**Prof. Arnon Karnieli**

The Remote Sensing Laboratory
Department of Solar Energy and Environmental Physics
Jacob Blaustein Institutes for Desert Research
Ben-Gurion University of the Negev
Sede-Boker Campus 84990, ISRAEL
Tel: +972-8-6596855 Mobile: +972-52-8795925
Fax: +972-8-6596805
E-mail: karnieli@bgu.ac.il

**פרופ' ארנון קרניאלי**

המעבדה לחישה מרחוק
המחלקה לאנרגיה סולרית ופיסיקה של הסביבה
המכונים לחקר המדבר ע"ש יעקב בלאושטיין
אוניברסיטת בן-גוריון בנגב
קמפוס שדה-בוקר 84990
טלפון: 08-6596855 נייד: 052-8795925
פקס: 08-6596805
https://karnieli-rsl.com/

Science from Above

March 1, 2021

Dear colleagues,

**Re: VENμS periodic news – March 1, 2021**

## 1. VENμS updates

### 1.1 VENμS Mission 2 (VM2)

Currently, as part of the technological mission, the VENμS is on the way down from its previous altitude at 720 km to the new one at 410 km. When the satellite is stabilized at 410 km, it will start imaging three strips over Israel as illustrated in the previous Newsletter (No. 25).

### 1.2 Collection 4 - reprocessing of old VENμS images

The Remote Sensing Laboratory at Sede Boker Campus of Ben Gurion University has started to reprocessed all VM1 images using updated L1 and updated Ground Image Processing Parameters (GIPP) for Maccs-Atcor Joint Algorithm (MAJA):

#### 1.2.1 The major improvements of L1

Radiometric correction

- Update on radiometric absolute calibration coefficients using latest Moon acquisitions.
- Cloud detection and quantification.

Geometric correction

- Multi-temporal registration with an enhancement of the correlation with the reference image
- Multi-spectral registration has been improved with the correction of radiometric sliding. This affects, in particular, B01 and B02 bands on sites acquired with high roll/pitch.

Another feature

- Equivalent spectral wavelengths were switched for actual calculated values in products metadata.

### 1.2.2 The main improvements of atmospheric correction using GIPP MAJA

The updated GIPPs allow a better estimation of the aerosol optical thickness (AOT). With the new GIPP, the AOT values are closely related to NASA's AERONET products). As a result, the reprocessed L2/L3 products have been improved.

More information about MAJA exists in https://github.com/CNES/MAJA

### 1.2.3 The status of the work

- Until today, all the VM1 products (L2/L3) of the W10 tile have been completed (12% of the data).
- Tiles S01, S03, S06, S07, W08, and W09 are in progress. S01, S03, S06, and W09 are expecting at the end of March. S07 and W08 at the end of April.

### 1.3 Website down

The VENμS website is currently down since a cyberattack targeted Ben-Gurion University. It is expected to function soon. Urgent requests of a limited number of images can be requested by mail from venus@bgu.ac.il.

## 2. Importance of the red-edge bands

VENμS and Sentinel-2 are characterized by four spectral bands along the red-edge (700-800 nm) (Figure 1).

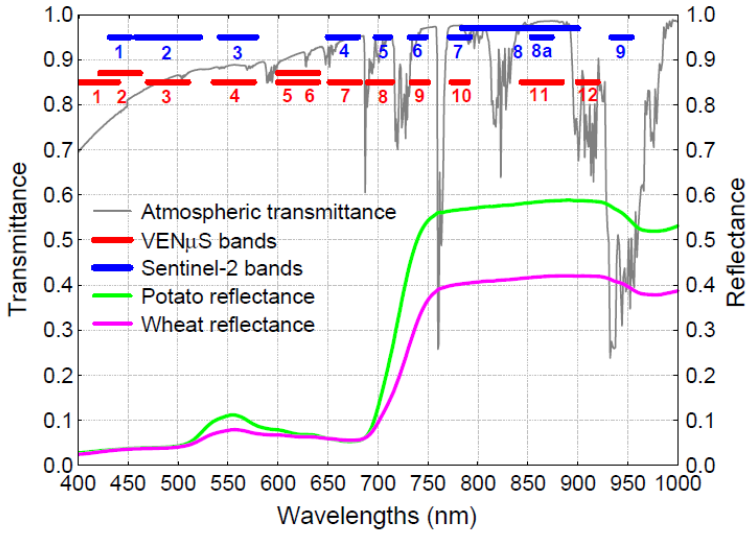


***Figure 1.*** *Band settings of VENμS and Sentinel-2 concerning the atmospheric transmittance and typical vegetation reflectance spectra (after Herrmann et al., 2011).*

