

SHE SPACE INTERNATIONAL

In memory of Devorah Blumberg

Bridging the Gap: Utilizing Space to Make Space

Dr. Shimrit Maman
Senior scientist & Director EPIF
Ben-Gurion University of the Negev



BACKGROUND & MOTIVATION



Modified after Adva Center based on CHE, Committee report, 2018

CHALLENGE

Our approach to handle the challenge

Identify
the Gap

Recognize the need for tailored pedagogic and learning content to meet the different learning styles and motivational needs of the female participants

PBL
(Project Based Learning)
“Hands-On”
RS\EO

Focus on practical issues rather than “pure” science.
Exploration in **active research!**

UN SDG'S
4, 5, 13 & 17

Toward Achieving United Nations SDG'S 4, 5, 13 and 17
CLIMATE CHANGE RESEARCH

RESEARCH QUESTIONS – TARGETING CLIMATE CHANGE



- Use of local satellites – national level
- Beyond borders – GLOBAL PERSPECTIVE

SHE SPACE INTERNATIONAL

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- Students experienced academic research, team work and international collaboration in an all-female setting designed to **empower** young women to continue in space science and research.



GEOGRAPHY • GENERATION • GENDER

- Dedicated to the idea of diversity, worldwide high-school aged female students are mentored by professional female researchers, women in the academy and industry and space agencies.



