COST Action ES1404 - Short Term Scientific Mission (STSM) Scientific report

Visiting Researcher (VR): Cenk Donmez
Researcher's institution: Cukurova University, Adana, Turkey

Host: Dr. Ali Nadir Arslan
Host institute: Finnish Meteorological Institute, Helsinki, Finland

Period: 30.07.2018 - 03.08.2018

1. Objectives of the visit

The overall objectives of the visit were, i) to strengthen the research collaboration between Cukurova University and FMI, ii) practices on FMIPROT, iii) discussion on future project applications and joint papers.

2. Mission Activities

The STSM comprised project-related methodological research activities as joint meetings and intensive laboratory work including snow modelling studies, data collection and evaluation. The VR aimed to gain expertise on the FMI Image Processing Toolbox (FMIPROT) that is a software designed to process digital image series from cameras and camera networks. Several discussions were held on possible project applications and joint papers. Integrating remote sensing products into the existing snow modelling toolset and adapt it to demand and conditions in a Mediterranean environment were also one of the important topics of the STSM.

2.1. Joint meetings and presentations (30.07.2018)

To introduce both research teams from Finland and Turkey, several meetings were held at FMI during the visit. Within these meetings, the VR introduced his research team to the research group of Arctic Space Center at the FMI where Dr.Arslan is affiliated. These meetings comprised the research topics and ongoing studies of the VR and Finnish research team.

- Dr. Ali Nadir Arslan presented the ongoing research activities of the FMI in his opening speech. He introduced large range of quality weather services and consulting services offered his institute. These services included aviation, air quality, energy, industry and sea level which the FMI are well equipped on. Particularly, their studies on theoretical mean sea level and geodetical leveling systems in Finland were interesting to experience within the given examples of sea height system calculations. He also summarized the recent developments in ES1404 COST action and its potential scientific and networking outputs.
- The VR presented the ongoing research activities of his research group in Turkey. He introduced the research group that he takes part at Cukurova University, Remote Sensing and GIS Lab, Adana, Turkey. He pointed out his research topics mainly on the hydrological modelling and its relations to estimate snow components including depth,

Snow Water Equivalent, and fractional snow cover. Model snow parameters were tightly discussed and tips were provided by Dr.Arslan to improve the modelling studies of the VR.

Following these presentations, a fruitful conversation was held by the FMI group and the VR. Dr. Arslan emphasized the data needs for testing snow modelling outcomes and the importance of remote sensing as a powerful tool that offers the ability to quantitatively examine the physical properties of snow in remote. Addressing the importance of remote sensing in snow modelling, the recent advances in snow products of various remote sensing platforms were discussed. Data availabilities and their specifications (spatial/temporal resolution, band withs, tracking etc.) were evaluated in this regard. The VR extended his knowledge in recent remote sensing data assimilation and analysis for demands of the snow model simulations. Deriving remote sensing snow products from optical sensors (MODIS, LANDSAT) and Synthetic Aperture Radar (SAR) were another important focus to integrate into validation process of the spatially distributed and temporal snow simulations.

2.2. FMIPROT practices (31.07.2018)

FMIPROT is an efficient image processing toolbox for extracting snow cover information from web cam data developed by the FMI (Arslan et.al, 2017). It can acquire and process images from multiple camera networks on a single platform by adding connection information of the image repositories.

Due to a potential interest of the VR to implement multiple camera networks in his study area, one of the main objectives of the STSM was to introduce the FMIPROT to him. An intensive laboratory work for using the algorithm and the toolbox for the validation of snow cover products were done in this case. These laboratory work consisted the installation, implementation, sample image acquirements and the tips on its graphical user interface. The graphical interface of the FMIPROT is given in Figure 1.

