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Science from Above

פרופ' ארנון קרניאלי

המעבדה לחישה מרחוק
המחלקה לאנרגיה סולרית ופיסיקה של הסביבה
המכוונים לחקר המדבר ע"ש יעקב בלאושטיין
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July 29, 2021

Dear colleagues,

Re: VENμS periodic news – July 29, 2021

1. VENμS updates

1.1 Collection 4 - reprocessing of old VENμS images

The reprocessing of all L2/L3 products to collection 4 is still running. Currently, we have completed the 52% of the L2 and the 44% of the L3. The tiles that have been already treated for the entire VM1 are the following: S01, S02, S03, S06, S07, W03, W04, W08, W09, W10, W11, and W12. The tiles E03 and E04 are now 'in the oven' and will soon be available on the website. Do not hesitate to contact us with any questions (manuel.salvoldi@gmail.com).

1.2 VENμS Mission 3 (VM3)

VENμS Mission 3 (VM3) will start on Aug. 15, 2021. The satellite will be stabilized at 410 km and will image three strips over Israel as illustrated below. Detailed images will be published soon in the VENμS webpage (<https://karnieli-rsl.com/ven%C2%B5s>). This orbit will be characterized by 3 m spatial resolution and 3 days revisit time, and 15 km swath. All other properties we as in VM1. Images will be available for authorized scientists at the VENμS website <https://venus.bgu.ac.il/venus/>



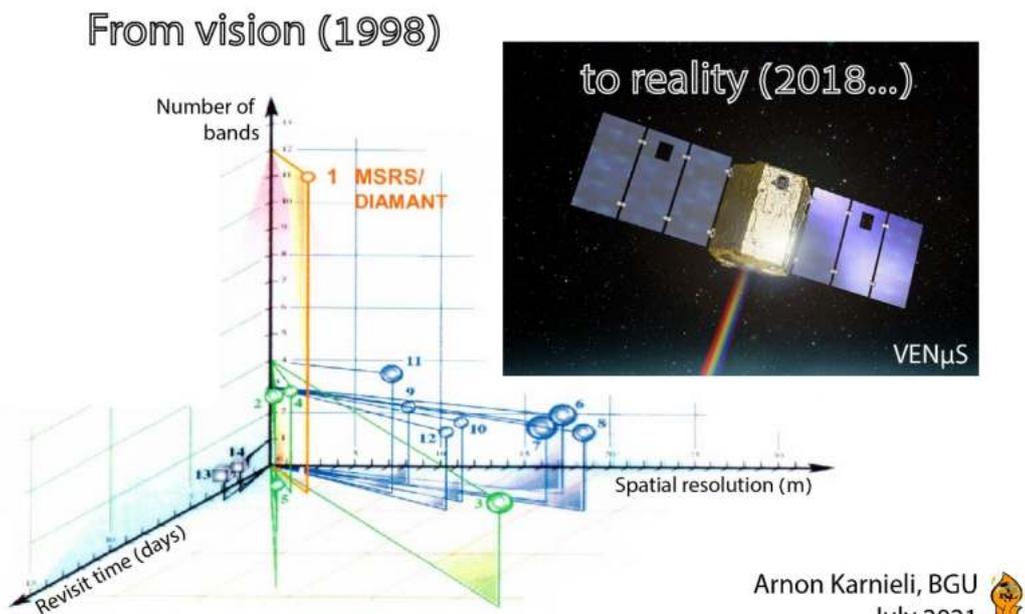
Note that there will be no international sites during VM3.

1.3 VEN μ S Mission 5 (VM5)

VEN μ S Mission 5 (VM5) is expected to start in January 2022. The satellite will be at 560 km. Accordingly, the spatial resolution will be 4 m while the revisit time will be 1 day. The swath will be 21 km. The strips over Israel and the worldwide research sites have not been determined yet.

2. Goodbye Avi Blasberger

After five and a half years as the Director of the Israel Space Agency, Avi will leave this job in August 2021. Concerning VEN μ S, back in 1998, Avi, as the head of the space division in ELOP (now Elbit), was the prophet of the VEN μ S camera. The project, funded by the EU (FP4), was called David, and the camera was called MSRS. In his vision, Avi saw a space system with a combination of high spectral bands, high spatial resolution, and high revisit time. After 20 years, this dream was turned into reality with the launch of VEN μ S.



3. Feature papers

Deep Learning-Based Phenological Event Modeling for Classification of Crops

Arun, V.P. and Karnieli, A. 2021. Deep learning-based phenological event modeling for classification of crops. *Remote Sensing*. **13**, 2477.

