H2020 - Research and Innovation Action

APPLICATE

Advanced Prediction in Polar regions and beyond: Modelling, observing system design and LInkages associated with a Changing Arctic climaTE

Grant Agreement No: 727862

Deliverable No. 7.13

Report on the Polar Prediction School 2018 and provision of FrostByte videos

Submission of Deliverable

Work Package	WP7 User engagement, dissemination and training		
Deliverable No	7.13		
Deliverable title	Report on the Polar Prediction School 2018		
Version	Final		
Status	Final		
Dissemination level	PU - Public		
Lead Beneficiary	14 - UiT		
Contributors	☒ 1 – AWI	☐ 2 – BSC	☒ 3 - ECMWF
	☐ 4 – UiB	☐ 5 – UNI Research	☐ 6 – MET Norway
	☐ 7 – Met Office	☐ 8 – UCL	☐ 9 - UREAD
	☒ 10 – SU	☐ 11 – CNRS-GAME	☐ 12 - CERFACS
	☐ 13 – AP	☒ 14 – UiT	☐ 15 - IORAS
	☐ 16 - MGO		
Due Date	31 May 2018		
Delivery Date	28 May 2018		

This project has received funding from the European Union's Horizon 2020 Research & Innovation programme under grant agreement No. 727862.

Table of Contents

EXECUTIVE SUMMARY

The Polar Prediction School was held from 17-27 April 2018 at the Abisko Scientific Research Station in northern Sweden. The training school brought together 29 students from nine different countries and at various career stages, from early PhD students through to post-docs. The programme for the school was designed to provide a comprehensive overview of the main aspects related to polar weather and climate prediction. It included theoretical lectures, practical exercises, meteorological fieldwork, and a dedicated science communication programme.

This report provides an overview of the organisation behind the school, activities during the school, as well as lessons learnt from the survey completed after the event.

A diverse course such as the Polar Prediction School, bringing together a wide set of students and lecturers, helps build and maintain the community needed to address the polar prediction problem, which is inherently multi-disciplinary. Overall, the school was a great success and we recommend this model be used for any future schools for early career researchers.

1. INTRODUCTION

1.1. Background and objectives

Weather and climate are changing faster in the Polar regions than anywhere else on Earth. However, our ability to predict polar weather and climate changes on scales from days to decades is still limited; hampering effective decision making. Furthermore, our understanding of how changes in the polar regions may affect the mid-latitudes, including high-impact extreme events, is far from complete. The APPLICATE training activities aim to help improve the professional skills and competences of those working on polar weather and climate, and provide a legacy for future generations of scientists. Within this context a Polar Prediction School was organised as one of the main training activities of APPLICATE's Work Package 7.

1.2. Organisation of this report

This report is essentially arranged chronologically, with section 2 describing the organisation before the training school, section 3 the school itself, and section 4 what needed to be done after the event. Some conclusions and an outlook are provided in section 5.

2. BEFORE THE SCHOOL

2.1 Development of the programme

The programme for the training school was developed to provide a multidisciplinary overview of polar weather and climate prediction. It was in large part based on a similar training school organised in Abisko in 2016 as part of the Year of Polar Prediction (YOPP). The programme included theoretical lectures, practical exercises using models and remote sensing data, meteorological fieldwork, as well as science communication training (see Annex 1). The schedule was developed by the organising committee together with the lecturers.

2.2 Advertisement and selection of participants

The training school was advertised through the APPLICATE network as well as through the Association of Polar Early Career Scientists (APECS). Advertisement for the event was begun in mid-2017, with a deadline for applications of 15 September 2017. Information about the programme, applications, and all other details about the training school were made available on a dedicated webpage of the APECS website. Applicants were asked to submit a curriculum vitae and motivation letter, which were used in the selection process.

