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Science from Above

April 18, 2020

Dear colleagues,

Re: <u>VENµS periodic news – April 18, 2020</u>

Although the COVID-19 virus has created an uncertain work environment worldwide, the VENµS satellite is safe in space and functioning well. We would like to use this opportunity to express our sincere hope that you and yours remain in good health.

1   VENµS product updates

<u>L2:</u> From June 2019, the website has been updated in real-time with the L2 5 m for all the 27 tiles .

In addition, L2 5 m images are also available from Nov. 2017 to April 2018 for the Southern strip and from the end of Jan. 2018 to April 2019 for the Western strip.

The only tile that has L2 5 m from the beginning of the scientific mission is W10, now also available on the website.

<u>L3:</u> At the moment on the website are available L3 5m only from Nov. 2017 to April 2018. On Tuesday, 21st April, the website will be updated with L3 5m from June 2019 for all the tiles and it will be updated with the new incoming L3 5m products in real-time. For the only tile W10, the L3 5m from the beginning of the mission will also be added on the website.

2   Special issue in Remote Sensing – call for papers

remote sensing
an Open Access Journal by MDPI

Consider submitting an article to the special issue of the Remote Sensing journal: "<u>VENµS Image Processing Techniques and Applications</u>".
https://www.mdpi.com/journal/remotesensing/special_issues/Venus

Deadline for manuscript submissions: 31 December 2020

Accepted papers will be published continuously in the journal (as soon as accepted) and will be listed together on the special issue website.

3   Algae bloom in the National Carrier

Although the National Carrier is just a 6-m wide, VENμS successfully detected algae bloom along the open-channel part of the carrier in Emek Beit Netoafa. The algae were developed when water pumping from the Sea of Galilee was suspended during Passover.

The VENμS image was obtained on 13 April 2020. The algae were detected by using the water chlorophyll index calculated as the ration between Band 3 (blue, 490 nm and Band 4 (green, 555 nm). The yellow and red colors indicate algae.
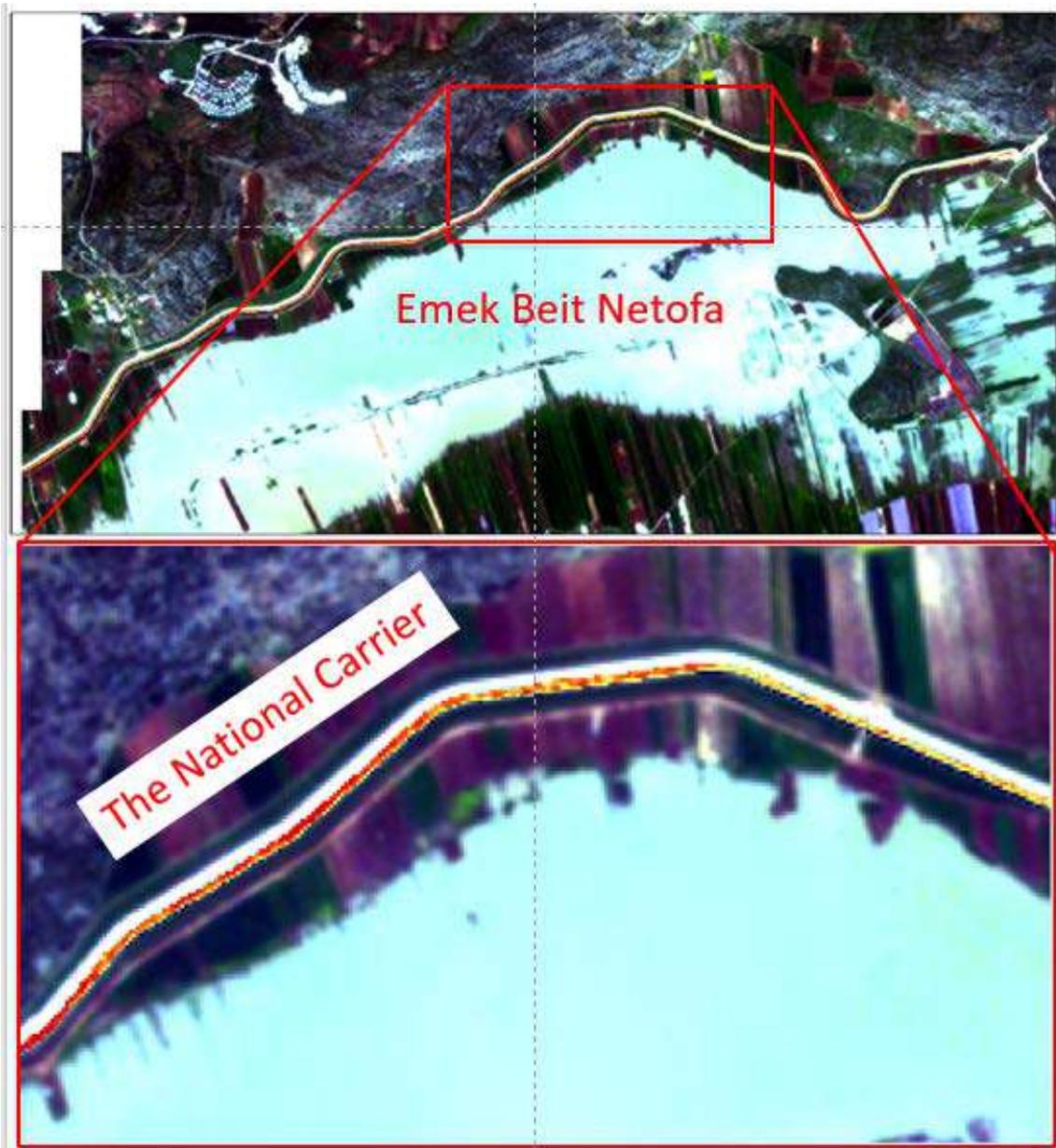
For more details contact Yaron Pitkovsky, Mekorot, Tel: 050-5895481, ypitkovsky@mekorot.co.il

