

Algorithm Theoretical Basis Document

GCOM-C/SGLI Vegetation Indices (VGI) (T2A)

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1. Introduction

The objective of the T2A algorithm is to calculate vegetation indices as one of the SGLI Level-2 (L2) land products. The output of T2A algorithm becomes the input for the statistics products (G4A and G5A).

2. Theoretical Description

2.1 General description of the Algorithm

The algorithm calculates two vegetation indices using the reflectances at visible and near-infrared wavelength regions. One is the Normalized Difference Vegetation Index (NDVI) and the other is the Enhanced Vegetation Index (EVI) defined as the following equations,

$$\text{NDVI} = (\text{R}_{\text{NIR}} - \text{R}_{\text{red}}) / (\text{R}_{\text{NIR}} + \text{R}_{\text{red}}) \quad \text{Eq. (1)}$$

$$\text{EVI} = G * (\text{R}_{\text{NIR}} - \text{R}_{\text{red}}) / (\text{R}_{\text{NIR}} + \text{C1} * \text{R}_{\text{red}} - \text{C2} * \text{R}_{\text{blue}} + \text{L}) \quad \text{Eq. (2)}$$

where R_{NIR} , R_{red} , and R_{blue} are the atmospherically corrected reflectance of near-infrared, red, and blue channels of SGLI, and G , C1 , C2 , L are constant numbers.

These vegetation indices become large when the vegetation density is large. NDVI is a simple normalized index that can be used to indicate the activity of vegetation making use of the reflectances at red and near-infrared wavelengths where the reflectance of vegetation exhibits a steep increase like a step function. EVI is an improved version of vegetation indices designed to enhance the vegetation signal in high density vegetation area.

2.2 Processing flow

Figure 1 indicate the flow of the T2A L2 Tile processing. Input is L2 tile daily radiance at the Top of the Atmosphere (LTOA) products with spatial resolution of 250m or 1km. Output is daily tile product containing vegetation indices (NDVI and EVI) and the flag for quality assurance (QA_flag) with the same spatial resolution.

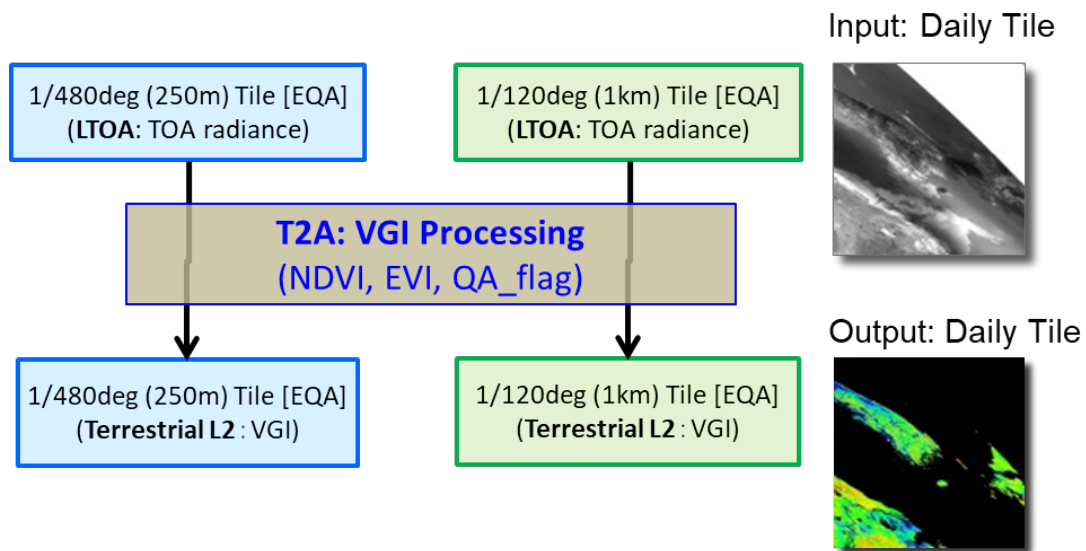


Fig. 1 Flow of the T2A L2 Tile processing

2.3. Sample images

Figure 2 indicate sample output images for the T2A processing. High density vegetation areas are shown in red while city or bare land with sparse vegetation are shown in blue.