Overall there were just over 100 applications for the 30 places available. All valid applications were assessed by a selection committee (essentially the organising committee of the training school), with each application getting scores from two reviewers based on a number of criteria. These criteria included: relevance of education and research background, quality of their statement of motivation and reasons why they want to attend, an overall impression of how the candidate would fit in the course. Geographical and gender balance as well as career stage were also taken into account during the selection process.

Thirty candidates were selected and notified, while the remainder were placed on a waiting list. In the end, several of the initially selected participants dropped out and replacements from the waiting list were notified. One last minute drop-out meant that in the end there were 29 students instead of the planned 30.

2.3 Securing additional sponsorship

Additional sponsorship for the Polar Prediction School was sought to help cover the costs of travel for both the lecturers and students, as well as to keep the registration fees to a minimum. Several organisations were approached and applications made accordingly. These included the International Arctic Science Committee (IASC), the Scientific Committee on Antarctic Research (SCAR), and the Climate and Cryosphere (CliC) project of the World Climate Research Programme (WCRP).

These sponsors were in addition to the funding provided through APPLICATE as well as the Polar Prediction Project (PPP) as part of the YOPP, supported by the World Meteorological Organisation (WMO).

2.4 Logistics in Abisko

On site in Abisko several things needed to be organised, including accommodation, lecture rooms, and catering. The Abisko Scientific Research Station, which is run by the Swedish Polar Research Secretariat, provided excellent facilities for the training school. Lecturers and students were accommodated in rooms at the station (with the students sharing rooms in groups of 2-4). The lectures and practical sessions were all held in the spacious lecture theatre, while the dining room was used for several of the activities part of the science communication programme.

Catering for lunch and dinner was provided by an external firm (Abisko Mountain Lodge), since the research station does not provide these services. Breakfasts and coffee breaks were organised by the project manager with the help of student groups.

The staff at the station provided excellent support with all of the organisation, both before, during, and after the training school.

3. THE SCHOOL

3.1 General

The Polar Prediction School took place form 17-27 April 2018. Most of the students and lecturers arrived on the 17th, although three of the main organisers arrived at the station one day in advance to set various things up (see full list of participants in Annex 1). The school officially started on the evening of 17 April with some introductory presentations about APPLICATE, YOPP, APECS, and expectations about the school. This was followed by an ice breaker and some introductory games for the students and lecturers to get to know each other.

The main elements of the programme are described in the following sections. Here we will note that the programme included one free day in the middle of the 10-days, which allowed all participants to spend some time enjoying the beautiful surroundings in Abisko and to take a small break in what was a very intense programme.

Figure 1: Group picture of the students and lecturers in front of the lecture theatre at the Abisko Scientific Research Station.

3.2 Lectures and practical exercises

The lectures and exercises covered polar weather, chaos and predictability, polar lows, polar ocean forecasting and sea-ice modelling, sea-ice prediction and predictability, limits of predictability, data assimilation and reanalysis, model verification in polar regions, remote sensing of the cryosphere, polar boundary layer dynamics, polar mid-latitude linkages, as well as air-sea exchange and turbulence (see also the programme in Annex 2).

A virtual machine was provided for all the students to ensure the relevant software and analysis tools within a uniform teaching environment. This was made available prior to the training school and students were asked to install the virtual machine on their individual laptops. This was necessary given the remoteness of the location and limited internet speed. This also had the added benefit that the students could take this platform back with them after the school.

The students used the virtual machine to investigate various topics related to the theoretical lectures and to the physical processes observed during the field component, such as running polar boundary layer case studies with a single column model.

3.3 Fieldwork

To introduce the students to various observational techniques as well as the challenges related to making these sorts of measurements in high latitudes, they conducted practical exercises based on data obtained from a micrometeorology mast. The mast was erected on the first full day of the training school by the students on the surface of the frozen Lake Torneträsk, a 5-minute walk away from the research station (see Figure 2). Up- and downwelling solar and infrared radiometers and eddy-covariance measurements of the turbulent heat flux were used to calculate the surface energy budget. Direct measurements of wind stress and indirect estimates derived from near-surface profiles of wind speed were used to calculate the surface drag coefficient in two different methods.

