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## פרופ' ארנון קרניאלי

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המכונים לחקר המדבר ע"ש יעקב בלאושטיין  
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<http://www.bgu.ac.il/BIDR/research/phys/remote>

*Science from Above*

May 31, 2020

Dear colleagues,

**Re: VEN $\mu$ S periodic news – May 31, 2020**

### 1 VEN $\mu$ S product updates

L2: In addition to the W10 tile, all the L2 products for W09 (from 30 Jan. 2018) are now in 5 m resolution and available on the VEN $\mu$ S website (<https://venus.bgu.ac.il/venus/>). We are doing our best to close the gaps and to provide a full series of L2 at 5 m resolution for all other tiles.

### 2 The change in the water level of the Sea of Galilee 2018-2020

Images obtained by VEN $\mu$ S, looks to the shorelines of the Sea of Galilee in September 2018 and April 2020.

At the beginning of winter 2018-19, the water level of the Sea of Galilee was the 214.55 meters below sea level, 21 cm above what is defined as a 'Black Line'. This height was the lowest ever measured. Below this level, operational problems, related to pumping water from the lake to the National Water Carrier, are expected to occur. Low water level accelerates the development of toxin cyanobacteria.

On the 20 April 2020, the level of the Sea of Galilee was the -208.94 m. 14 cm below the 'Upper Red Line'. This height is the maximum level to avoid floods along the shores and damage to engineering plants. Therefore, when water reaches this level, there is a recommendation to open the Degania Dam for releasing water to the southern Jordan River.

The added water areas mainly observed in the Ginosar Valley on the north-west side and in the Majrase – Betiha (Bethsaida) Valley on the north-north-east of the lake. Also, the small island, east of the lake's outlet, was flooded and disappeared.

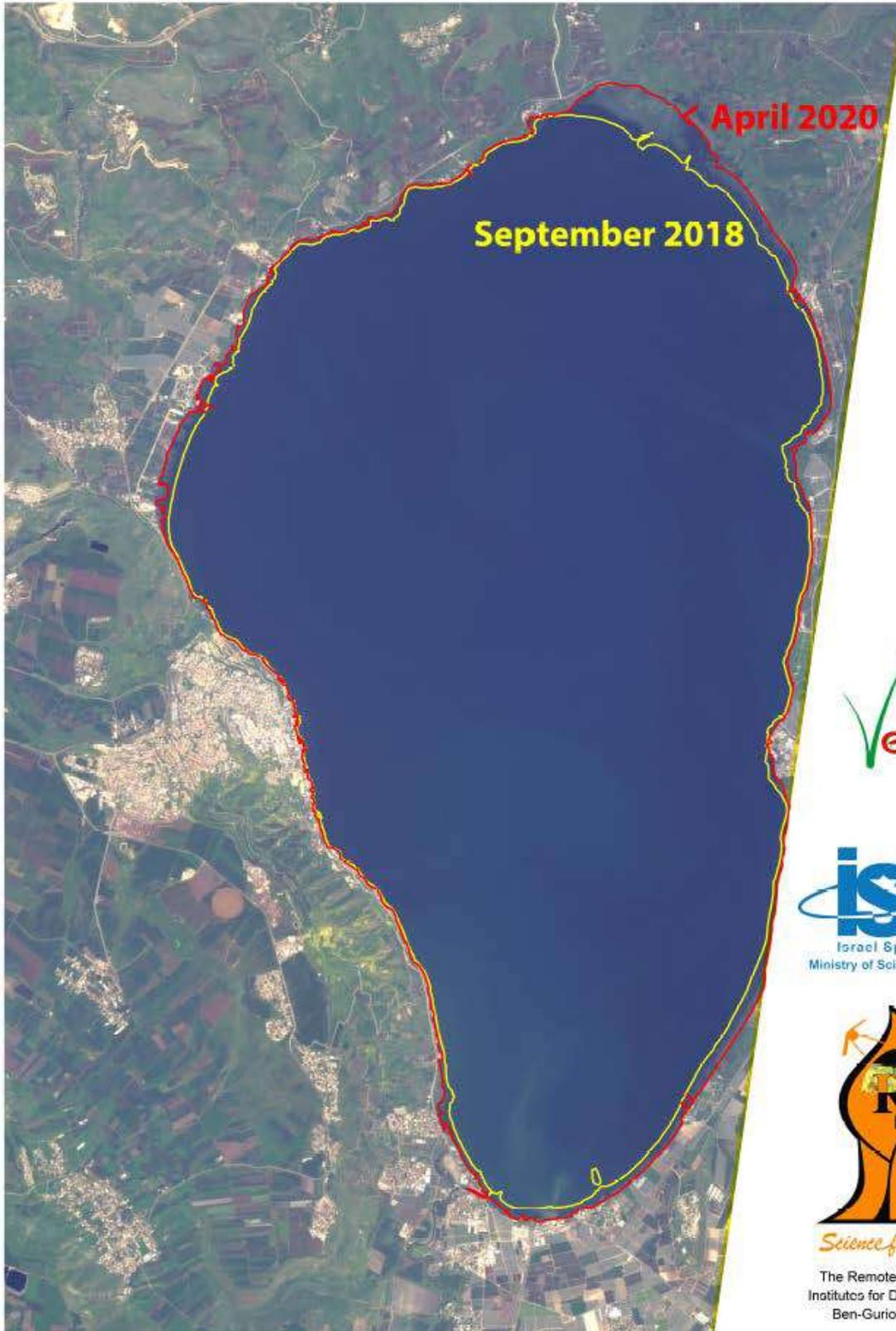
The rise of the water level during the last two winters has helped the ecological stability and improved the quality of the water. Water salinity dropped. The natural algae (Peridinium) bloomed, while the toxin cyanobacteria disappeared.