FRAMEWORK



Meetings at each facility



Meeting experts in the fields of satellite and space sciences



Learning remote sensing theory



Work in student-led research teams



“Hands-on” experience with real (in-use) scientific instruments



Student-planned research at every stage



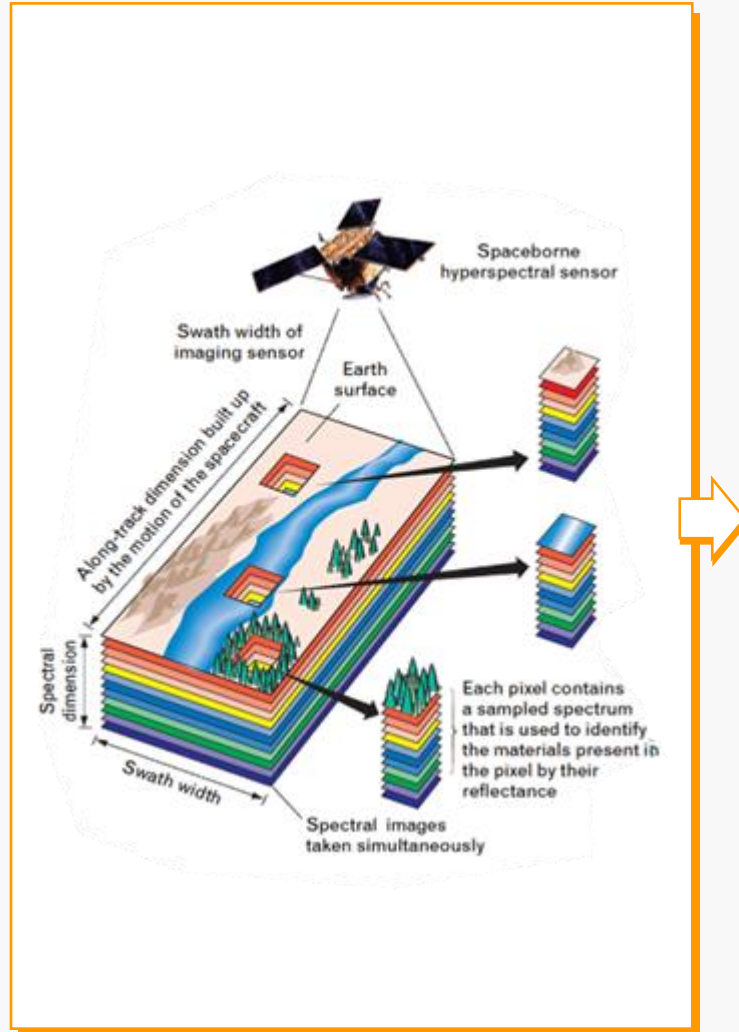
