Report of the

EUFAR FP7

N4EWG-mtg12

"A Demonstration and Practical Exercise for Modeling Soil Spectral Information" (DePeMossi)

In collaboration with ISPRS WG VII/3

August 29-31, 2011 – GFZ Potsdam, Germany

Last update on 28/09/2011 by Sabine Chabrillat, Eyal Ben-Dor

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2. List of attendees

- **Organizators/ Instructors:**

	Name	Surname	Institution	Participation
1	Ben-Dor	Eyal	Tel-Aviv University, Israel	Main organisator / Instructor
2	Chabrillat	Sabine	GFZ Potsdam, Germany	Local organisator / Instructor
3	Schwartz	Guy	Tel Aviv University, Israel	Instructor
4	Westad	Frank	Camo Software, Oslo, Norway	Instructor

- **Excused:**

Raphael Viscarra-Rossel (CSIRO, Instructor)

- **Attendees:**

	Name	Surname	Institution
1	Amare	Tadele	University of Bern, Switzwerland
2	Ampe	Eva	Vrije University Brussels, Belgium
3	Bayer	Anita	DLR-DFD-LA, Germany
4	Beyer	Florian	University Halle, Germany
5	Brodsky	Lukas	University of Prague, Czech Republic
6	Brosinsky	Arlena	GFZ Potsdam, Germany
7	Buzzi	Jorge	Geological Survey, Spain
8	Csorba	Ádám	Hungarian Institute of Agricultural Engineering, Hungary
9	Denk	Michael	University Halle, Germany
10	Eisele	Andreas	GFZ Potsdam, Germany
11	Förster	Saskia	GFZ Potsdam, Germany
12	Garcia-Melendez	Eduardo	University of León, Spain
13	Große-Stoltenberg	Andre	University Münster, Germany
14	Guerrero	César	University Miguel Hernández, Spain
15	Hergarten	Christian	University of Bern, Switzwerland
16	Kopačková	Veronika	Geological Survey, Czech Republic
17	Kuśnierek	Krysztof	University of Poznan, Poland
18	Noon	Carole	Université catholique de Louvain, Belgium
19	Schmid	Thomas	CIEMAT, Spain
20	Siegmann	Bastian	University of Osnabrück, Germany
21	Sykas	Dimitris	NT University of Athens, Greece
22	Vellico	Michela	OGS, Italy

3. Meeting outline

3.1. Goals

The meeting was organized under the N4EWG – Expert Working Group "Hyperspectral Applications for Soil" as a follow-up meeting of the first N4EWG meeting organized in 2010. In April 2010 a two days meeting of the EWG was conducted at GFZ under the support of EUFAR with a great success (see the FP7-EGW Meeting 04 -Soil Applications- report at the EWG web page under "Documents"). The first meeting was based on a traditional approach of mostly interactive sessions where experts presented methods and possibilities of hyperspectral applications for soil quantitative mapping. Based on this meeting, discussions lead to advices and recommendations to EUFAR and a follow-up meeting was suggested.

The goals of the follow-up EWG meeting were to demonstrate, teach and practically train the EWG members in the use of *state-of-the-art* methods (software, algorithms and approaches) to model soil spectroscopy for thematic mapping from the hyperspectral domain. For this, students who are using soil spectroscopy (image or point) in their research were gathered and exposed to state-of-the-art tools in order to improve and increase quantitative applications of hyperspectral imagery for soil and geosciences research. Experts of the EWG Hyperspectral applications for soils presented to younger members a 3-days practical teaching and demonstration in spectral measurements protocol and in the use of available softwares for determination of soil properties based on spectroscopic data/images.

The DePeMossi workshop was then organized under the following focus:

- Instructors for this demonstration are leading scientists in the field that developed new soil spectral analyses approach or responsible for new software to analyze spectral information: Frank Westad (CAMO)—Unscrambler®X; Guy Schwartz, Eyal Ben Dor (TAU)—Paracuda®; Sabine Chabrillat (GFZ)—HYSOMA; Raphael Viscarra-Rossel (CSIRO)—Parles®
- It will be an analytical workshop with computers, new software, soil databases and deductive lessons and exercise
- In GFZ there is an infrastructure 'GeoLab' developed for educational activities (Courses/Schools) that can be accessible for free, with lecturing and tutoring installations for maximal 24 places
- Participants will be selected based on soil spectroscopy background and recommendation.

3.2. Program

The workshop consisted in interactive sessions for field spectrometry measurements, standards and protocols, and for practical training in three software packages: Unscrambler, Paracuda, and Hysoma. A total of 30 fellows registered for the workshop from which 24 were selected. Upon the cancellation from Raphael Viscarra-Rossel the software ParLes could not be demonstrated as initially planned. Instead a session on soil spectroscopy standards and protocols was organized.

The workshop was organized over 3 days and 6 half-day sessions. Day 1 consisted of an introductory session on soil spectroscopy analyses, and a session on soil spectroscopy measurements, standards and protocols comprising both lecture and practical exercises with

two ASD FieldSpecPro provided from the GFZ and soil samples from TAU. Day 2 consisted in a lecture session on multivariate analyses and basic statistics, and an exercise session with the software Unscrambler®X from CAMO. Day 3 consisted in two sessions with teaching lectures followed by practical training for two different softwares: Paracuda® from Tel-Aviv University and the HYperspectral SOil MApper (HYSOMA) software interface developed at GFZ under the EUFAR-FP7 JRA2 HYQUAPRO. Finally a general round table was used to discuss current issues regarding soil properties mapping using hyperspectral imagery and soil spectroscopy. The problem of software availabilities for the processing of soil applications and their distribution was also discussed.

