ITC CONFERENCE GRANT
SCIENTIFIC REPORT

This report is submitted for approval by the grantee to the MC Chair.

Action number: CA16202
Conference title: European Geophysical Union General Assembly 2019
Conference start and end date: 07/04/2019 to 12/04/2019
Conference attendance start and end date: 06/04/2019 to 12/04/2019
Grantee name: Bojan Cvetkovic

ACTIVITIES DURING YOUR ATTENDANCE AT THIS CONFERENCE:

The most significant field of my professional development and scientific interest is the work on improving numerical atmospheric weather and climate models. In accordance with this, during the conference I attended sessions focusing on atmospheric mineral dust and ice particles, numerical weather and climate modeling, remote sensing, big data and machine learning in geosciences and urban air quality.

In a poster session I presented the ongoing work and recent research results regarding numerical modeling of the high latitude dust emission and atmospheric transport. Our first findings and results in this field were presented at EGU2018. The latest results represent the continuation of this research work.

Details:

- Date: 12 Apr 2019
- Session: AS3.4 - Atmosphere – Cryosphere - Biosphere interaction with focus on transport, deposition and effects of dust, black carbon, and other aerosols
- Abstract title: Numerical modeling of the Icelandic mineral dust transport and processes-towards the operational forecasting system, (Bojan Cvetkovic et al.)
- Abstract download link:
  https://meetingorganizer.copernicus.org/EGU2019/EGU2019-10799.pdf
- Poster download link:
  http://www.seevccc.rs/EGU2018/BojanCvetkovic_EGU2019poster.pdf

The main discussion topics during the poster session were:

- Concept of coupling Numerical Weather Prediction (NWP) model with the model for the mineral dust atmospheric cycle;
- High resolution dust modelling with data assimilation;
- Icelandic topsoil sediments as the largest European source of the high-latitude sand and dust particles;
- Use of supercomputers in NWP and dust transport modeling, programming languages and etc.;
- Dust source mapping techniques and concept of dust hotspots;
- Impacts of Icelandic dust aerosol particles on climate, environment, human health and its role in the atmospheric processes;
- Heterogeneous ice nucleation due to mineral dust, ice nucleating particles etc.

During the conference I met researchers and colleagues from several groups. With many of them I closely collaborate within the inDust cost action. We informed each other about ongoing work and set ideas for further scientific collaboration. I met with convener of the Session Dr. Pavla Dagsson Waldhauserova from the Agricultural University of Iceland and we summarized current status of the paper that we are going to publish, which represents our collaborative work within inDust cost action. The details can be found in above mentioned abstract.

Furthermore, Dr. Dagsson Waldhauserova and me met with Dr. Nsikanabasi Umo, ex University of Leeds, now working at Karlsruhe Institute of Technology (KIT). The recent findings of his group are related to parameterization of the heterogeneous ice nucleation due to mineral dust originating from Iceland dust productive sources. Since our group intensively work on this topic (we already implemented parameterization of the ice nucleation due to mineral dust in the model for the Saharan dust transport), the plan is to implement this new parameterization scheme in the model for the Icelandic dust aerosol transport.

I also discussed with Dr. Jann Schrod from the INUIT Research Unit (Ice Nuclei Research Unit, Institute for Atmospheric and Environmental Sciences, Goethe University, Frankfurt, Germany) about our current collaborative work:

- Modeling of the long range transport of the Saharan mineral dust to South America region;
- Modeling of the Icelandic dust transport towards Svalbard and heterogeneous ice nucleation due to these aerosol particles.

The group photo of the inDust community at the poster session.

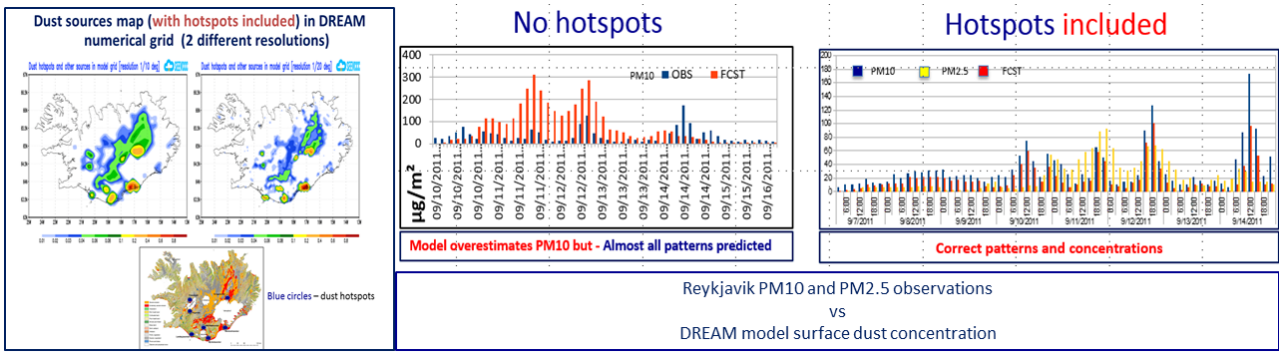
IMPACT ON YOUR RESEARCH AND FUTURE COLLABORATIONS (if applicable)

