

## **Summary of the EARSEL SIG IS Workshop held in Tel Aviv, March 16-21, 2009**

Prof. Eyal Ben-Dor  
Workshop Chair

This workshop was organized by the European Remote Sensing Laboratory (EARSeL) and co-organized by the ISPRS technical commission VII/4 "Information extraction from hyperspectral data". The workshop was chaired by Prof. Eyal Ben-Dor, head of the Remote Sensing Laboratory, Department of Geography, Tel Aviv University. The scientific workshop (poster, oral, and round table sessions) took place at Tel Aviv University, Ramat Aviv from March 16-18, 2009. On March 19 a meeting of the ISIS group was held and then afterwards, on March 20 and 21, 2009 field trips to the Dead Sea Rift and to Makhtesh Ramon National Park in Southern Israel took place. The workshop consisted of 190 participants from 28 different countries and 4 continents. Eighty-six oral presentations were given in 19 sessions and 55 posters were presented during two active poster sessions. Two keynote lectures were given by Dr. Green from NASA, JPL, and by Dr. Roy from IRSC summarizing the hyperspectral activities in their countries including reviewing upcoming HSR programs. The workshop's guest of honor was Dr. Leibig, ESA, director of the Earth Observation Programs and head of ESRIN, who was unfortunately unable to attend the workshop due to a last-minute change in his busy schedule. Dr. Rast, from ESA, who heads the Program Planning office at the Earth Observation Director's Coordination and Planning Service and on behalf of Dr. Leibig and ESA, greeted the participants. A special session was dedicated to honor Prof. Itten for his outstanding contribution over the years to the European hyperspectral community and on the occasion of his retirement from the RSL University of Zurich, which took place four weeks before the workshop. The memorable session consisted of lectures given by his former students and by some leading scientists in both Europe and worldwide. Prof. Itten also gave a special lecture that summarized the HSR activity in Europe over the past 25 years. This special session was then followed by a reception ceremony in which a golden honorable medal was given to Prof. Itten on behalf of the EARSEL SIG IS board.

The workshop was characterized by the high scientific standards of papers and interesting sessions as well as post-workshop activities. Many breakthrough results were presented and discussed during the workshop. Special awards for the best oral and poster presentations were given to the two winners after a careful evaluation process that was hosted by the session leaders and assisted by volunteers from the audience (students as well as senior scientists). The high quality of the papers and the difficulty in selecting a winner reflects the very high quality of the scientific matter presented at the workshop. Seventeen papers in the oral session received scores of 8.7-9.1 and five in the poster session ranged from 9-9.5 (out of 10). The criteria for the best papers were scientific innovation, reliable results, coherent presentation, and contribution to the HSR discipline. The best paper award was given to Dr. Borel and his colleagues from Nall Aerospace and Technologies, Corp. Fairborn, OH, USA for their paper entitled: "ADJOINT RADIOSITY-BASED ALGORITHMS FOR RETRIEVING TARGET REFLECTANCE IN URBAN AREA SHADOWS".

The award for the best poster paper was given to Ms. R. Lugassi and colleagues from the RSL, Tel-Aviv University for her paper entitled "HEAT INDUCED SOIL MINERALOGICAL CHANGES AND ITS CORRESPONDING CHANGES IN SPECTRAL PROPERTIES "

The participants were from the academia, national and international research bodies, governmental centers, industry, and end users; some were also decision makers. In addition, students in their initial academic stages were allowed to attend specific sessions and gained some direct insight into this promising technology. Several worldwide companies with expertise in HSR technology (hardware and software) presented their products in active exhibition sessions during the coffee breaks. The companies were EL-OP, HIVISTA, SPECIM, NORVEKO, ITT, and ASD. The workshop broke several records (the number of participants, papers, and days); however, the most significant one was the attendance of many HSR experts from all over the world and not necessarily from Europe. This includes scientists from the USA, Canada, Australia, India, and Japan.

Post-workshop activities included the semi-annual meeting of the ISIS working group, where about 40 people from the USA, Canada, Japan, Europe, Israel, China, and India discussed new achievements and initiatives in orbital HSR technology as well as discussed possible applications that require more development to make this technology robust and in demand. Two other activities were field trips to the Dead Sea and to Makhtesh Ramon. Whereas the Dead Sea field trip focused mostly on the history of the area and less on its geology, the field trip to Makhtesh Ramon was dedicated mostly to showing the participants the remarkable suitability of the area to serve as a calibration site for both hyper and multispectral sensors. The blue skies almost all year long, along with high radiation, sparse vegetation, diverse surface mineralogy (for spectral and thematic calibration), uniform sand playa (for radiometric calibration), a nearby well-equipped laboratory, a well-studied and mapped area (geology, geomorphology, soil, and topography), hotel and nearby highway are only a few of the factors that were discussed during the field trip. In addition, spectral measurements were taken from several locations along the visited sites and uploaded to the conference website for further perusal by potential users in order to obtain information concerning the spectral capacity of the area.