<https://doi.org/10.3390/rs13132477>



Abstract: Classification of crops using time-series vegetation index (VI) curves requires appropriate modeling of phenological events and their characteristics. The current study explores the use of capsules, a group of neurons having an activation vector, to learn the characteristic features of the phenological curves. In addition, joint optimization of denoising and classification is adopted to improve the generalizability of the approach and to make it resilient to noise. The proposed approach employs reconstruction loss as a regularizer for classification, whereas the crop-type label is used as prior information for denoising. The activity vector of the class capsule is applied to sample the latent space conditioned on the cell state of a Long Short-Term Memory (LSTM) that integrates the sequences of the phenological events. Learning of significant phenological characteristics is facilitated by adversarial variational encoding in conjunction with constraints to regulate latent representations and embed label information. The proposed architecture, called the variational capsule network (VCapsNet), significantly improves the classification and denoising results. The performance of VCapsNet can be attributed to the suitable modeling of phenological events and the resilience to outliers and noise. The maxpooling-based capsule implementation yields better results, particularly with limited training samples, compared to the conventional implementations. In addition to the confusion matrix-based accuracy measures, this study illustrates the use of interpretability-based evaluation measures. Moreover, the proposed approach is less sensitive to noise and yields good results, even at shallower depths, compared to the main existing approaches. The performance of VCapsNet in accurately classifying wheat and barley crops indicates that the approach addresses the issues in crop-type classification. The approach is generic and effectively models the crop-specific phenological features and events. The interpretability-based evaluation measures further indicate that the approach successfully identifies the crop transitions, in addition to the planting, heading, and harvesting dates. Due to its effectiveness in crop-type classification, the proposed approach is applicable to acreage estimation and other applications in different scales.

For more information, contact: Pattathal Arun, e-mail: arunvi2601@gmail.com

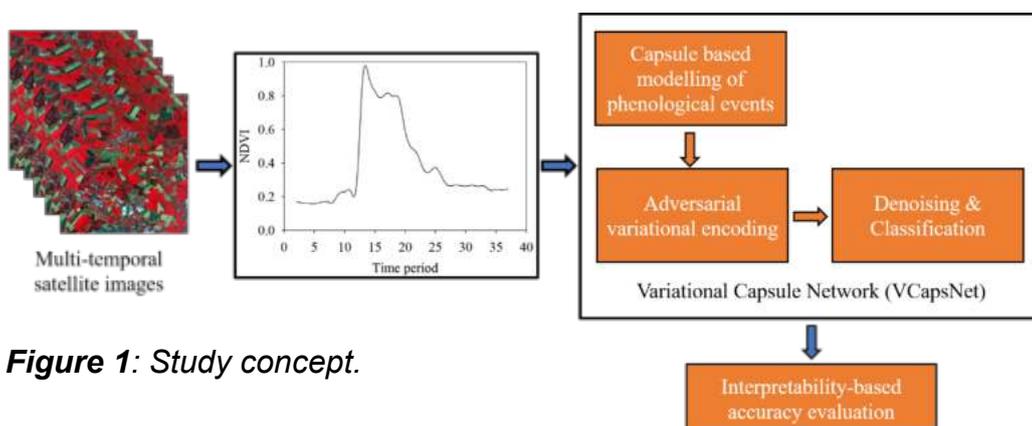


Figure 1: Study concept.



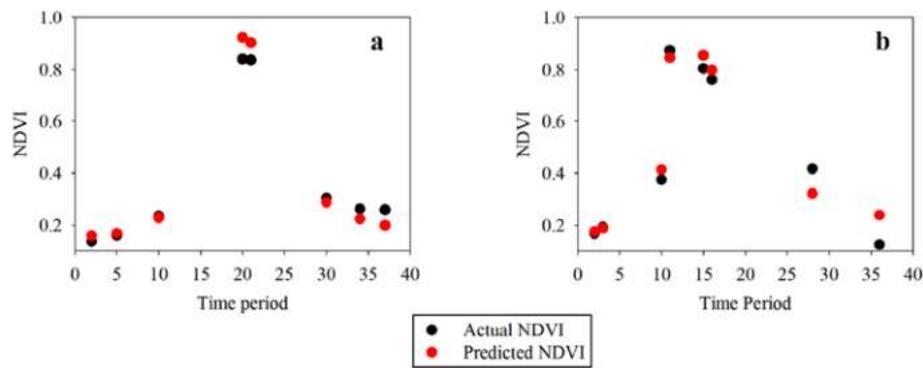


Figure 2: Expected and predicted VEN μ s-derived NDVI of wheat (a) and barley fields (b).

4. Special issue in Remote Sensing – call for papers

New deadline for manuscript submissions: 31 December 2021



remote sensing

an Open Access Journal by MDPI

Consider submitting an article to the special issue of the Remote Sensing journal: "VEN μ S Image Processing Techniques and Applications".

https://www.mdpi.com/journal/remotesensing/special_issues/Venus

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

5. Previous VEN μ S Newsletters

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

6. Unsubscribe

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

Best regards,

Manuel and Arnon

Ben Gurion University