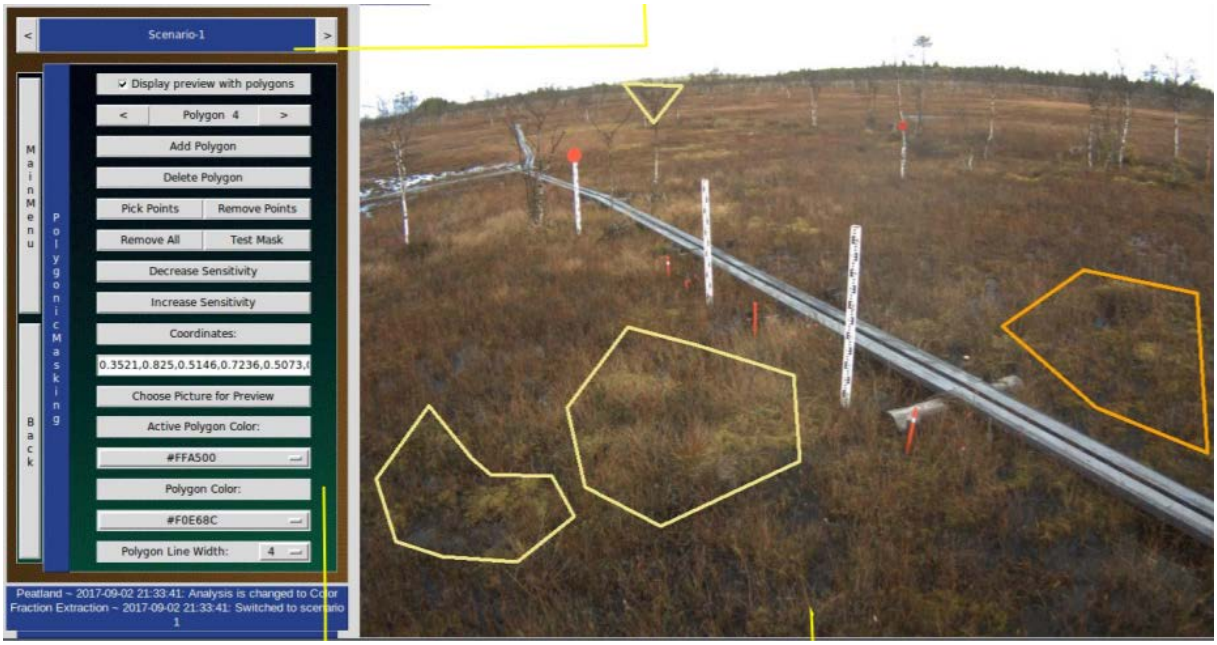

Figure 1. The graphical interface of the FMIPROT (Arslan et.al, 2017).

During the trainings on the FMIPROT, basic functions of its interface were introduced to the VR. Main focus was given to its camera network manager for adding, removing and

editing recognized cameras. The camera network part was also examined on how the FMIPROT connected to a camera. The parameters were setup, CNIF and loading camera options were trained additionally.

Scenario analysis was also done to investigate color fractions of the acquired images (Figure 2). This was introduced to the VR by Dr.Arslan and related experts at Arctic Space Center at FMI.

