Cost Action ES1305 (ENRAM) combined WG1-4 meetings

25 & 26.02.2014 – Lucerne / Sempach, Switzerland

Day 1 – 09:00 – 17:00, 25.02.2014 – Hotel Ibis Styles, Lucerne

At 9:00 Felix Liechti, the local organizer, welcomed the participants to this meeting. Felix Liechti outlined the time schedule for the period of the combined meetings, and other logistical details.

Jason Chapman, the Action chair, provided an overall presentation of the ENRAM network (9:10) as many of the participants had joined the Action since the Kick-off meeting (October 2013). In fact, the number of signatory countries has increased from 14 to 20 since the last meeting. Jason Chapman highlighted that this is a network that benefits from having as many as countries as possible involved, despite being already larger than average. An overview of the time-table and agreed tasks for the current year was presented followed by the indication of those members that have already been assigned to action tasks. Jason Chapman ended his initial presentation indicating the need to establish collaborative studies with similar weather radar networks in the USA and Asia and other regions.

At 9:33 the leaders of each WG provided a short presentation of their respective WG and the specific objectives for this meeting:

WG1 - **Hidde Leijnse**–Define strategy for obtaining weather radar data and for central implementation of algorithms;

WG 2 - **Felix Liechti** –Identify locations for the calibration experiments with different types of biological radars;

WG 3 - Hans van Gasteren – Explore software tools to visualize animal movement form weather radar data and prepare a case study leading to a data-challenge for developers to work with sample data;

WG 4 – Ommo Hüppop –Identify the members of the WG and establish the general aims of the group.

During these presentations two issues were raised by the audience. The possibility of developing a new type of biological radar was discussed, but given the vast costs required for such operation this idea was set aside. Yossi Leshem indicated that the East European flyway should be given priority as very few countries from that region have so far joined the action. It was agreed that this topic would be approached during the MC meeting to take place the following day.

Jason Chapman reminds (9:50) the working group leaders that STSM are a good tool to promote specific pieces of research and that all WG's should strive to use this mechanism whenever an opportunity arises. As the grant holder, Jason Chapman also provided details on how to deal with the eCost system, regarding the acceptance of official invitations and the use of TRR forms.

After a short coffee-break (10:00 – 10:30) each WG was given the opportunity to introduce its general aims and scopes, so that members not yet involved in a WG could integrate the most suitable to them. In addition, the WG leaders also opened the discussion to the audience regarding their planned activities so that contribution from members already involved in a specific WG could contribute into other WG's.

WG PLENARY SESSIONS

WG1 – Hidde Leijnse asked that all present members of the WG would introduce themselves and then presented the general aims and scopes for WG 1 and the plan for the first year (as above). Jason Chapman suggested that contacting the national meteorological institutes directly could be a way to get them involved in the action. Judy Shamoun-Baranes added that having the local (i.e. national) knowledge and know-how is a great bonus. It was agreed that a letter would be prepared by this WG and sent to the heads of national meteorological institutes asking for their involvement in ENRAM.

At 11:00 Adrian Dokter gave a presentation on the current status of the bird retrieval algorithm for weather radars. He added that the new algorithm for insects still needs to be developed and that dual polarization weather radars (next generation) will greatly improve this. Finally, he indicated that calibration experiments with biological radars should be situated within 20-30 km from the weather radar.

The interaction of WG1 which provides the data on bird movement, with WG3, which will produce the visualizations was identified and both groups agreed to be aware of each other's advances.

WG2 – Matti Leskinen presented the draft agenda of the WG1 & WG2 combined meeting (11:15), to be held in Helsinki during July with the main aim off designing biological algorithms for weather radar data.

Felix Liechti presented WG2 aims (as above) and highlighted the need to identify weather radar echoes to species or group level (11:35). He then started to identify potential biological radars that can be used on the calibration experiments, highlighting the Bulgarian radars available in a country that has recently joined the action.