Conference participation



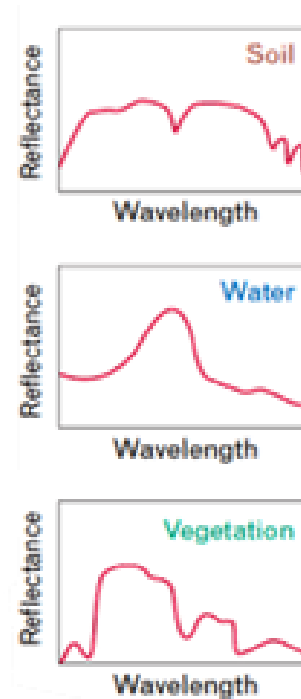
Use of professional research equipment

METHODOLOGY

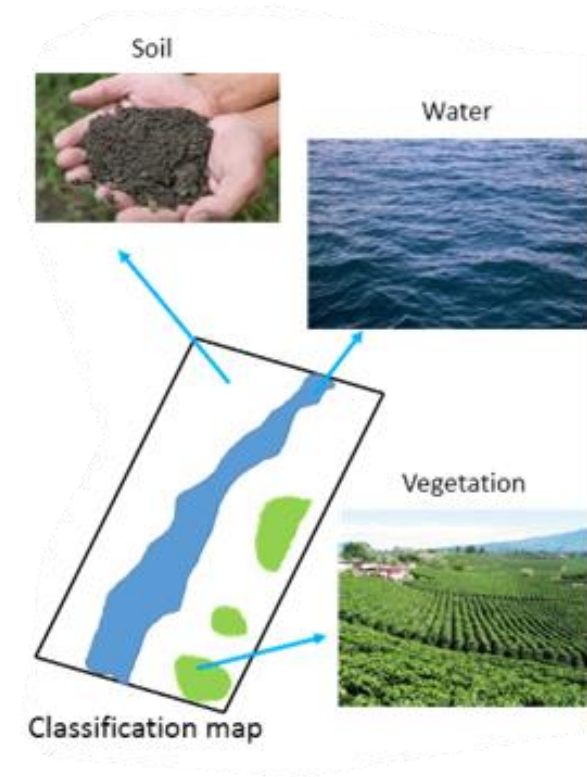
Image collection



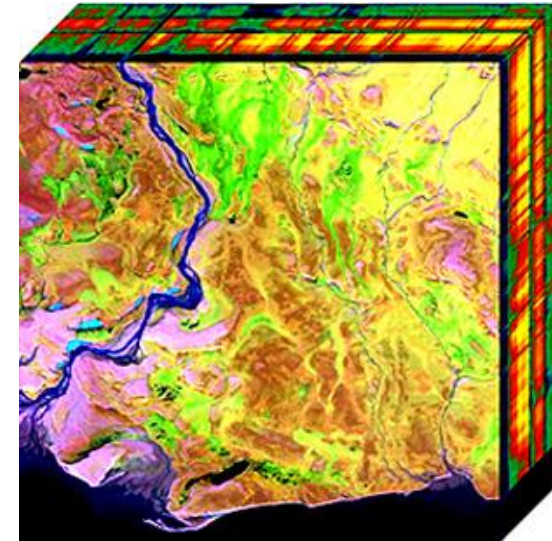
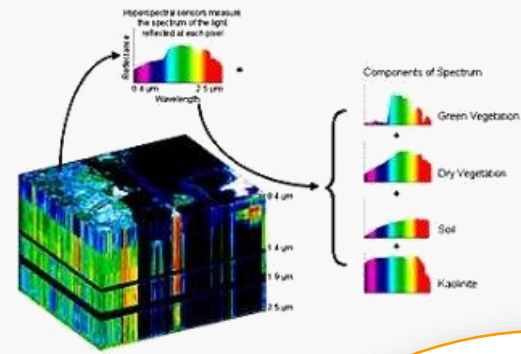
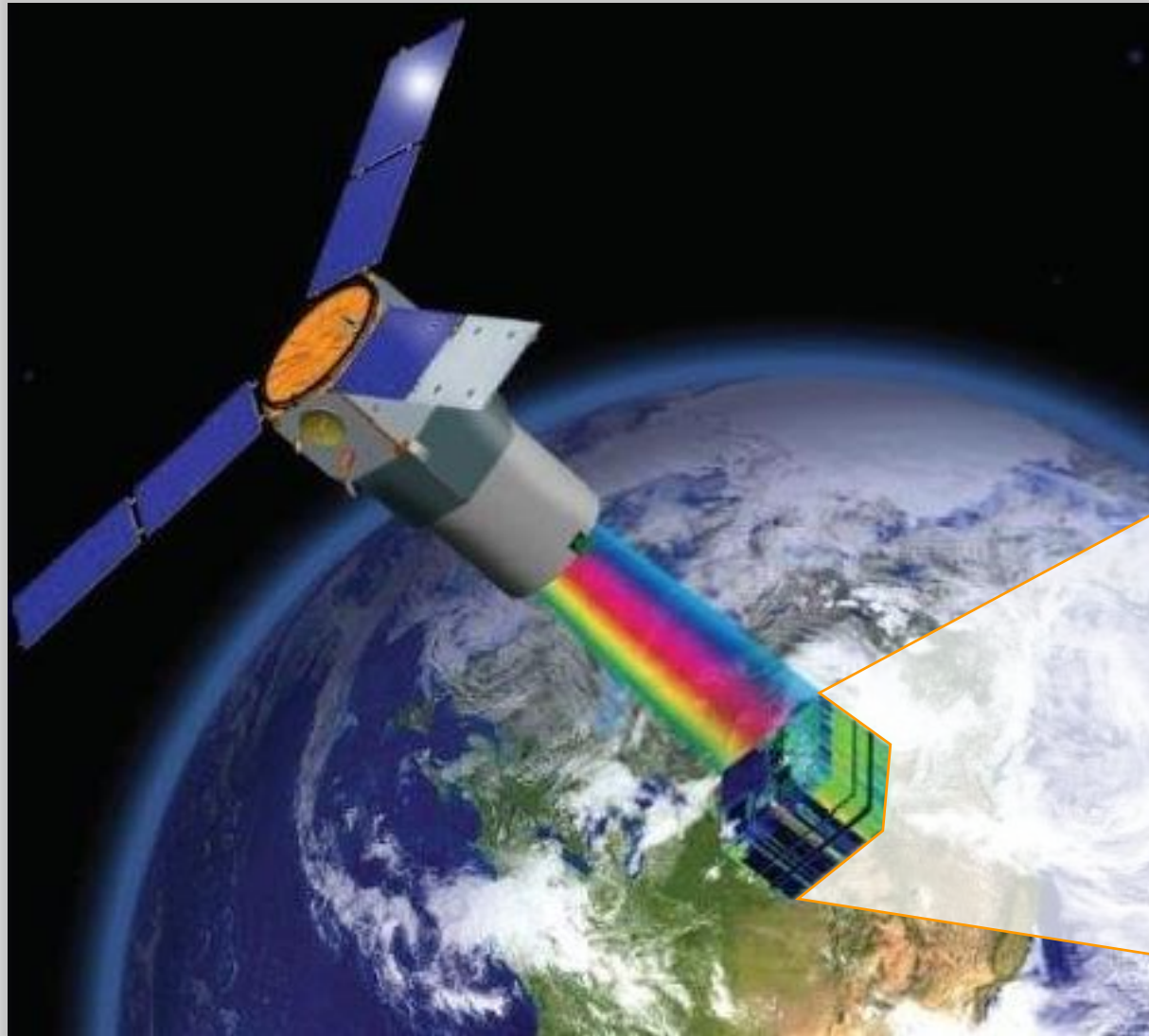
Analysis according to phenomena



