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המכונים לחקר המדבר ע"ש יעקב בלאושטיין
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Science from Above

May 15, 2021

Dear colleagues,

Re: VENμS periodic news – May 15, 2021

1. VENμS updates

1.1 VENμS technology mission

As part of the VENμS technological mission, the satellite is lowering its orbit from an altitude of 720 km to the new one at 410 km. The new altitude will enable obtaining images over Israel at 3 m resolution and two days revisit time using the Israeli Hall Effect Thruster (IHET). A Hall thruster is a type of electric (ion) thruster in which an electric field accelerates the propellant (e.g., xenon). Micro-satellites a Hall thruster (rather than a conventional chemical (e.g., hydrazine) is more efficient and has better maneuvering performances in low orbits.

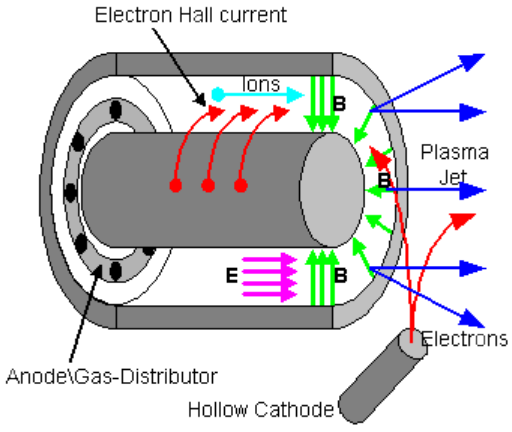


Fig. 1: The principle of an electric thruster

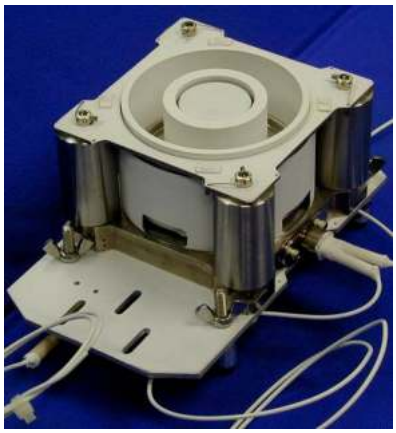


Fig. 2: The IHET onboard VENμS.

Micro-satellites a Hall thruster (rather than a conventional chemical (e.g., hydrazine) is more efficient and has better maneuvering performances in low orbits. The objectives of the technological mission are: (1) test and qualify an IHET in space via a series of experiments; and (2) Demonstrate IHET mission enhancement capabilities, such as orbit maintenance, orbit transfer from 720

km, 410 km, and back to 560 km, and enabling imaging in a high drag environment.

After completing VM3, the orbit will be changed again to 560 km. For the next two years, starting December 2021, images will be obtained over Israel and selected sites worldwide at 4 m resolution and 1 day revisit time (VM5). More details about the technological mission at Newsletter (No. 25).

1.2 Collection 4 - reprocessing of old VENμS images

The Remote Sensing Laboratory at Sede Boker Campus of Ben Gurion University continues to reprocess all VM1 images using updated L1 and updated Ground Image Processing Parameters (GIPP) for Maccs-Atcor Joint Algorithm (MAJA). More details about the major improvements appear in Newsletter No. 26. The status is:

(1) L2/L3 products for 7 tiles were reprocessed for the entire VM1. The tiles are S01, S03, S06, S07, W08, W09, and W10.

(2) We have recently started the reprocessing of the following tiles: E02, E03, E04, S02, S05, S10, W03, W04, W05, W11, and W12.

(3) We estimate that the reprocessing of the L2/L3 for W11 and W12 will be terminated at the beginning of June 2021 .

(4) Until now, we have reprocessed the 29% of the L2 and the 26% of L3.

1.3 Cyberattract on Ben Gurion University

The cyberattack on Ben Gurion University changed the VENμS website and our service. We hope to get back to normal within a few days. In the meantime, don't hesitate to contact us in order to obtain images.

