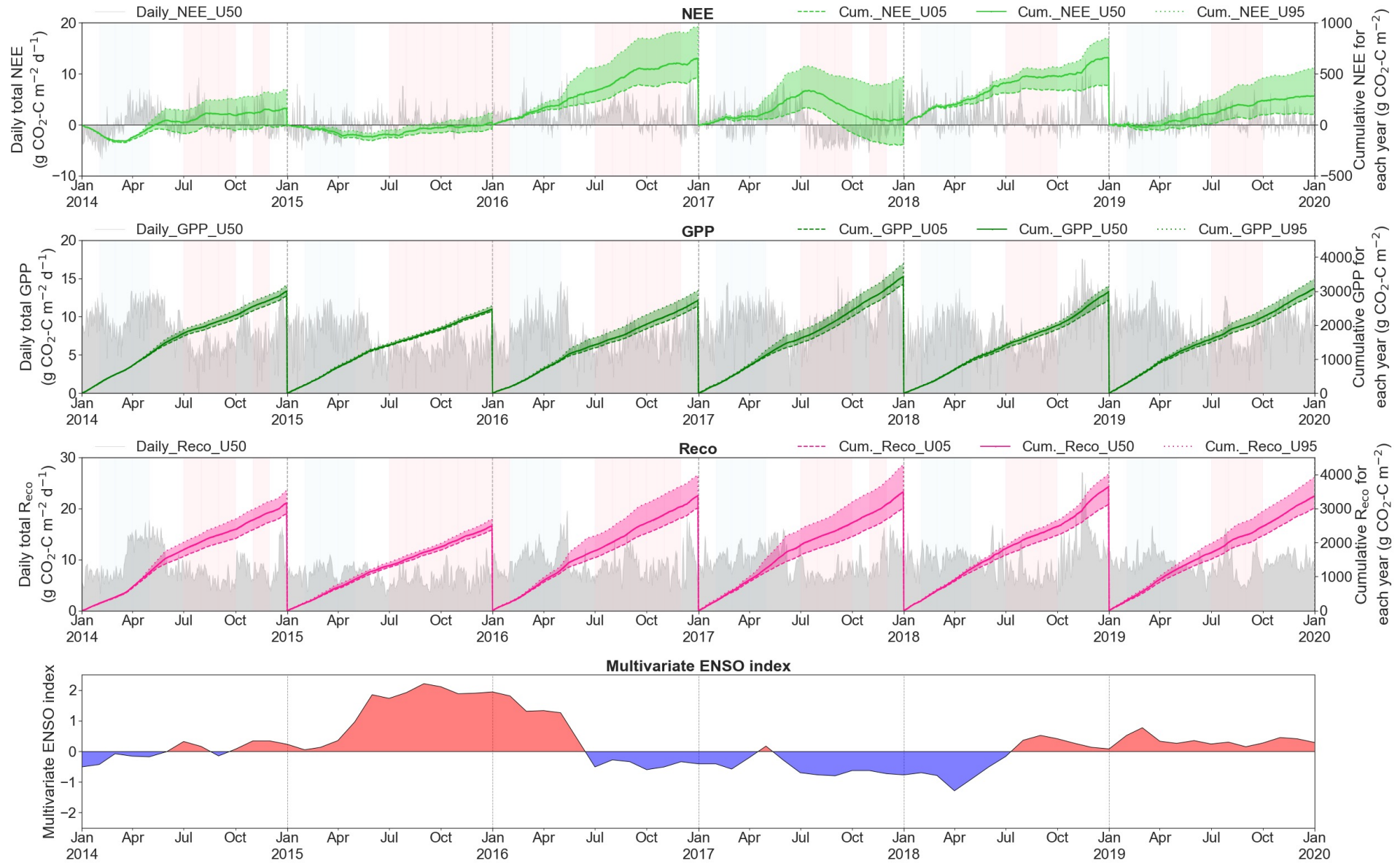
- NEE partitioning
- NEE = R_{eco} - GPP
- Daytime R_{eco} was estimated as the mean of two adjacent nighttime R_{eco}.