Joris Everaert, presented the Robin 3D-flex radar (combined horizontal, S-Band and vertical radars). Yossi Leshem, presented the radars he and his co-workers used mostly for bird collision risk and highlighted the bird algorithm for soaring birds developed by his team. Yossi Leshem opened the discussion regarding the possibility of using the airforce radars with the weather algorithms to track animal movement in his country (Israel) as well as using data from countries further north of Israel in order to predict when birds are going to cross that nation's air space and therefore produce a migration forecast to help avoid bird strikes. Gonzalo Arroyo (12:25) presented the radar work developed in Gibraltar. Judy Shamoun-Baranes suggests that the "funnelling behaviour" of migratory birds passing Gibraltar towards Africa could potentially make this site of great relevance for the

calibration of weather radar data with individual tracks of marked birds (GPS, Satellite, GSM) that might use this route and whose tracks might be available to members of the group.

12:35 – 14:00 Lunch

After lunch the presentation of biological radars currently accessible to the group continued with Cecilia Nilsson presenting the biological radars in operation in Lund. She indicated the ability of the installed software that uses wing flapping patterns to discern group or species of birds being tracked by the radars. She also added that both the Lund fixed and mobile radars will be re-built and the mobile radar will be moved into a better trailer and therefore easier to move. At 14:10 Jason Chapman presented the only dedicated insect monitoring radars in Europe, which are in the UK. He also mentioned that there is currently an application for funding to build a network of European insect radars with suggested locations Lund (Sweden), Dijon (France), Granollers (Spain) and Gibraltar. Jan Blew presented his radar work (14:20), which has mostly been dedicated to understand animal movements in the proximity of wind –farms.

WG3 – Hans van Gasteren presented an overview of the workshop held in UVA earlier this month organized by **WG3** on visualization tools. Peter Desmet made a live demonstration of CartoDB (14:45) one of the tools to be used in the visualization of animal movement patterns. Judy Shamoun-Baranes gave an overview of the current approaches to visualizing radar data for bird movement research (15:07) and launched two main questions for the audience to become aware of the forthcoming challenges: a) how to store and analyse large datasets attained from radar and tracking data, and b) how to merge and operate with different types of radar which generate different types of data (ie. tracking radars provide small tracks and weather radars provide points).

WG4 – Ommo Hüppop, listed the current **WG4** members and all presented the potential outreach issues to be tackled by the WG. Jason Chapman suggested the possibility of approaching such outreach issues using a 'horizon scanning' approach regarding not only radar studies, but rather migration as a whole. And use this document to highlight the capacity of tackling new applied and fundamental questions by using a continental wide approach on the study of migration. The group discussed the possibility of incorporating a modelling approach in this document but this did not gather support within the group.

At 16:28 the floor was open for discussion lead by Jason and Felix. Jan Blew asked about progress regarding the website to which Judy Shamoun-Baranes (responsible for this task), said it had planned to present details on this on tomorrow's session and this was therefore moved to the next day's meeting. Yossi Leshem suggested that ENRAM's work should be more visible to the common citizen and proposed the production of press material or video to promote the action. Judy Shamoun-Baranes added that the group's presence on the social media should be achieved shortly and it was agreed that tomorrow's MC meeting would be used to find people responsible for promoting the action. Given that ENRAM does not have any fully dedicated position, Hidde Leijnse and Jason Chapman suggested that the action could be used as leverage for applications for PhD studentships in the national funding schemes by the academic researchers currently in the action. It was decided

that each WG would reflect on the possibility of presenting a PhD project within its aims and scopes. Jose Alves added that the benefit for successful PhD applicants were that the student could benefit from the vast network of experts currently present in this action and use STMS funding to visit other laboratories and learn new techniques. Jason mentioned that all members involved in the action should include an acknowledgement to COST and ENRAM on the outputs of their work in order to highlight the contributions of the action. It was also agreed that there will be collated information on the current PhD and post-docs involved in the action so that every member of the action is aware of the current studies already being developed by members (and their teams) of ENRAM.

Day 2 – 09:00 – 13:00, 26.02.2014 – Vogelwarte in Sempach

At 9:05 Felix Liecheti, welcomed all the participants and provided organizational details. After that Jason Chapman provided an overview of the action's work plan for year one (2014) so that it was clear to every WG which tasks are planned for the year. Judy Shamoun-Baranes adds that for the website development all WG's should provide contributions and it was agreed that every WG would nominate a contact point responsible to provide content to the action's website manager.

By 9:15 each WG leader presented one slide indicating the aims of the day for each WG and at 9:25 Felix Liechti sent each WG members to a separate room.