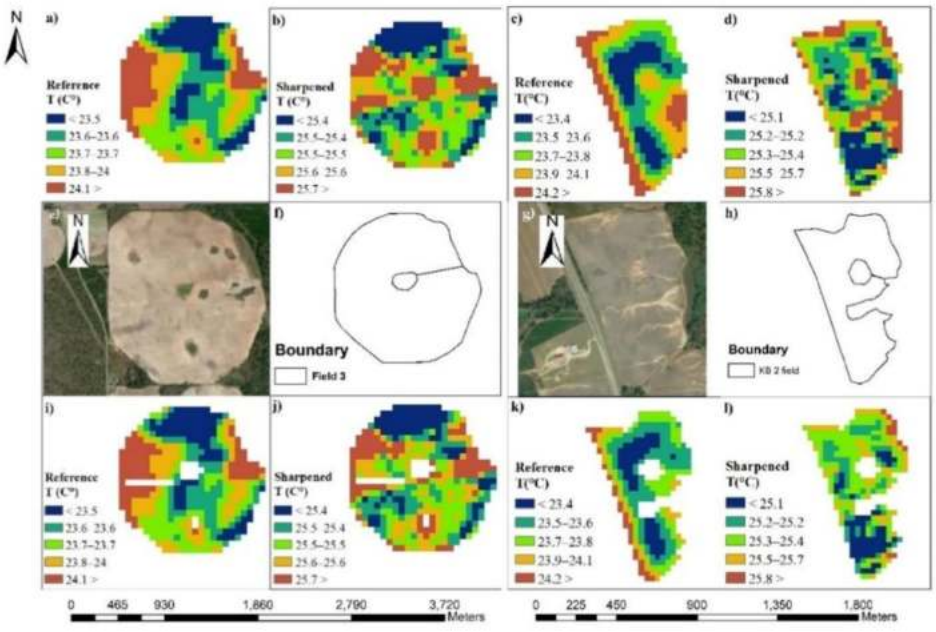
2. Feature paper

Field Scale Assessment of the TsHARP Technique for Thermal Sharpening of MODIS Satellite Images Using VENμS and Sentinel-2-Derived NDVI

Lorena N. Lacerda LN, Cohen, Y., Snider J., Huryna, H., Liakos, V. and Vellidis, G. (2021) Field Scale Assessment of the TsHARP Technique for Thermal Sharpening of MODIS Satellite Images Using VENμS and Sentinel-2-Derived NDVI. *Remote Sensing*, **13**, 1155. http://doi.org/10.3390/rs13061155

Abstract: Remotely sensed-based surface temperature is an important tool for crop monitoring and has great potential for improving irrigation management. However, current thermal satellite platforms do not display the fine spatial resolution required for identifying crop water status patterns at the field scale. The thermal sharpening (TsHARP) utility provides a technique for downscaling coarse thermal images to match the finer resolution of images

acquired in the visible and near infrared bandwidths. This sharpening method is based on the inverse linear relationship between vegetation fraction calculated from the normalized difference vegetation index (NDVI) and land surface temperature (LST). The current study used the TsHARP method to sharpen low-resolution thermal data from the Moderate Resolution Imaging Spectrometer MODIS (1 km) to the finer resolution of Sentinel-2 (10 m) and Vegetation and Environment New micro-Spacecraft (VENμS) (5 m) visible-near infrared images. The sharpening methodology was evaluated at scene and field scales in southern Georgia and northern Mississippi, USA. A comparison of sharpened temperature was made with reference temperatures from Landsat-8 Operational Land Imager (OLI) in four different spatial resolutions (30, 60, 120, and 240 m) for method validation. Coarse resolution comparison on the dates in which imagery from both sensors were acquired on the same day resulted in average observed mean absolute error (MAE) of 1.63^{o}C, and R^2 variation from 0.34 to 0.74. Temperature errors at the field scale ranged from 0.25 to 3.11 ^{o}C using both Sentinel-2 and VENμS. Sharpened maps at 120 and 60 m resolution showed the highest consistency for all fields and dates. Maps sharpened using VENμS images showed comparable or higher accuracy than maps sharpened using Sentinel-2. The superior performance coupled with the better revisit time indicates that the VENμS platform has high potential for frequent in-season crop monitoring. Further research with ground data collection is needed to explore field use limitations of this methodology, but these results give useful insights of potential benefits of implementing the TsHARP technique as a tool for crop stress monitoring.



Field map comparison between reference and sharpened (MODIS/VENμS) maps before and after pixel removal. (a–d) Reference and sharpened maps of the whole area within fields 3 and 9. (e–h) Visual

imagery and field boundary for both fields. (i–l) Reference and sharpened maps after pixel extraction for fields 3 and 9.

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3. Special issue in Remote Sensing – call for papers

New deadline for manuscript submissions: 31 December 2021

Consider submitting an article to the special issue of the Remote Sensing journal: "VENμS 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.

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

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Best regards,

Manuel and Arnon

Ben Gurion University