Images were processed in the VEN $\mu$ S Scientific Center, the Remote Sensing Laboratory, Desert Research Institutes, Ben Gurion University.

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# Sea of Galilee

## Change of shorelines 2018-2020



### 3 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: "[VENUS Image Processing Techniques and Applications](https://www.mdpi.com/journal/remotesensing/special_issues/Venus)".

[https://www.mdpi.com/journal/remotesensing/special\\_issues/Venus](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.

### 4 Feature paper

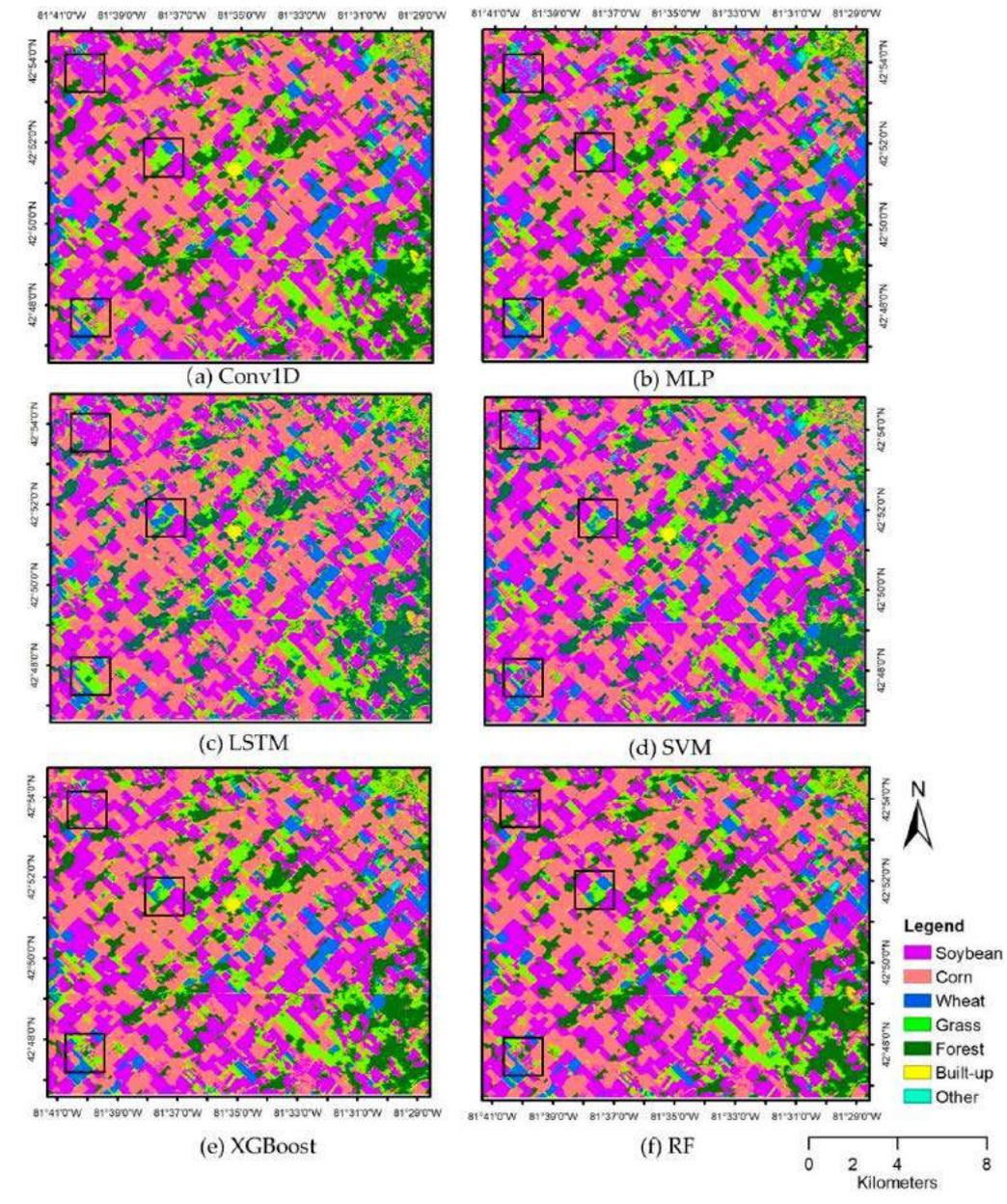
#### **Synergistic Use of Multi-Temporal RADARSAT-2 and VENUS Data for Crop Classification Based on 1D Convolutional Neural Network**