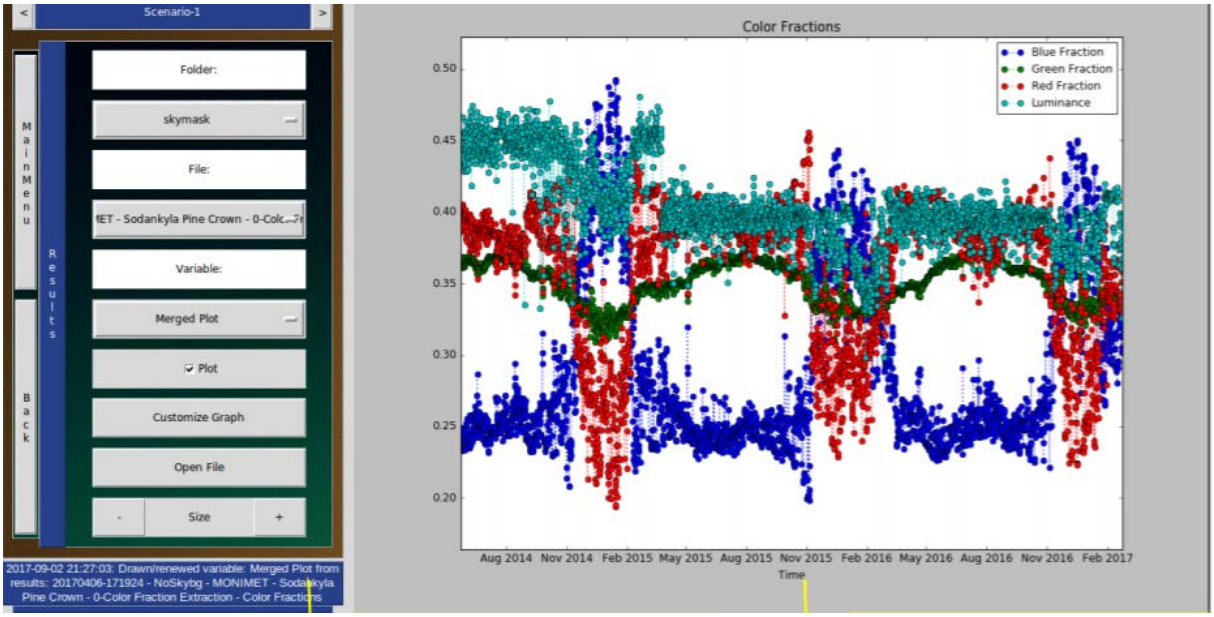

Figure 2. Scenario analysis interface of the FMIPROT (Arslan et.al, 2017).

Practices on the FMIPROT and web cam installation process were given to the VR while data visualation options were focussed. FMIPROT trainings carried out during the STSM had significant importance to provide expertise to the VR. He gained valuable assest on camera networks and their data processing procedures. This will give him and the FMI group a chance to implement those toolbox and the camera systems to his study region in Turkey where these systems can be effective tools to collect ground truth his snow modelling studies. These future possibilities will be referred as one of the networking outputs of the COST ES 1404 in near future.

2.3. Daily Visit of the Turkish Team (01.08.2018)

During the STSM, three members of the VR's research group from Turkey had a daily visit to FMI to introduce their ongoing research project supported by the Turkish Scientific and Research Council (TUBITAK, NO:115Y063). The VR also takes part on this project and it comprises modelling of water quality and quantities at Seyhan River Basin, Turkey.

Firstly, Prof. Dr. Suha Berberoglu, introduced his group's studies briefly. Prof.Dr. Berberoglu is the Dean of the Architecture Faculty of Cukurova University, Turkey and head of the LANDGIS research group. He pointed out the potential of his group in environmental modelling, particularly in hydrology and net primary productivity research. Then, he introduced his ongoing projects where they might be a relevant basis for future collaborations between FMI and Cukurova University. Moreover, Dr. Ahmet Cilek, and PhD student Muge Unal from Prof.Berberoglu's group gave a brief information on their research activities.

During the meeting with Turkish research team and the FMI group, the VR presented the construction and implementation processes of four gauging stations in their study region in Turkey. The equipments on these stations were introduced (Figure 3). The gauging stations include a solar panel, measurement probs and automatized sampler. Particularly, the VR considered on the difficulties of the prob settings and the potential measures on vandalism against the stations in rural areas. A delightful and efficient conversation was held between the host, the VR and the visiting group from Turkey in this regard.

After the meetings, Dr. Arslan introduced the physical and managemental structure of the FMI to the visiting research group and also the VR. He described the future prospects of his institute, respectively (Figure 4).