09:30 – WG PARALLEL SESSIONS:

WG 1 meeting

WG1 members present:

Matti Leskinen (University of Helsinki, Finland), Przemysław Jacewicz (IMGW, Poland), Alessio Balleri (Cranfield University, UK), Günther Haase (SMHI, Sweden), Adriaan Dokter (NIOO, the Netherlands), Hidde Leijnse (KNMI, the Netherlands)

Hidde starts by summarizing the aims and scopes of WG1, i.e.:

- Test existing algorithms on weather radars across Europe (and discuss results)
- If necessary, adapt or develop new algorithms
- Compile an overview of different radar practices, including their relevance for ENRAM
- Facilitating the use of common data formats
- Promote the use of algorithms at NMS or centrally
- Facilitate exchange of data between NMS and ENRAM participants
- Investigate dual-polarization algorithms
- Suggest adaptations to algorithms for S-, C-, and X-band
- Coordinate collaboration with non-ENRAM partners
- Organization of training workshops
- Setting a standard protocol for continent-scale monitoring of animal movement using weather radar

Adriaan mentions the dependence of the other WGs on the access to (processed) WR data and thereby on WG1, therefore we need to focus on getting up and running the retrieval of biological data from the European weather radar network a.s.a.p. Our main tasks in the coming year are therefore (1) obtain permissions to use OPERA data within ENRAM and (2) implementing the algorithm on a large numbers of radars. The remaining discussion time is spent primarily on these two tasks:

A) what kind of data we want to have access to?

- For the bird algorithm we require access to full volume data (including polarimetric variables) to generate vertical profiles of birds/insects.

-We would like to compile height-integrated 2D maps to analyse and visualize spatial patterns of bird migration

B) what permissions / data do we need from the meteorological data centres?

In approaching the OPERA representatives/decision makers we need to clearly distinguish between (1) data that we require access to for the retrieval of bird profiles (typically full volume data), (2) the types data that will be made available outside of OPERA to the ENRAM users, and (3) data that can be made publicly available (profiles only). We expect that member states will be hesitant to make publicly available weather radar elevation scans - for profile data permission will be much easier. Therefore we will focus on rolling out the profile algorithm first (adding a clause we only generate profiles and we do not intend to make publicly available full elevation scans). Once this algorithm is in place we expect it will be easier to add other features like 2D maps in the future.

In summary: We will ask permission for running bird/insect algorithms on volume data. We add the clause that our first aim is to deliver profile data to end-users (not images*).*

C) how to approach the meteorological community for data access?

We plan to approach the relevant levels of decision making in a well-orchestrated way to generate momentum in the decision process

1) An official letter to the final decision makers of Eumetnet (directors of national NMSs, Eumetnet assembly) will be drafted in the first week of March (Adriaan) and shared within WG1 / core group for review. This letters aims to A) inform them of the existence of ENRAM B) indicate our interest in opera/eumetnet data, i.e. retrieval of bird and insect profiles from weather radars C) point out the shared benefits of retrieving biological data from weather radar data D) ask for their support, indicate that no other action is required than to give permission.
2) At the next OPERA meeting (19-21 march) Hidde will promote the algorithm among the delegates. In this meeting an official request to the Eumetnet assembly for data access will be filed. We will make sure the official ENRAM letter (point 1) is sent out before this official

request reaches the Eumetnet assembly. We will ask for permission to use OPERA data for ENRAM purposes through the facilities of Baltrad (see D)

3) One week after the OPERA meeting an email of each national ENRAM member will be sent to each national opera representative, to keep ENRAM in the picture and to establish some contacts at the national level. We will draft an concept email that local ENRAM members may use (Hidde). We aim to send out this email on 1 April, i.e. 10 days after the next opera meeting.

D) how to organize the implemention work?

- We decided to take the "Baltrad shortcut", i.e. first implement the existing bird algorithm on the Baltrad network. The advantage of this approach is (1) Baltrad has toolboxes and software in place for running and testing algorithms locally (2) baltrad has stored opera-wide data already for several months which are easily accessible (3) opera will have a Baltrad plugin, so that porting to OPERA data centre in the future is easy (4) Baltrad already runs several dedicated algorithms that uses the full OPERA volume data, so our algorithm will be 'nothing new' (5) we can start implementing already tomorrow if we like, using the Baltic datasets only.
- We organize an STSM mission for someone to come to Sweden to implement the existing algorithm (Jurriaan Spaaks (UvA) would be an excellent person). We do not need to wait for OPERA permissions to start this work, so the sooner this is arranged the better.