The participants/students got homework to work on the data they acquired during the active lessons. The homework consisted of analyzing the results of the four technologies studied and discuss it scientifically. All students considered this stage seriously and the result is an outstanding piece of work that is downloaded into a webpage for the students to review.

A questioner to evaluate the workshop as well as comments for the future was passed by. The overall impression was very good and there was no exception that the workshop provided new technique and open new frontier to the students.

4. Conclusion

This EWG meeting was a unique opportunity to further advance the quantitative applications of soil spectroscopy and prepare a new generation for future activity in this promising field. The high candidate rate showed that there is a very strong interest for state-of-the-art tools for the quantitative modeling of spectral information for the determination of soil properties.

Participants appreciated the organization of the workshop in interactive sessions with practical exercises with spectrometers or on the computer, where they could learn much more than in a traditional meeting organization. Social activities were appreciated too. The workshop represented a unique opportunity to meet the younger member of the EWG community and prepare them for future challenges. The meeting allowed the further building and strengthening of the soil spectroscopy network that began last year with the organization of the EWG meeting 04.

Outlook

The EUFAR EWG Hyperspectral Applications for soils has got more than 200 members to date and the EWG meetings are allowing the building of a strong network. There is a strong demand for improved and operational soil mapping routines that are scientific tasks that are not satisfyingly solved today. In particular, soil mapping algorithms covering the whole wavelength region VNIR-SWIR and Thermal part of the spectrum are lacking.
The participants asked for the PDF of the workshop manuel to be made available on the EUFAR web site.

Recommandations toward EUFAR

Users of hyperspectral imagery for soils have a strong demand for

- availability of hyperspectral data
- availability of state-of-the-art tools for soil mapping using hyperspectral imagery.

It is recommended to

- further advertise EUFAR TA activities in soil-related and geosciences conferences, where still large parts of the geoscience community are little aware of it.
- include the HYSOMA interface software in the EUFAR Toolbox web page as separate tool easy to download for non-expert users.
- Establish a “sister” EWG in soil applications using the TIR spectral region in particular and other HSR-TIR application in general.
- Support more *easy-to-use* tool to analyze soil spectroscopy in all spectral regions for getting the most from the HSR technology in this emerging field

5. Action list

1. **Put PDF of the workshop manuel on the EUFAR web site:**
   Sabine Chabrillat
   30.09.2011

6. Annexes (if applicable)

All annexes are available either in this report or at www.eufar.net

ANNEXES SUMMARY:

ANNEX I: Workshop agenda

ANNEX II: Workshop manual (available through the EUFAR web page)

ANNEX I:

Monday 29/08/11

Time	*DePeMossi Workshop*	*Instructor*
09:00 – 09:30	Registration and Coffee	
09:30 – 10:00	**Introduction**	**Organisators**
10:00 – 11:00	**Soil spectral analyses: History present and future**	**Eyal Ben-Dor (TAU)**
11:00 – 12:00	**Soil spectral measurements: Introduction**	**Eyal Ben-Dor (TAU)**
12:00 – 13:30	Lunch	
13:30 – 16:00	**Soil spectral measurements: Variation, standards and protocols**	**Eyal Ben-Dor (TAU)**
16:00 – 16:30	Coffee Break	
16:30 – 18:00	**Exercise**	**Eyal Ben-Dor (TAU)**

Tuesday 30/08/11

Time	*DePeMossi Workshop*	*Instructor*
09.00 – 11:00	**Multivariate analyses and basic statistics**	**Frank Westad (CAMO)**
11:00 – 11:30	Coffee Break	
11:30 – 12:30	**Unscrambler®X: Introduction**	**Frank Westad (CAMO)**
12:30 – 14:00	Lunch	

14:00 – 16:30	**Unscrambler®X: Practical Use**	**Frank Westad (CAMO)**
16:30 – 17:00	Coffee Break	
17:00 – 18:30	**Unscrambler®X: Exercise**	**Frank Westad (CAMO)**
20:00	Gala Dinner	

Wednesday 31/08/11

Time	*DePeMossi Workshop*	*Instructor*
09.00 – 09:30	**Problems and solutions: Model extraction**	**Guy Schwartz (TAU)**
09:30 – 10:30	**Paracuda®: Introduction**	**Guy Schwartz (TAU)**
10:30 – 11:00	Coffee Break	
11:00 – 12:30	**Paracuda®: Practical use**	**Guy Schwartz (TAU)**
12:30 – 13:30	Lunch	
13:30 – 15:00	**HYSOMA: Introduction**	**Sabine Chabrillat (GFZ)**
15:00 – 16:00	**HYSOMA: Practical use**	**Sabine Chabrillat (GFZ)**
16:00 – 16:30	Coffee Break	
16:30 – 17:30	**HYSOMA: Exercise**	**Sabine Chabrillat (GFZ)**
17:30 – 18:00	**Workshop summary**	**All**