



Manuscript "Orographic enhancement of snowfall"

D3.2 - MOEoS

PNOWWA

Grant:	699221
Call:	H2020-SESAR-2015-1
Topic:	Sesar-04-2015
Consortium coordinator:	Finnish Meteorological Institute
Edition date:	[13 March 2018]
Edition:	[00.01.00]
Dissemination level:	PUBLIC (PU)

Founding Members



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Document History

Edition	Date	Status	Author	Justification
00.01.00	13.3.2018	First release	Elena Saltikoff Martin Hagen	

PNOWWA

PROBABILISTIC NOWCASTING OF WINTER WEATHER FOR AIRPORTS

This document is part of a project that has received funding from the SESAR Joint Undertaking under grant agreement No 699221 under European Union's Horizon 2020 research and innovation programme.



Abstract

This document includes the manuscript (abstract) concerning Manuscript "Orographic enhancement of snowfall".

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Abbreviations

ATM	Air Traffic Management
FAA	Finnish Aeronautical Association
PNOWWA	Probabilistic Nowcasting of Winter Weather for Airports

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Executive Summary

PNOWWA - Probabilistic Nowcasting of Winter Weather for Airports – is a research project developing methods to support the Air Traffic Management (ATM) challenged by winter weather. In winter 2017, PNOWWA organized a real-time demonstration campaign providing to selected end-users very short-term (0-3h) probabilistic winter weather forecasts in 15 minute time resolution. The nowcasts are based on extrapolation of the movement of weather radar echoes, and ensembles are generated by adding stochastic perturbations.

The manuscript concerns improvements of the STEPS method and adapting it for ultra-high spatial and temporal resolution in urban environment. In addition, the benefits of probabilistic approach over deterministic nowcasting are discussed, and predictability of precipitation is analysed on small spatial scales. Improvement of forecast quality is seen in the CSI scores and attributed to the additional information obtained from the ensembles, which increases the discrimination power of the nowcasts. On the other hand, the improvement seen in MAE is attributed to filtering of small spatial scales having low predictability.

The article "Orographic enhancement of snowfall" was submitted in (Open Access journal) Geophysica, where the deadline of the special issue is 31st March. It will then enter the peer review process. The exact date and issue has not been confirmed by the deadline of this deliverable.

Introduction

PNOWWA - Probabilistic Nowcasting of Winter Weather for Airports – is a research project developing methods to support the Air Traffic Management (ATM) challenged by winter weather using weather radars as the main instrument observing the atmosphere. The movement of snowstorms is forecasted by extrapolating their movement observed in subsequent radar images. Hills and mountains cause changes in the movement, and sometimes when the snowstorms arrive to mountaineous areas, there are no more continuing their movement as observed before entering the mountaineous areas.

The manuscript discusses such situations as a part of a larger discussion of the PNOWWA project. The manuscript is submitted to *Geophysica*, in a special issue related to the Pory Seminar organized in December 2017. Hence it also forms part of the outreach to snow research community.

Due to the manuscript not being published by the date of this deliverable, the manuscript is confidential to respect the copyrights of the authors and *Geophysica* journal. After publication and an embargo to be agreed with the journal, a scanned version will be added to PNOWWA website.

1 Abstract of the Manuscript

The forecast of snow events at airports is a major challenge in airport operation during winter time. In contrast to rain, snow has to be actively removed from aircraft or operation areas. Short term forecasting – or nowcasting – of snow events is require for airport operation. Airport stakeholders need to know the start and duration of snow events, but they need also an estimate of the snow accumulation during the event. Extrapolation techniques based upon weather radar observations are used to generate a probabilistic nowcasting for airports. These techniques assume a linear propagation of the precipitation fields. In case of intensifying, decay or non-linear propagation the forecast quality is considerable reduced. In this paper we show that lake effects along the coastlines or flow within the proximity of mountains degrade the forecast quality and the reliable lead time for nowcasts is shorter than for situations which are not affected by heterogeneous terrain.

2 Conclusions

The article was submitted in Geophysica, where the deadline of the special issue is 31st March. It will then enter the peer review process. The exact date and issue has not been confirmed by the deadline of this deliverable. Due the manuscript has not been published by the date of this deliverable, the manuscript is not public to respect the copyrights of the authors and Geophysica journal. After publication the manuscript will released and published in the frame of the PNOWWA project either in PNOWWA webpage or by providing the direct link to the publication. Geophysica is an open access journal.

References

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2. Pyry Seminar <https://suomifinland100.fi/project/seminar-snow-day-pyry-blizzard/?lang=en>