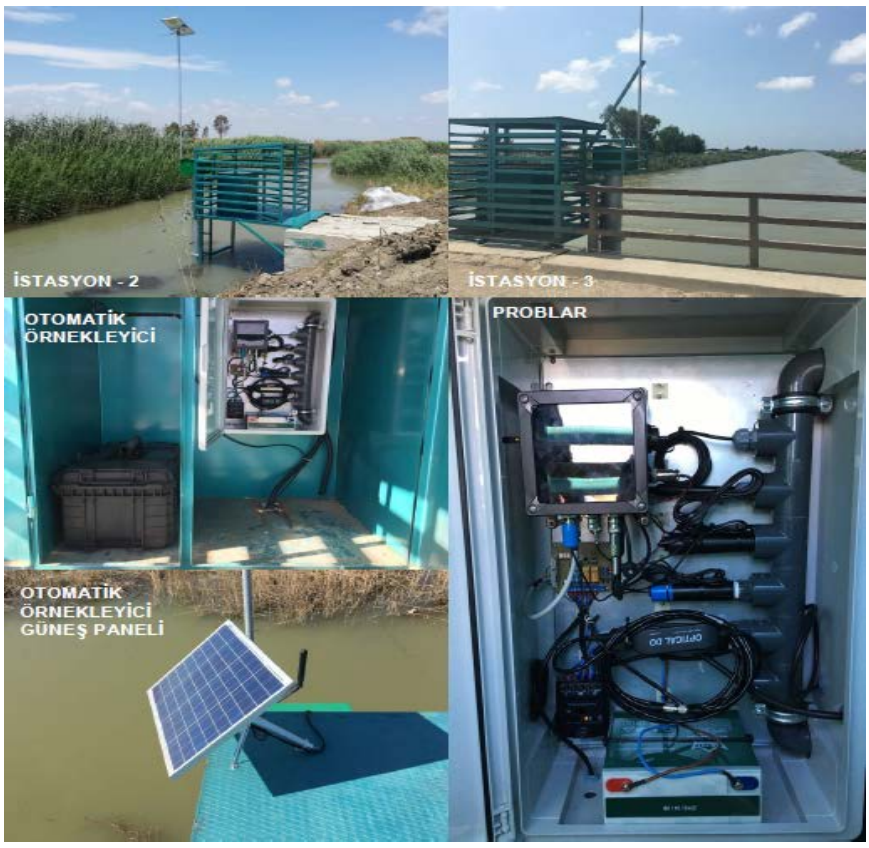

Figure 3. Equipments of the gauging stations introduced by the VR

Figure 4. Dr.Arslan introduced the FMI to daily visiting Turkish group and also the VR.

2.3. Discussions on future project applications and joint papers (02-03.08.2018)

Project applications: Snow modeling in cooperation with remote sensing and recent toolboxes such as FMIPROT with respect to process-based modeling in local scale are required to apply in Turkey where the seasonal amount of the snow water supply regime in total water budgets is an important research question. The VR is preparing a project application with collaboration of Cukurova University (Turkey) and Friedrich-Schiller University (Germany). The project will be submitted to a joint research call of TUBITAK and BMBF (Germany) institutes. Details of this project were discussed by the VR and Dr.Arslan during the joint meetings. It was discussed that the camera networks Dr.Arslan introduced, could provide valuable insights for the project. The VR declared this option to his German partners and shared their contact information with Dr.Arslan as one of the networking aims of the COST ES 1404.

Joint papers: The VR is already preparing a joint paper to submit to a peer-reviewed international journal. The headline of this paper is “Multi-seasonal snow cover change detection based on a modified Water-Resistant Snow Index and in-situ data”. The STSM allowed the VR to improve the contents of the paper based on the review given by the FMI group. It was tightly discussed during the meetings and some improvement options were suggested by Dr.Arslan on the results of the paper. As he will be one of the authors, the paper is decided to submit to *Geosciences-MDPI* journal until mid-September, 2018. On the other hand, the fruitful discussions on possible future publications on regional snow modelling were also discussed.

3.Summary of the STSM

The STSM was effective to introduce and increase the possible/potential future collaboration options between Cukurova University and the FMI. The knowledge shared has been excellent and the visit has opened the possibilities to the common researches to improve their studies on snow processes through modelling and microwave satellites observations.

I would like to thank the COST Action ES1404, in particular Dr. Ali Nadir Arslan to award me this STSM grant as well as, the FMI for hosting me.

Dr.Cenk Dönmez

References

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