Interpretation

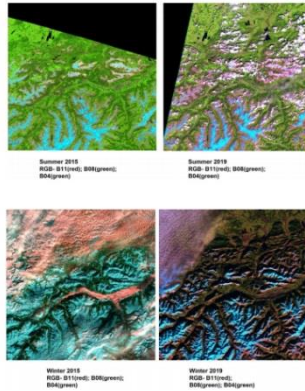


Multi-dimensional data, detection & classification





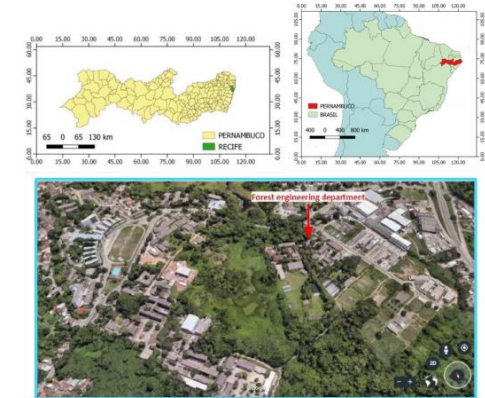
SHE SPACE RESEARCH RESULTS



Snowpack development in the Bavarian Alps



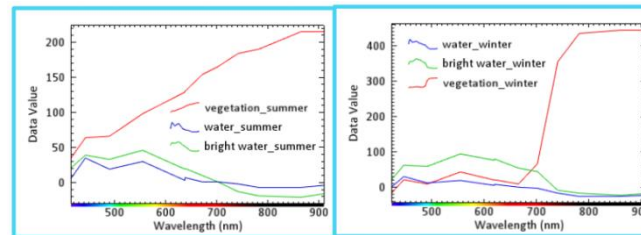
Detecting wildfire by satellites



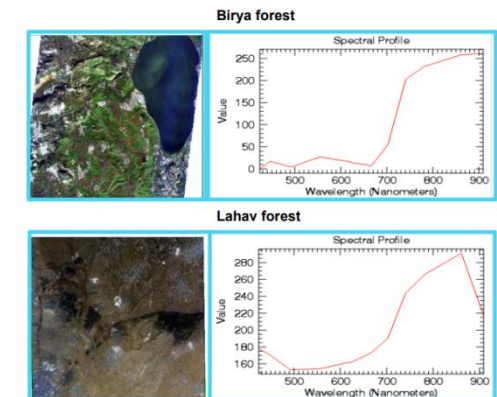
Preserving and restoring forests



Climate change influence on wheat growth



Water Availability and Quality



Effect of Climate Change on Water Resources

CLIMATE ACTION: INTERNATIONAL GIRLS' SYMPOSIUM ON ENERGY AND RESPONSIBILITY

IGSER 2019



1st International Girls' Symposium on Energy and Responsibility

Friday, October 4th 2019

The German Aerospace centre, DLR, and the MINT-Girls Regensburg organize a symposium on *Energy and Responsibility* taking place at the DLR in Oberpfaffenhofen. Students representing their respective school from all European countries are invited to participate.



Introduction

Learning about the environment produces deep understanding of both the physical and human-social interactions, develops caring attitudes and contributes to responsible environmental behavior. In Israel, it is especially important for the public to show environmental responsibility for water sources. Israel is mostly desert (Fig. 2.3), with limited annual rainfall. One cause of the ongoing water crisis in Israel is overuse of the water in the Sea of Galilee (Fig. 2.1), which has been at record lows for several years. Because of this shortage, water from the streams surrounding the Sea of Galilee infiltrates the lake, increasing the possibility of pollution. To understand environmental responsibility in Israel, we used remote sensing to study water quantity and quality in the Sea of Galilee and in the Mediterranean Sea.

Material & Methods

We used Venus satellite (Fig. 1) images for our study. Venus is an Israeli-French research satellite, launched in August 2017.

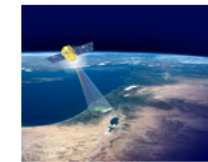
Significant advantages of the satellite are:

1. Spatial resolution: 10 m/pixel
2. Radiometric resolution: 10 bit
3. Temporal resolution (revisit time): 2 days
4. Spectral resolution (12 bands): 423.9 – 908.7 nm



Figure 1: Venus satellite

These advantages aided our research as follows. 1) Because of the satellite's high radiometric resolution we can detect small spectral changes. 2) Thanks to the satellite's research focus on plant health we were better able to investigate the presence of algae in the water of the Sea of Galilee. 3) The spatial resolution is high enough that we were able to sub-set large areas and look for local differences. 4) Finally, the 2-day revisit time may help us in the future to develop this work into a study investigating more detailed changes over shorter time-periods than seasonal differences.