Figure 2: Students setting up the micrometeorological tower on lake Torneträsk.

Radiosondes were also launched each day and the soundings were uploaded to the Global Telecommunication System, which is used in operational forecasts. In addition, a mini intense observational period was held on one day where radiosondes were launched every six hours. This was to study the diurnal cycle of the polar boundary layer at the site, even though the weather conditions at the time were not ideally suited to this. On the final day of the training school all the observations were drawn together and compared to study the changes in the surface energy balance over the course of the training school. This demonstrated the close links between large-scale weather patterns, the surface energy budget, and albedo on the lake.

3.4 Science communication

Soft skills training was provided through a dedicated science communication programme, with six evening sessions and an afternoon of final presentations. These sessions were run by Jessica Rohde of the Interagency Arctic Research Policy Committee and specifically designed for early career researchers. Topics covered included how to distil information, tailoring messages for specific audiences, using social media, and slide design.

The students put what they learnt directly into practice through the brief informative videos ('FrostBytes') about their research that they worked on during the school. On the final afternoon each student presented their work and this was recorded. The videos are available on the APECS website at: https://apecs.is/research/apecs-projects/applicate/2522-apecs-applicate-frostbytes.html

3.5 Weather briefings

Daily weather briefings were made by the students each evening. They were asked to provide an overview of the day's weather, to compare the previous day's forecast with the observed radiosounding they made, and to analyse forecasts for the coming days using global and regional products. The briefings were an opportunity for the students to learn to interpret weather forecasts in complex polar mountain environments, such as where Abisko is located, and to better understand how today's models perform in such regions. Furthermore, they led to interesting discussions about model skill and uncertainty in polar regions.

4. AFTER THE SCHOOL

4.1 Survey

As part of the assessment of all APPLICATE training activities a survey of the school was carried out. All students were asked to complete a questionnaire about their experience and how they thought things might be improved.

The students found the lectures and the material they covered to be relevant and well presented. They felt the mix of lectures, practicals, and fieldwork was well structured, with enough time allocated to each aspect. Nearly all students found the location of Abisko to be a good one, and most felt the accommodation and food were satisfactory. All students who responded indicated they would recommend the training school if held again, and a large majority of the students felt the school was useful at this point in their careers.

A few students found the programme too intense, with the days being too long. There were also suggestions to provide more clear instructions for the FrostByte videos and the virtual machine, as well as to have a dedicated session at the beginning of the school where the students could present their research to each other (rather than at the end).

Overall the feedback was very positive and many students indicated that they thought there should be another edition of the training school.

4.2 Reporting

One of the tasks to be completed after the training school was to report back to sponsors and to complete all payments. The disbursement of many of the travel grants was carried out after the school through APECS, while payment of the remainder of the invoices was carried out by UiT. Various reports were also written for the respective sponsors, as required.

5. CONCLUSIONS AND OUTLOOK

The Polar Prediction School 2018 included a unique and comprehensive programme of lectures, practical exercises, fieldwork, and soft skills training. The use of the virtual machine ensured a uniform teaching environment where students could combine the knowledge gained from the modelling sessions and weather briefings with their own field observations. This led to some excellent discovery-based learning about polar prediction and motivation to combine tools and resources in future. The science communication sessions complemented the rest of the programme and the students directly put what they learnt into practice through the development of their FrostByte videos.

The polar prediction problem is inherently multi-disciplinary and requires cooperation across a wide community. A diverse course such as the Polar Prediction School, bringing together a wide set of students and lecturers, helps build and maintain the community needed for such an effort. Overall, the school was a great success and we recommend this model be used for any future schools for early career researchers.