4   Feature paper

A within-season approach for detecting early growth stages in corn and soybean using high temporal and spatial resolution imagery

Abstract: Crop emergence date is a critical input to models of crop development and biomass accumulation. The ability to robustly detect and map emergence date using remote sensing would greatly benefit operational yield estimation and crop monitoring efforts; however, this has proven to be challenging. Previous remote-sensing phenology algorithms showed that crop stages can typically be detected starting only around the V3-V4 (3 to 4 established leaves) vegetative stage. Furthermore, traditional approaches have a strong assumption regarding the temporal evolution of plant growth and normally require a complete growth period of observations to define seasonal changes. Most approaches were not designed for within-season operational mapping, particularly in the early growing season. In the current paper, we describe a new within-season emergence (WISE) approach to mapping crop green-up date using satellite observations available during early growth stages. The approach was first optimized using high spatiotemporal resolution (10 m, 2-day revisit) imagery from the Vegetation and Environment monitoring New MicroSatellite (VENµS) research mission, and assessed using ground observations of early crop growth stages (emergence VE and one leaf V1 stages for corn, and emergence VE and unifoliolate VC stages for soybeans) collected over the Beltsville Agricultural Research Center (BARC) experimental fields in Beltsville, MD during the 2019 growing season. Results show that early crop growth stages can be reliably detected at sub-field scale about two weeks after crop emergence. The remote-sensing green-up dates were about 4–5 days after crop emergence on average. Coefficients of determination (R2) between green-up dates and the mid-point dates of the early