These bands enable the calculation of the red-edge inflection point (REIP) approved to be a better indicator for several biophysical variables, such as chlorophyll, nitrogen, leaf area index (LAI), and more. Herrmann et al. (2011)

correlated NDVI and REIP vs. LAI of wheat and potato datasets, using the VENμS and Sentinel-2 band settings, in order to observe the relation to as well as prediction accuracy in retrieving LAI values. The REIP was found to be a significantly better predictor than NDVI for wheat and potato data and therefore can be implemented for future LAI monitoring applications by these sensors (Table 1).

***Table 1.*** *Summary of results for the coefficient of determination (r) of predicting LAI by NDVI and REIP using the VENμS and Sentinel-2 band settings. All values are significant (p<0.05) (after Herrmann et al., 2011).*

| | **VENμS** | | **Sentinel-2** | |
|---|---|---|---|---|
| | NDVI | REIP | NDVI | REIP |
| **Wheat** | 0.78 | 0.91 | 0.78 | 0.91 |
| **Potato** | 0.60 | 0.72 | 0.61 | 0.73 |

Reference: Herrmann, I., Pimstein, A., Karnieli, A., Cohen, Y., Alchanatis, V. and Bonfil, D.J. 2011. LAI assessment of wheat and potato crops by VENμS and Sentinel-2 bands. *Remote Sensing of the Environment*. **115**, 2141–2151.

In a recent analysis of ground-measured LAI vs. Sentinel-2-derived LAI over two vineyards in California, the NDVI reveals saturated values, while the REIP calculations exhibit high correlation ($r^2$=0.96) (Figure 2, unpublished data).

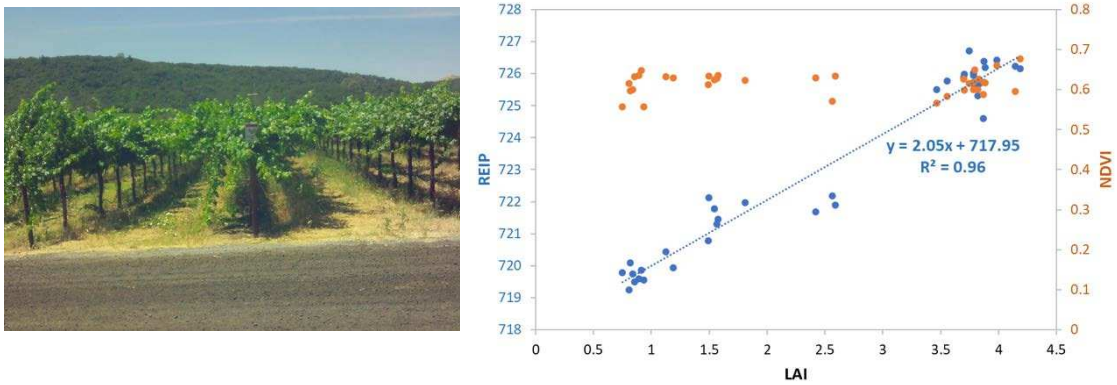


***Figure 2.*** *Left: a vineyard in California; Right: correlation of NDVI and REIP vs. LAI.*

## 3. VENµS on Israeli stamps

Israel Post printed a series of stamps illustrating the Israeli remote sensing satellites. Below are the VENµS stamp and the 'Day of Issue' envelope.



## 4. Previous VENµS Newsletters

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

## 5. Unsubscribe

If you wish to unsubscribe from the future VENµS Newsletters, write an e-mail to karnieli@bgu.ac.il.

Best regards,

Manuel and Arnon

Ben Gurion University