6. ACRONYMS

APECS – Association of Polar Early Career Scientists
CliC – Climate and Cryosphere
IASC – International Arctic Science Committee
PPP – Polar Prediction Project
SCAR – Scientific Committee on Antarctic Research
WCRP – World Climate Research Programme
WMO – World Meteorological Organisation
YOPP – Year of Polar Prediction

7. ANNEXES

Annex 1: Participants

Students:

- Leandro Ponsoni
- Evelien Dekker
- Martin Hagman
- Lorenzo Zampieri
- James Warner
- Jenny Turton
- Kasper Hintz
- Yurii Batrak
- Patrick Stoll
- Clara Burgard
- Helene Asbjørnsen
- Flo Lemonnier
- Rebecca Frew
- Ying Dai
- Sam Cornish

- Ella Gilbert
- Benjamin Barton
- Christopher Barrell
- Christine McKenna
- Mallik Mahmud
- Kabir Rasouli
- Pia Nielsen
- Jan Nitzbon
- Alexander Vessey
- Fernanda Casagrande
- Alexander Lohse
- Cheng You
- Sally Woodhouse
- Stefan Kowalewski

Lecturers/Organisers

- Ian Brooks
- Don Perovich
- Anna Hogg
- Matthieu Chevallier
- Thomas Jung
- Gunilla Svensson
- Doug Smith
- Johnny Day
- Jessica Rohde
- Gerlis Fugmann
- Linus Magnusson
- Erik Kolstad
- Anna Fitch
- Fiona Tummon

Annex 2: Training school programme

	Tues 17	Wed 18	Thur 19	Fri 20	Sat 21	Sun 22	Mon 23	Tues 24	Wed 25	Thur 26	Fri 27
8:00-9:00		Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast
9:00-10:00		Intro to polar weather	Polar Lows	Sea ice prediction & predictability	DA practical cont.	*Time off + Sonde Launches every 6 hours: 2am, 8am, 2pm*	Stable BL/diurnal cycle	Clouds and Air mass transformation	Sea ice 101	Tower practical/discussion	
10:00-11:00		Chaos and predictability	Hurricane/polar low practical	Sea ice prediction practical	Model verification in polar regions + practical		GABLES Practical	Larcform 1	Melting ice and sleepless nights	Measurement pratical	
11:00-12:00		Measuring the Polar Atmosphere									
12:00-12:30											
12:30-14:30	Arrival	Lunch/Sonde Launch	Lunch/Sonde Launch	Lunch/Sonde Launch	Lunch/Sonde Launch	Lunch/Sonde Launch	Lunch/Sonde Launch	Lunch/Sonde Launch	Lunch	Lunch	
14:30-15:30		Measurement Practical	Discussion of practical	Cyclones & sea ice predictability limits	Remote sensing of the cryosphere		Science Communication	Discussion of SCM exercises	Air-sea exchange and turbulance	Sci Comm - final presentations	Depart
15:30-16:30		Measurement Practical	Polar Ocean forecasting	Data assimilation and Reanalysis	Remote sensing exercise			Polar mid-latitude linkages	Turbulance practical		
16:30-17:00		Coffee	Coffee	Coffee	Coffee	*Time off*	Coffee	Coffee	Coffee	Coffee	
17:00-18:00		Weather in Abisko	Sea ice modelling	DA practical	Remote sensing exercise		Science Communication	Polar mid-latitude linkages	Turbulance Practical	Final Discussion + assessment form	
18:00-18:30	*Computer check*	*Downtime*	*Downtime*	*Downtime*	*Downtime*		*Downtime*	*Downtime*	*Downtime*	*Downtime*	
18:30-20:00	Dinner	Dinner	Dinner	Dinner	Dinner	Dinner	Dinner	Dinner	Dinner	Dinner	
20:00-21:30	Orientation + Welcome Social	Weather briefing + Sci Comm	Weather briefing + Sci Comm	Weather briefing + Sci Comm	Weather briefing	Weather briefing + Sci Comm	Weather briefing	Weather briefing + Sci Comm	Weather briefing + Sci Comm	Final evening social	