E) high priority work (main topics Helsinki meeting) / new developments

1) Martin de Graaf processed data for 60 radars for the month Aug 2011 at KNMI. First data looks good at first sight, therefore we do not foresee huge problems – however a more detailed quality analysis is top priority of WG1. The Helsinki meeting should be used to look at this dataset in more detail.
2) Design of an insect algorithm
3) Retrieval of 2D images of height-integrated bird density
4) Investigate use of polarimetry

F) other aims of WG1 discussed

1) Hidde points out the possibilities for us to organize training workshops for meteorologists on how they can retrieve biological information from weather radars, and why that can be interesting to them.

2) making algorithms function on X-band and S-band data. Adriaan suggests this is definitely worthwhile and feasible, but considering the large number of C-band radars in Europe not top-priority.

Plan for STSM: send someone to Sweden to implement algorithm on Baltrad

Prospective PhD-projects: development 2D spatial data retrieval and/or insect algorithm

Action points:

1) Hidde/Gunther: Hidde asks Willem Bouten / Jurriaan Spaaks for possibilities of an implementation STSM by Jurriaan. If Jurriaan is interested, Hidde puts Jurriaan and Gunther into contact and they fix a schedule/timeline, otherwise a different approach within WG1 needs to be discussed (Feb/March 2014)
2) Jarmo/Matti: confirm dates with potential participants (end of Feb).
3) Hidde/Gunther: find out when the next decision round of the Eumetnet assembly takes place – this determines when the ENRAM letter needs to be sent out (see 3 below)
4) Adriaan: draft a letter to directors of NMSs (Eumetnet assembly) (for review within WG1/core group), to be sent out before next opera meeting (19 march)
5) Hidde: file an official request for data access via Baltrad to the eumetnet assembly (opera meeting 19-21 March)
6) Hidde: draft an email to the opera representatives (after Opera meeting, last week of March) and approach national ENRAM representatives for sending this email.
7) Hidde: deliver website content to Judy

[*WG1 Minutes prepared by Adriaan Dokter*]

WG 2 meeting

Participants: Felix Liechti (chair) (Switzerland), Natalino Fenech (Malta), Joris Everaert (Belgium), Yossi Leshem (Israel), Gonzalo Munoz (Spain), Cecilia Nilsson (Sweden), Jan Blew (Germany)

WG2 will coordinate and stimulate cross-calibrations of different dedicated biological radars and the weather radar network, with respect to their capabilities of detecting and classifying a broad range of animal taxa in the aerosphere (insects, birds and bats). This knowledge will form the basis of the evaluation of the suite of biological-classification algorithms by WG1.

The work-plan of WG2 includes - among others - the following steps:

- Link research groups to conduct comparative analysis of pre-existing data from dedicated biological radars (for birds and insects), and pre-existing data from operational weather radars that is believed to represent various biological targets (birds and insects).
- Create a platform for the organization of a cross-calibration measurement campaign, involving the simultaneous deployment of multiple remote sensors within the sensed volume of an operational dual-polarisation weather radar. The remote sensors to be deployed will include as many existing systems as possible (e.g. air traffic surveillance radar, ornithological radar, entomological radar, thermal imaging equipment, LIDAR (Laser Imaging Detection And Ranging), acoustics for flight call identification, etc.).

Future action: the comparison campaign shall bring radars (and other remote sensors) close to existing weather radar stations for cross-calibration.

What kinds of movement parameters can be compared between weather radar and other radars are to be expected?

1. **Phenology** (relative and absolute temporal patterns)
   With a limited demand for accuracy, this can be recorded with almost any kind of radar (e.g. marine radar in vertical mode).

2. **Height** distributions
   Requires knowledge on detection range and surveyed volume with respect to height above ground level.

3. General **behaviour** (direction and speed)
   Requires tracking of single targets or Doppler speed of volume targets.

4. **Composition** of migration (birds vs. insects / large – small birds etc.)
   Requires target identification (air speed, radar cross section, echosignature)
   Indirect identification might come from ground truthing.