The scientific content of the workshop indicated that extensive activity in HSR technology was gained over the past two years, since the 5<sup>th</sup> EARSEL SIG IS meeting that took place in Bruges, Belgium. These activities were led by space agencies (national and international), industry, research centers, and academia. Special attention was devoted to new orbital sensor missions of two countries: Italy with PRISMA, and Germany with EnMAP and one space agency ESA with FLEX. In addition, future activities of NASA and India were discussed (later at the ISIS meeting China and Japan also presented their future plans). The workshop was closed by a round table that was dedicated to the German EnMAP mission. The panelists were from Germany (science and industry), Canada, and the USA. The round table chair, Dr. Berger from ESA, led a fruitful discussion that underscored two major points: 1) The community is urgently waiting for this mission to be launched, and 2) The EnMAP has undergone significant progress during the past two years and is the first one in queue. The overall subjects that were presented during all sessions are as follows:

- 1) Present and future HSR activity in space (8 projects)
- 2) The space agency's activities in HSR (India, USA, Italy, Germany, and ESA)
- 3) Ex-terrestrial HSR activity (Moon and Mars)

- 4) New and future HSR sensors (ground, air, and space)
- 5) A review of large-scale projects for educating and data dissemination
- 6) The effects in the atmosphere (atmospheric correction as well as for detection of gases and aerosol)
- 7) Geology and geomorphology applications
- 8) Soil and precision agriculture
- 9) Aquatic environment: cost, inland, and deep waters
- 10) The CRISH-PROBA ESA project
- 11) The FLEX ESA project
- 12) Data processing
- 13) Fusion with other sensors (mostly LIDAR) and wavelengths extending toward the TIR region
- 14) CAL-VAL
- 15) New processing algorithms including change detection scenarios
- 16) New spectral information from soil, vegetation, and artificial matter
- 17) Disaster monitoring
- 18) Ecology, vegetation and environment, precision agriculture (from vegetation view point)
- 19) The effects on the economy and the affordability of the HSR technology
- 20) Data compression, decompression, and handling
- 21) The future of HSR technology
- 22) The progress of HSR technology from the first EARSEL SIG IS meeting until today

In summary, the workshop turned out to be a great success and demonstrated the significant progress in HSR technology worldwide. A rough check between the abstracts of the 1<sup>st</sup> EARSEL SIG IS (1997) and the 6<sup>th</sup> EARSEL SIG IS meetings (2008) revealed that the progress achieved is tremendous. Although progress is vital in older aspects, new aspects were introduced. In addition, two significant regressions were inspected in atmospheric and geological applications (in terms of the number of presentations). This means that whereas in 1997, the atmosphere was a significant barrier in retrieving reflectance values, this issue has been completely solved today. New aspects in the atmosphere, such as detecting gas plumes or the dust's mineral composition are entering the current era. The geological application was the driving force of the HSR technology in its early stage, as shown in Dr. Green's keynote presentation. Nowadays, it seems that the geological applications are ripe and well studied whereas researchers now prefer to search for new applications in other fields. Data fusion, data compression, change detection, satellite sensors, ex-terrestrial HSR missions, new airborne sensors, economy aspects and large-scale campaigns were some of the activities that attracted attention in this workshop much more than in the first one. Another change between the two workshops was personal-based involvement. A name-by-name check revealed that the 6<sup>th</sup> EARSEL SIG IS workshop consists of more than 60% new members' names than in the 1<sup>st</sup> EARSEL SIG IS meeting. This leads to the following points: 1) more people have entered our community and discovered the new technology, 2) other worldwide active groups recognize the contribution of EARSEL SIG IS to the HSR and joined our activity for the first time, and 3) some people have left this promising technology or have decided for some reason not to attend the 6<sup>th</sup> meeting. The summary session has concluded that the technology is quite advanced and mature but it still has a long way to go

from being an unknown to a completely well-recognized and active technology. In this direction, it was agreed that commercialization is still far from being practical and that progress to that end is of utmost importance. Another conclusion drawn from the workshop is that many parallel activities in HSR technology are taking place worldwide and collaboration with these activities is essential for future HSR progress. Based on the large number of papers submitted and presented and on a scientific community that is consistently growing, it was recommended to possibly extend the future workshop to 4 days. The next EARSEL SIG IS workshop will take place in Edinburg, Scotland from April 11-13, 2011 chaired by Dr. Tim Maltus, where we hope to see more progress, attendees, and collaboration with other scientific communities.

**Participants of the 6th EARSeL SIG IS Workshop  
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