growth stages were above 0.90. The mean absolute differences, standard deviations, and root mean square errors comparing to the early growth stage mid-point dates were within six days. The maximum differences were within±10 days across all fields. The WISE approach was assessed using operational Sentinel-2 data (10 m, 5-day revisit) over BARC. The detected green-up dates from Sentinel-2 were consistent with those from VENµS. Some fields were not detected due to the lack of observations around the emergence dates. For independent evaluation, the WISE approach was applied over an agricultural watershed on the Maryland Eastern Shore using both VENµS and the Harmonized Landsat and Sentinel-2 (HLS) data (30 m, 3–4-day revisit). The detected green-up dates were compared with emergence dates in crop progress reports from the National Agricultural Statistics Service (NASS) at the state-level. The WISE-detected green-up dates at the regional scale are within VE stage ranges but slightly earlier than NASS crop progress reports at the state-level. The WISE approach uses remote-sensing observations during the early crop growth stages and has potential for operational application within the season using Sentinel-2 and HLS data.
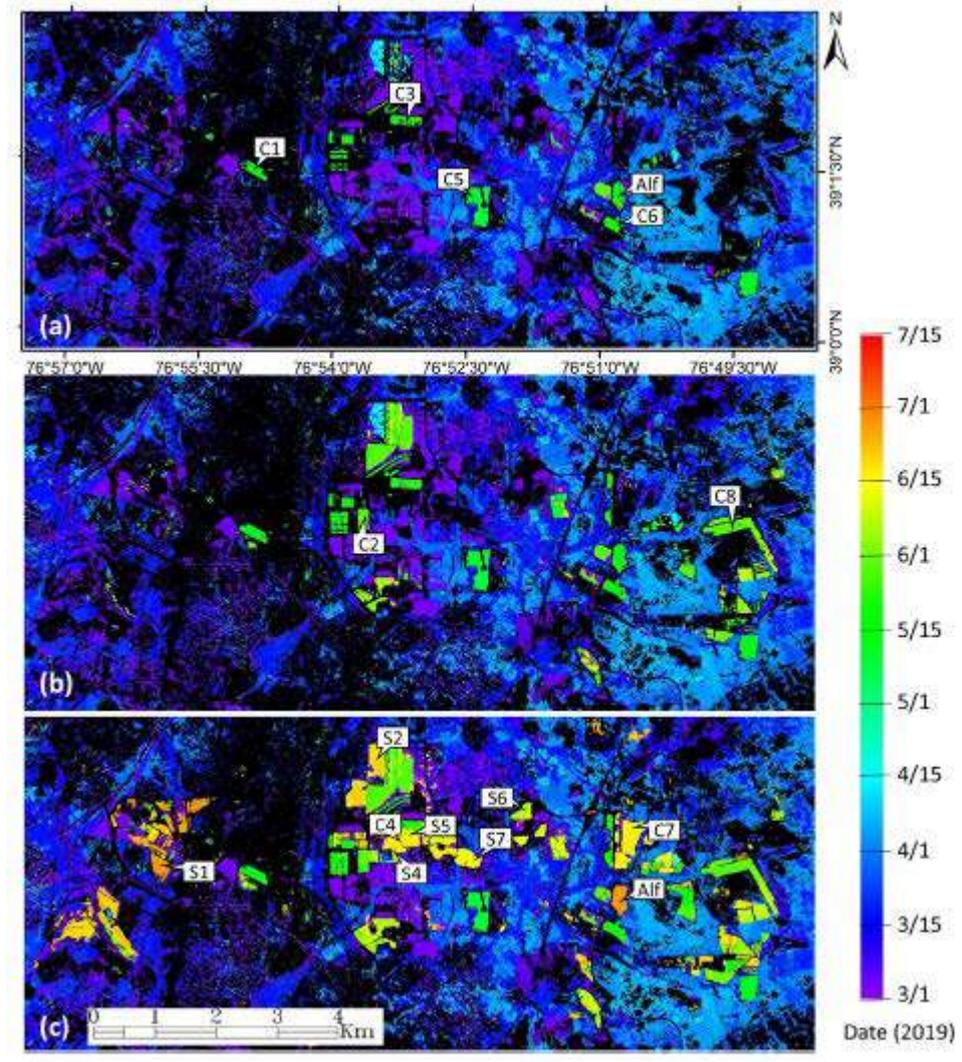
Green-up dates detected using VENµS time-series NDVI data until June 15 (a), July 1 (b) and July 15, 2019 (c). Later green-up events were detected by including more recent observations. Newly detected green-ups are labeled in each panel. A green-up momentum threshold of 0.01 was used in each case.

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5   Previous VENµS Newsletters

Previous VENµS Newsletters along with more information about VENµS can be read in the following link: https://karnieli-rsl.com/newsletters

Best wishes and stay healthy!

Manuel and Arnon

Ben Gurion University

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