Liao, C.H., Wang, J.F., Xie, Q.H., Al Baz, A., Huang, X.D., Shang, J.L., He, Y.J. 2020. Synergistic Use of Multi-Temporal RADARSAT-2 and VENUS Data for Crop Classification Based on 1D Convolutional Neural Network. Remote Sensing, 12, Article Number: 832, DOI: [10.3390/rs12050832](https://doi.org/10.3390/rs12050832)

**Abstract:** Annual crop inventory information is important for many agriculture applications and government statistics. The synergistic use of multi-temporal polarimetric synthetic aperture radar (SAR) and available multispectral remote sensing data can reduce the temporal gaps and provide the spectral and polarimetric information of the crops, which is effective for crop classification in areas with frequent cloud interference. The main objectives of this study are to develop a deep learning model to map agricultural areas using multi-temporal full polarimetric SAR and multi-spectral remote sensing data, and to evaluate the influence of different input features on the performance of deep learning methods in crop classification. In this study, a one-dimensional convolutional neural network (Conv1D) was proposed and tested on multi-temporal RADARSAT-2 and VENUS data for crop classification. Compared with the Multi-Layer Perceptron (MLP), Recurrent Neural Network (RNN) and non-deep learning methods including XGBoost, Random Forest (RF), and Support Vector Machine (SVM), the Conv1D performed the best when the multi-temporal RADARSAT-2 data (Pauli decomposition or coherency matrix) and VENUS multispectral data were fused by the Minimum Noise Fraction (MNF) transformation. The Pauli decomposition and coherency matrix gave similar overall accuracy (OA) for Conv1D when fused with the VENUS data by the MNF transformation (OA = 96.65 ± 1.03% and 96.72 ± 0.77%). The MNF transformation improved the OA and F-score for most classes when Conv1D was used. The results reveal that the coherency matrix has a great



potential in crop classification and the MNF transformation of multi-temporal RADARSAT-2 and VEN\_S data can enhance the performance of Conv1D.



Classification maps of the four classifiers (a) Conv1D, (b) MLP, (c) LSTM, (d) SVM, (e) XGBoost, (f) RF using the MNF transformation of RADARSAT-2 Pauli decomposition and VEN $\mu$ S data. Misclassifications mainly exist between Wheat and Forage, as well as Soybean and Other.

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## 5 Previous VEN $\mu$ S Newsletters

Previous VEN $\mu$ S Newsletters along with more information about VEN $\mu$ S can be read in the following link: <https://karnieli-rsl.com/newsletters>

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Best wishes and stay healthy!

Manuel and Arnon

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