List of potential comparisons with existing radar systems

- Lund, Falsterbo (Sweden): tracking radar (incl. pencil beam mode):
  provides mean migration direction and migration speed per night and altitude, comparison with 2 weather radars nearby.
- Jabbeke, Belgium: Robin Radar (Surveillance S-band horizontal, FMCW-vertical)
  can provide all parameters using different modes. Comparison with nearby weather radar.
- Malaga, Spain: DeTect Radar (Surveillance X-band horizontal and vertical); site may be too close to the weather radar; analysis of weather radar data might be difficult due to topography (as e.g. in Switzerland, the lowest 1000 m cannot be analysed)
- Israel – 2 Russian weather radars, analyses manually, 2 other weather radars, analyses with NL-algorithm.
- Northern Germany: research offshore platforms North Sea and Baltic Sea (FINO 1, 3 and 2) surveillance radars vertical and horizontal, pencil beam radar) matching with weather radars around the North Sea (Norway, Denmark, Germany) and Baltic Sea (??)
- Italy – not feasible, as weather radar data are not available (left the OPERA network)
- Malta – not included yet in the OPERA network – contacts are made with the aim to include the existing weather radar algorithm
- Bulgaria, operational in windfarms: Robinradar, Swiss Birdscan-fixbeam – Felix to contact Bulgaria to see the options.
- Comparison of the insect radar from Rothamstad (Jason), the vertical bird radar from Sempach (Felix) and the marine radar from Italy (Carlo) with the weather radar in southern England (Chenies, 16 km from Rothamsted).

Keep in mind that the optimal distance to the respective weather radar station would be 20-30 km.

Analysis of pre-existing data with weather radar data (backwards and / or forward)

- radar campaign at the Fehmarnbelt (Denmark and Germany) 2009 and 2010 (120 days each) with Superfledermaus, marine surveillance radars, and manually analysed weather radar data from Stevns, DK.

Open questions:

- what to do with daytime data:
  e.g. visual observations of birds of prey (Strait of Gibraltar),
  e. g. large leaving events of waterbirds from the Wadden Sea towards the E and NE.

Joined Session:
WG 1 (Classification and Retrieval of Biological Data from European Weather Radars) and WG 2

Request from WG2: get four months of weather radar data bird movements for comparisons (campaigns, pre-existing data)

WG1 suggests to use the BALTRAD network, as here the NL algorithms can be applied; everything done in BALTRAD will then feed into the OPERA network.

Next steps:

- Who organises which radar site?
- What kind of data can be expected from which site?
  => migration parameters and observation period
- Which weather radar data are available for the period of 1.Aug – 30. Nov.2014?
- Application of the STSM exchange between Rothamstad and Sempach.
- Preparation of the WG1 and WG2 meeting in Helsinki (June 2014); decision of campaigns with existing radars (sensors), pre-existing data;

Aims for WG2 meeting in Helsinki:

- Final decision of who will take part in the comparison
- Definition of which movement parameters will be compared at which site
- What will be the expected sample size per site? (~number of days)
- How will we analyse and compare the results?
- Time schedule for the field work and the analysis

[*WG2 minutes prepared by Jan Blew & Felix Liechti*]

WG 3 meeting

Participants: Hans van Gasteren (Chair, NL) José Alves (Vice-chair, Portugal), Judy Shamoun-Baranes (NL), Carlo Catoni (IT), Lars Petterssen (Sweden), Peter Desmet (BE), Markus Franzen (Sweden), Georg Fuchs (Germany), Ronald Tucker (NL), Thonie van Lieburg (NL), Janine Aschwanden (CH)

José Alves lead the first part of the WG3's discussion starting by asking all the present members to introduce themselves as some were new to the WG. José Alves then presented a table with a list of visualisation tools that were introduced to the WG during the workshop earlier this month. This list included details of each tool (i.e. software) as well as advantages and disadvantages regarding its use by developers and researchers. The group members added more visualization tool to the list and it was agreed that Peter Desmet will maintain and update a version of the list in tabular format, but that a descriptive overview of the most relevant tools will also be presented on ENRAM's website. The group discussed the possibility of having visualisation tools experts and developers in a training school where group members would be though how to use selected tools for visualization of radar and tracking data. It was decided that before this was considered, radar data on bird movement and modelling of routes based on radar readings would be required so that this training school is of real use to the WG members.