The research group which I belong at the Republic Hydrometeorological Service of Serbia, under the activities of the South East European Virtual Climate Change Center, is working on research projects focusing on atmospheric dust cycle modeling and aerosol remote sensing. Dust Regional Atmospheric Model (DREAM) (Nickovic et al., 2001; Nickovic, 2005; Pejanovic et al., 2011; Vukovic et al. 2014) was developed to predict the atmospheric dust process, including dust emission, dust horizontal and vertical turbulent mixing, long-range transport and dust deposition.

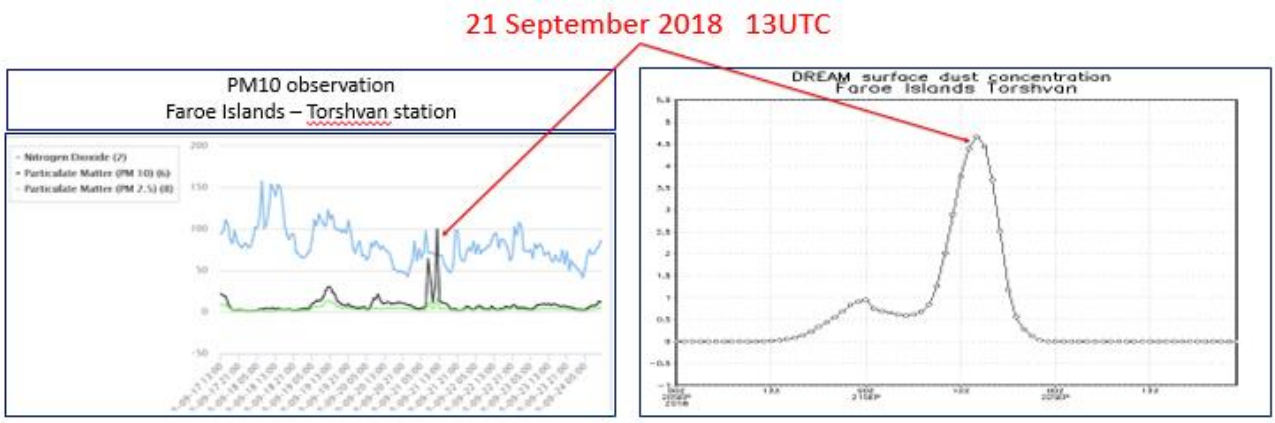
The collaboration with the Agricultural University of Iceland, within the inDust cost action, led to design of the first fully dynamic numerical modeling system capable to simulate, predict and quantify Icelandic mineral dust process, which could be used both as an operational forecasting system and as a reliable tool for examining various effects on environment and climate change. The first version of the model has been introduced into operationall use at April 2018 and the first results has been published at last year EGU.

Since then, numerous upgrades to the original model has been implemented: improved dust source specification with geographic distribution of Icelandic dust sources based on detailed soil data of the Agricultural University of Iceland; variable particle size distribution following corresponding local measurements; introduced active snow cover instead of its climatological values. One of the most significant improvements of the system is the introduction of the dust hotspots in the model dust emission scheme. Dust hotspots represents relatively small areas susch that the mass of the dust

particles emited from them is comparable to mass emitted from all other mineral dust sources in the Iceland. The comparison of the model results (with and without dust hotspots) with the Reykjavik PM observations for the case study period (10 – 14 September 2011, intense dust episode) is shown on the plot below:



Another case study, shown at the EGU2019, represent the long range transport of the Icelandic dust particles towards Faroe Islands and United Kingdom (September 2018). The comparison of the model results (dust hotspots included) with the PM10 measurements from the Torshvan station (Faroe Islands) is shown on the next plot:



These findings will be included in a paper, currently in preparation.