(Restrepo-Coupe et al., 2013, AFM)



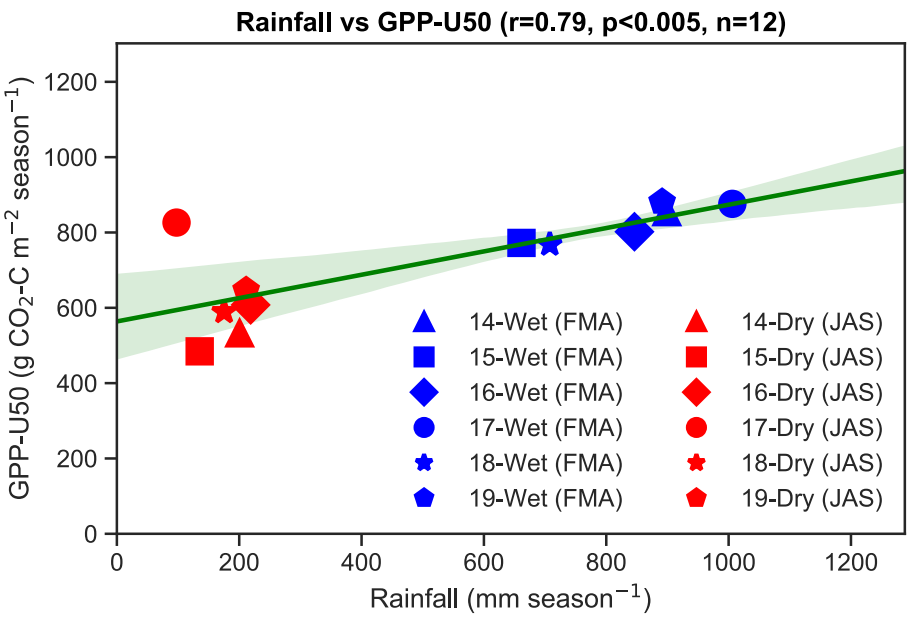
Inter-annual/seasonal variations in NEE, GPP, and R_{eco}

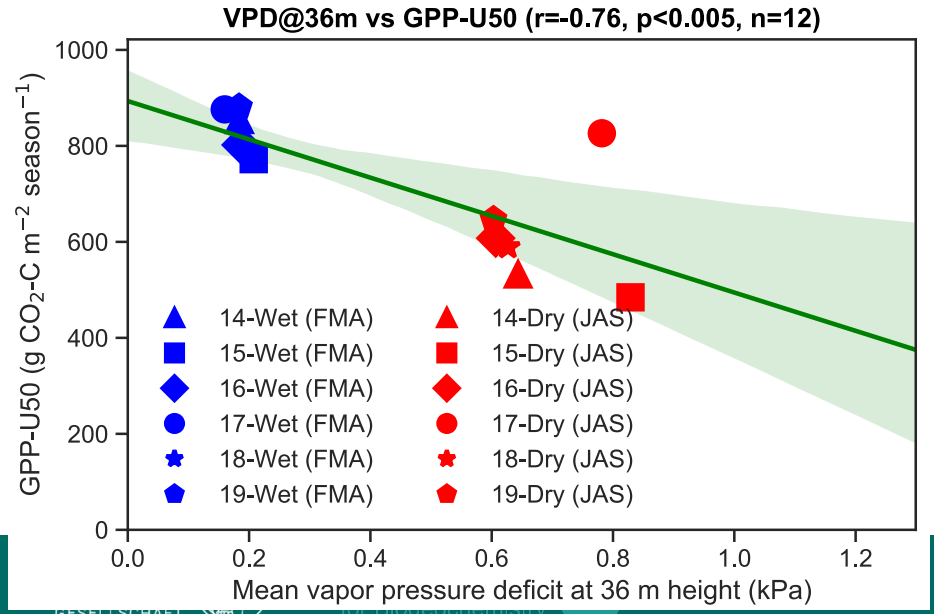
(Komiya et al., in prep.)