After a coffee break (10:37–10:52) the discussion focused on the data showcase that the WG will use as a data challenge for visualization tool experts and developers. It was decided to use a migration wave event that was recorded between the 05.04.2013 and end of that month (on both radar and tracking studies). The dataset for the data showcase needs to be prepared as follows:

1- Raw data from 5 weather radars (3 in the Netherlands and 2 in Belgium) to use as reference provided as "ppi" files by Hidde Leijnse (possibly already smoother data);
2- Processed data (ie, with bird algorithm applied) form the same 5 weather radars plus of 2 military radars (1 from Belgium and one from the Netherlands) provided by Judy Shamoun-Baranes and Hans van Gasteren who will also check for adaptations to algorithm assumptions about species group;
3- Weather data as wind vectors at different pressure levels provided by Judy Shamoun-Baranes;
4- Modelled data on the movement vectors of birds provided by Hans van Gasteren who will run the model to get tracking data;

The group discussed the possibility of preparing a written document reporting this exercise which Peter Desmet suggested to be in an on-line open source format. It would also be explicit about some of the limitations, namely the inability to determine species or groups of species that are being analysed and that modelling of virtual birds assumes constant heading and speed since measurement. It was agreed that the preparation of the data (i.e. get the above datasets in a given format to directly input on visualization tools) could be organized as a STSM with specialized programmers and possibly hosted at UVA. This STSM should take place before the next combined WG1-4 meetings in October so that the data challenge will be kicked-off then.

The WG meeting finished with discussion of media and PR work to be done for the action. Peter Desmet offered to create gitub and twitter accounts for ENRAM with the latter having a twitter feed into the action's website. Judy Shamoun-Baranes mentioned that she will be presenting the draft website to the general group during the afternoon and Lars Pettersson suggested that ENRAM website had Google analytics tool implemented for gauging the number of visitors. Carlo Catoni offered to collect a two/three word title describing each member's activity to list on the website, together with a link to the member's website.

[*WG3 minutes prepared by Hans van Gasteren*]

WG4 meeting

Participants: Ommo Hüppop (Chair, Germany), Jason Chapman (UK), Michal Ciach (Poland), Giacomo Dell'Omo (IT), Antonio Roman Munoz Gallego (SP), Vladimir Ivovic (Slovenia)

Discussion in WG 4 was limited to drawing up a long list of questions/topics for our proposed review paper, dealing with the role that radar studies can play in answering some of the "Grand Challenges of Movement Ecology". A long-list of about 35 topics was produced at the meeting.

Action points:

- the long list of topics will be typed up by Jason Chapman and circulated to a small group (comprising WG 4 members and a few other ENRAM colleagues) within a week or so, for correcting and adding any omissions.
- Once a finalised long list is produced, this will be circulated to a much broader community of people interested in movement research (the entire ENRAM community plus selected international experts), who will be asked to select their top 10 topics.
- This "horizon scan" of the movement ecology community will be used to select between 10 – 12 topics that will be discussed in the review paper.
- A first draft of the review paper (in the form of an internal report) will be circulated to the ENRAM community ahead of the next MC meeting, to be held in Spain in October 2014.

[*WG4 minutes prepared by Jason Chapman*]

11:30 – 13:00 Lunch & tour of the building.

At 13:05 a member of each working group (Adriaan Dokter WG1; Felix Liechti WG2; Hans van Gasteren WG3 and Ommo Hüppop WG4) presented a short summary of each WGs discussion. After

that (13:40), Judy Shamoun-Baranes presented ENRAM's logo and the draft website (www.enram.eu) which has been secured for the coming 5 years. The group discussed website details namely the addition of a photo gallery of members doing ENRAM related tasks, which could be sent by the member's with the photographer's name already include. Peter Desmet mentioned that given the twitter feed the "news" section could be removed. Finally, Hidde Leijnse suggested that the site should be live by the 19th of March, which is when the next OPERA meeting will take place and this could be presented there.

By 14:00 Jason Chapman closes the WG meetings & thanks all participants of their attendance. Felix Liechti asks for pictures and also thanks the presence of all.

Immediately following the WG meeting, the MC meeting was held (see separate minutes).

Minutes prepared by José Alves and Jason Chapman

J. W. Chapman *6th March 2014*