We mapped the range of reflectance values for single bands using two specific bands: Band 7 (666.2 nm) and Band 2 (446.9 nm). We also used spectral signature extraction from regions of interest and comparison of spectral signatures to determine the largest reflectance differences by band ENVI/IDL image analysis software to process the satellite images was used.

Study sites

1. The Sea of Galilee is the largest freshwater lake in Israel. It is one of our freshwater sources (Fig. 2.1).
2. The Mediterranean Sea is an intercontinental sea located between the continents of Asia, Africa and Europe. Our study area is on the coast (Fig. 2.2). Because it is a closed sea, it is more vulnerable to pollution. There are also many ports and industrial areas along the coast that may contribute to pollution.
3. Negev desert, less than 200mm rain/year.



Figure 2: A map of Israel with study areas

Results

The colored polygons (Fig. 3) mark the areas identified as water; both man-made agricultural reservoirs and natural water bodies. Comparing the number of pixels between the two sets of polygons (Table 1), one can see that summer has fewer pixels attributed to water than winter, but the results are similar for both seasons.

Table 1. Pixel counts for summer (blue) and winter (red) water identifications.

Winter pixel count	Summer pixel count
1598820	1588933

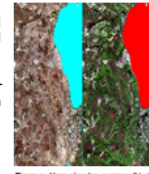


Figure 3: Three images showing summer (blue) and winter (red) water polygons.

Water quality was investigated by: 1) Looking for spectral differences between the Sea of Galilee and the Mediterranean Sea (Figs. 4 and 5) to differentiate between salty and fresh water; 2) Attempting to locate areas within the Sea of Galilee showing the spectral signature of algae, which we hypothesized would be similar to plants (Figs. 6 and 7).

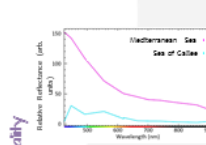


Figure 4: Spectral signatures of the Sea of Galilee and the Mediterranean Sea

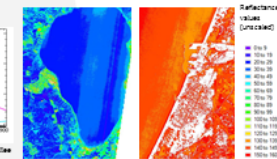


Figure 5: Band 2 (446.9 nm) colored, uncalibrated reflectance differences between the Sea of Galilee (left) and the Mediterranean (right).

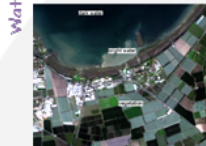


Figure 6: Three points were selected to identify algae spectral signatures: healthy vegetation (left), deep water, and water close to the shore (right).

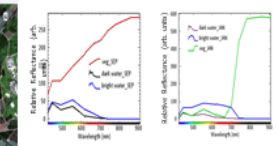


Figure 7: Spectral signatures of the 3 points in September (left) and January (right).

We hypothesized that the 'bright water' might contain algae. However, the 'bright water' spectrum was very different from vegetation and more like the deep water signature.

Conclusions

- Reflectance values are higher over the Mediterranean than over the Sea of Galilee, the biggest difference being in band 2 (446.9). This is probably due to differences in elevation between the two study areas.
- There are no significant differences in the spectral signatures of different areas within the Sea of Galilee and the Mediterranean.
- The overall quality and quantity of the water in the Sea of Galilee are both unchanged during the winter and summer, as detected by remote sensing using Venus images.
- The Venus satellite may be less suitable for testing changes within a water source, but the differences between fresh and salt water are clearly detectable.



CONCLUSIONS

TOWARD ACHIEVING UNITED NATIONS SDG'S 4, 5, 13 & 17



WOMEN FOR SPACE & SPACE FOR WOMEN



**Acting as ambassadors
for
Women in space science**



MERCIE

GRACIAS

감사합니다

DANKESCHÖN

THANK YOU

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OBRIGADO