Seasonal factors for GPP

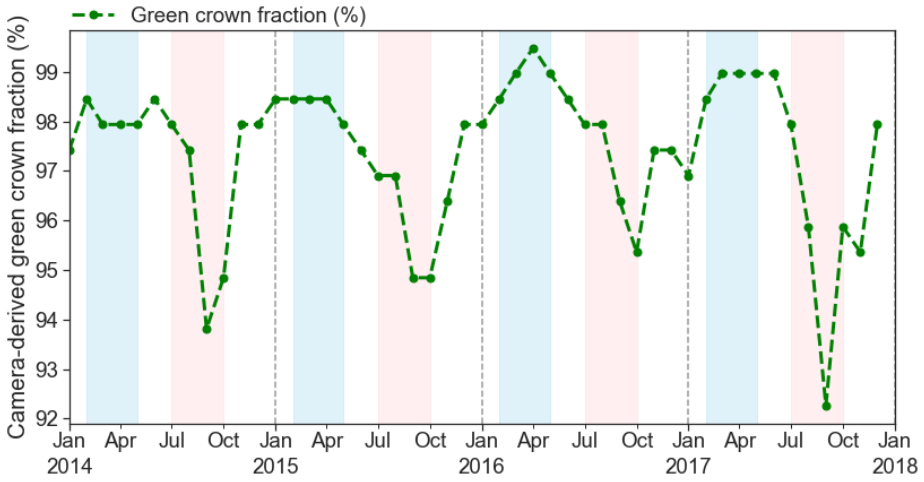
(Komiya et al., in prep.)





- **Upper canopy leaf phenology**
  - monitored by a StarDot RGB imaging system at 81 m AGL
    (provided from Dr. Bruce Nelson, INPA, and Dr. Eliane Gomes-Alves, MPI-BGC)
- **Green crown fraction**

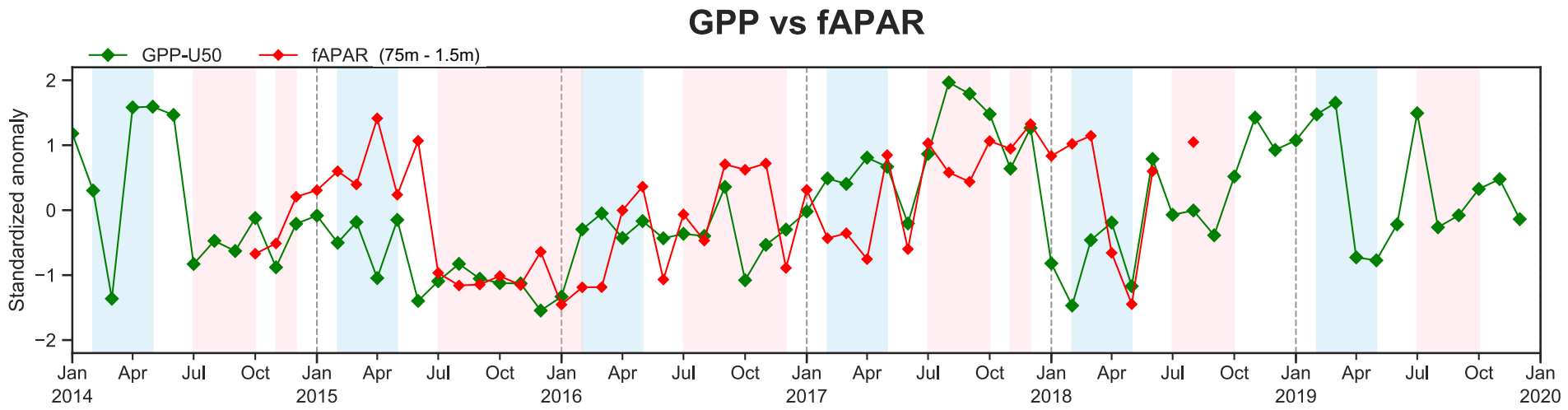
= Percentage of tree crowns with green leaves
= 100% – the percentage of tree crowns with leaf abscission



- **Green crown fraction in 2017-dry season**
  - The lowest value means the highest percentage of deciduous tree crowns in the top canopy.
  - More light was available in the sub-canopy trees.
  - This likely contributed to the highest GPP in 2017-dry season.

Standardized anomalies of GPP and fraction of incident PAR (fAPAR)

(Komiya et al., in prep.)



- **Summary**
  - Amazon rainforest at the ATTO site is turning into carbon source.
  - GPP in wet/dry season relate to precipitation and VPD.
  - The largest GPP in 2017-dry season was likely related to light availability inside the.

- **Questions??**

  -Please feel free to contact me by email (skomiya@bgc-jena.mpg.de)

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