During dry season, trees are able to take water from deep soil or groundwater due to deep roots. Such soil and annual processes are generally assumed to be relatively constant across tropical regions. However, there are still significant disagreements between model simulations and observations, especially in tropical regions. For instance, most models fail to capture Amazon greening up during dry season (Sukhodolov et al., 2006).

Therefore, the mechanisms for Amazon greening up in dry period needs to be studied in order to improve model performance of vegetation dynamics in tropical regions.

Hypothesis
During dry season, trees are able to take water from deep soil or groundwater due to deep roots. Such processes are missing in most current dynamic vegetation models.

Materials and methods
Dynamic global vegetation model
LPFVSSS model (Braathen et al., 2008), one of the most commonly used model of dynamic vegetation models, is used in this study (Fig. 1). Spatial resolution is 0.5 degrees.

- The current LPFVSSS model assumes that there are two soil layer with constant soil depth, i.e. 0.5 m for the upper layer and 1 m for the bottom layer.

Input Data for the model
- CRUCLP data set: precipitation, temperature, radiation, carbon deposition.
- Soil depth data (Poulter et al., 2016): average soil and sedimentary deposit thickness, spatial resolution of 30 arc second.
- Water table depth data (Fan et al., 2013): 30 arc seconds resolution.
- Temperature, precipitation, radiation, CO2

Validation
- Gross Primary Production (GPP), one of ecological term to describe terrestrial carbon balance, is taken as an indicator for model evaluation.
- GPP data produced at MTG (Jung et al., 2011) is considered as observations.

Results
- Results after increasing soil depth and including groundwater
- Results from the old model

Discussion and Conclusions
- Groundwater plays a more important role than deep soil regarding to tropical rainforests growing up in dry period, while previous studies found that mainly increasing soil depth, GPP could maintain in the dry period for tropical rainforests (Baker et al., 2008; Peucker et al., 2009).
- It is found that trees have stronger demand of groundwater when water table is deeper. Groundwater could contribute to a large proportion of Amazon evapotranspiration (Pan, 2017).
- The sensitivity of GPP is still not well captured compared to observations based on the fact that the trend of modelled GPP before dry years is an inverse of observations. Therefore, in order to enhance our understanding of the ecosystem response of tropical forests to climate, more mechanisms need to be investigated.

References