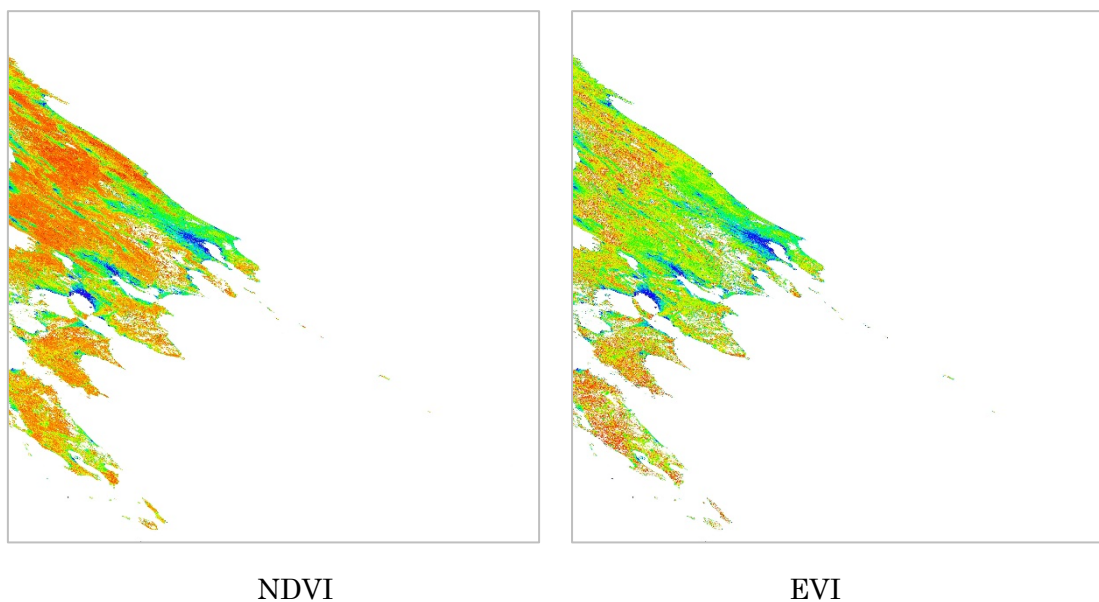


Fig. 2 Sample images of the T2A processing. (Left: NDVI, Right: EVI, Observation Date: September 19, 2018, Tile No.: 0529)

Figure 3 indicate Level-3 8-day average global map of NDVI and EVI, which is the output of G7A processing. Similar to Fig.2, high density vegetation areas are shown in red while city or bare land with sparse vegetation are shown in blue.

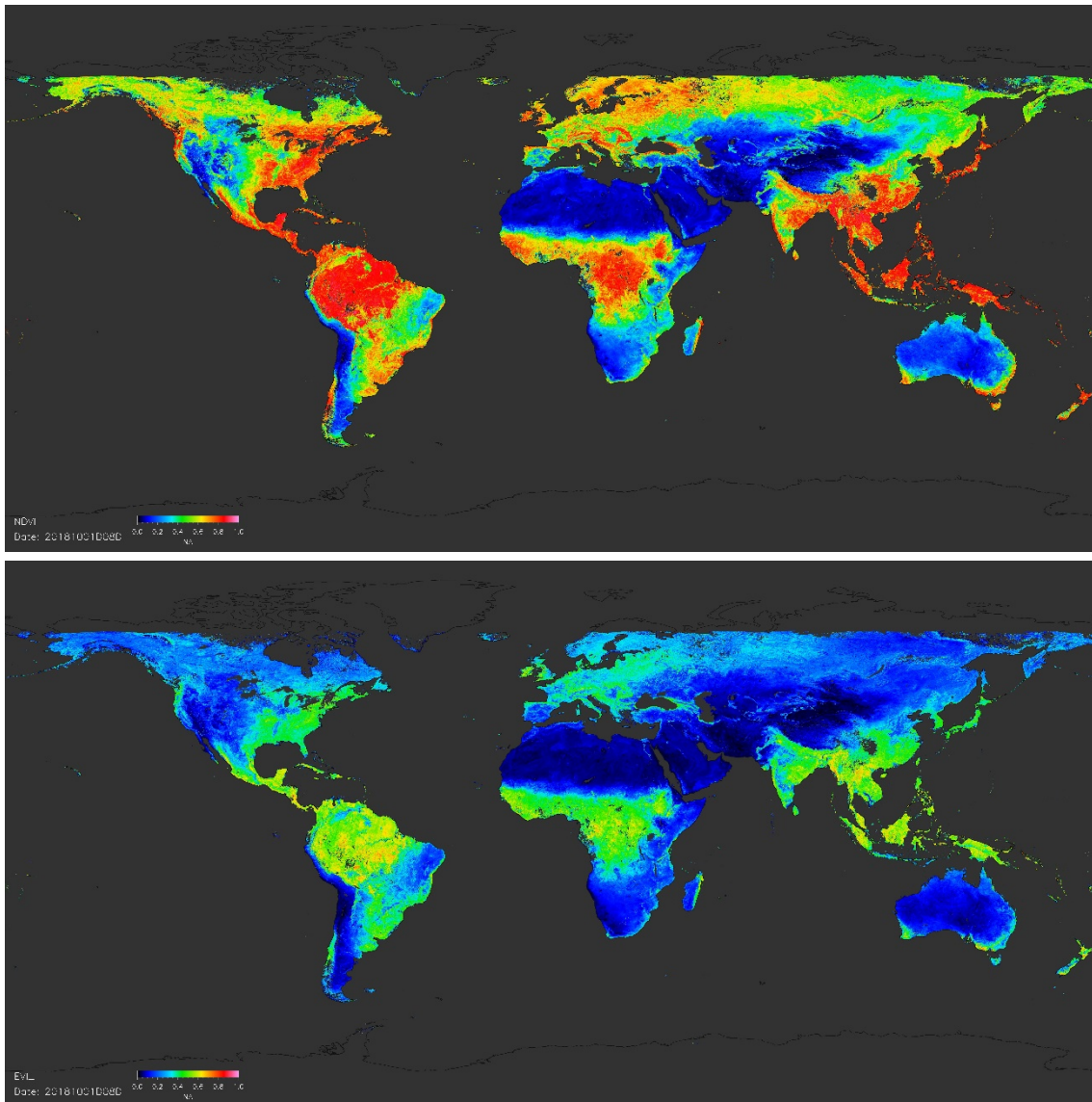


Fig. 3 Sample images of Level-3 8-day average global map of NDVI and EVI (output of G7A processing). (Upper: NDVI, Lower: EVI, Observation Dates: October 1 to 8, 2018)

3. Current status of the T2A algorithm implementation

The T2A process works well without system errors. Processing speed and memory size are also within the expectations.