

VIRTUAL MOBILITY (VM) GRANT REPORT

This report is submitted by the VM grantee to VNS Manager, who will coordinate the approval on behalf of the Action MC.

Action number: CA18235

VM grant title: “Implementing and testing PARAFOG at Burgas airport.”

VM grant start and end date: 14/10/2021 to 28/10/2021

Grantee name: Damyan Barantiev

Description of the outcomes and achieved outputs (including any specific Action objective and deliverables, or publications resulting from the Virtual Mobility).

(max. 500 words)

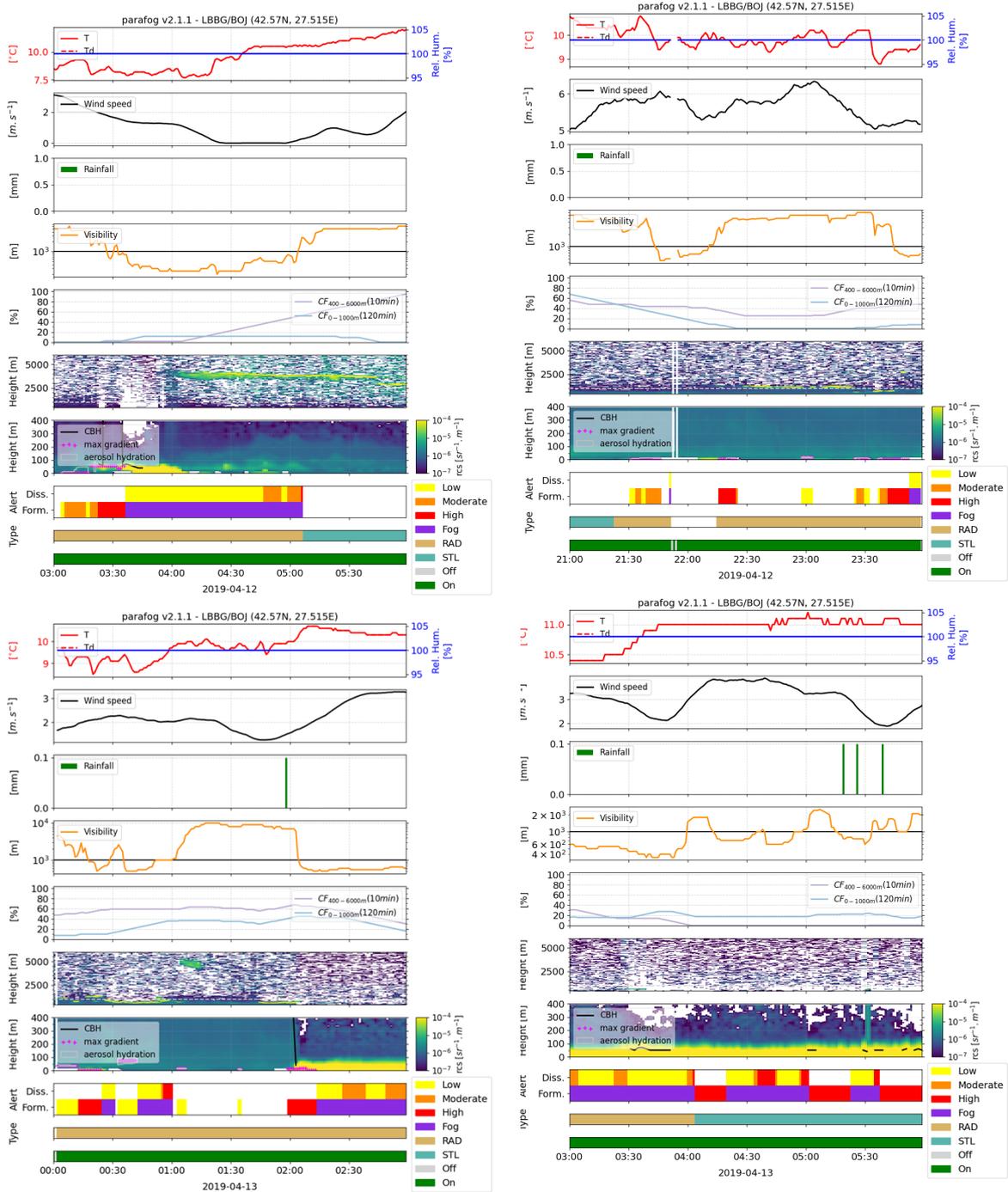
The main goal of the project is to support a common initiative for knowledge exchange aiming to lay the foundation for the implementation and use of the improved version of the PARAFOG v2 (PFG2) software as a decision support system for fog monitoring and forecasting at airports in Bulgaria. The successful implementation of the project took place through an intensive and fruitful exchange of knowledge. The remote contact made and the teamwork of the involved group of scientists had established sustainable professional relations between them in a significantly important and perspective multidisciplinary scientific field such as natural sciences (atmospheric physics), mathematical sciences, and informatics and in the field of ground-based remote sensing (GBRS) instruments. The grantee had the opportunity to acquire a lot of new knowledge, based on the common use of data from modern technology for Atmospheric Boundary Layer (ABL) profiling and specific science-based software. This enhanced his professional qualifications in modern remote sensing measurements and became the basis for the realization and implementation of a state-of-the-art product with significant societal benefit within the framework of COST Action CA18235 (PROBE). As a result of the collective work, the following specific activities can be pointed out:

1. Establishing contact with the Bulgarian Air Traffic Services (BULATSA) – short presentation of the COST Action PROBE and its activities, presentation of the specific task of the VM Grand, presentation of PARAFOG software and the benefits of its implementation, request of operational data from Burgas Airport (BOJ) suitable for the implementation of the objectives of the project (period with registered fog).
2. PFG2 software evaluation – testing installation procedure and working status of the PFG2 on Ubuntu OS installed on MS Windows OS environment in three different ways /Ubuntu Terminal through Windows Subsystem for Linux (WSL) feature, Ubuntu OS on virtual machines build through Hyper V feature, Ubuntu OS on virtual machines build through third-party virtualization software/, verification of CL31 and meteorological data from BOJ and conversion into NetCDF /linear interpolation is applied for the backscatter profiles in time scales (from a two-minute output to a one-minute output)/, PFG2 configuration and initialization with four days BOJ data, review and summarize the results.
3. Dissemination of results – presentation of the results to the BULATSA with recommendations for product implementation, presentation of the results to the scientific community at a national

scientific forum (3rd Scientific Conference “Climate, atmosphere and water resources in the face of climate change”), preparation of a publication for the conference proceedings.

Preliminary conclusions:

The equipment installed at BOJ Airport is suitable for operation of PFG2 decision support system and reliable information is provided. Short interruptions in the flow of information could lead to unreliable output information



Results from PFG2 evaluation in a complex terrain at Bulgarian Black Sea coast (12 -13 October 2019 Burgas Airport)

Description of the benefits to the COST Action Strategy (what and how).

(max. 500 words)

The BULATSA is a state enterprise and it performs state functions for the provision of air navigation services in the serviced civil airspace of the Republic of Bulgaria. As a certified provider of air navigation services BULATSA provides air navigation meteorological services (AMS) in compliance with the ICAO requirements. The Weather Forecasting Center at Sofia Air Traffic Control Center provides meteorological information for Sofia Airport, meteorological forecasts and warnings for all international airports in the Republic of Bulgaria (Burgas, Varna, Plovdiv and Gorna Orjahovitza ATC). BULATSA has five Automated Weather Observing Systems (AWOS), located at the all international airports on the territory of the Republic of Bulgaria. The configuration of AWOS includes sensors for measuring of wind, temperature, humidity, pressure, visibility, lower boundary and amount of clouds, runway condition at Sofia Airport, amount of precipitation and a system for determining the weather phenomena. Its operational ABL profiling instruments are not implemented into the common European network that PROBE coordinates, therefore it is of great importance BULSAT to be attracted to this network as in this way the essential gap in the flow of GBRS measurements data from Bulgaria could be filled. BULSTAT is also an important stakeholder, as it is strongly interested in the opportunity to test and implement a new improved ABL higher-level product, through which as an end-user to improve and facilitate its operational activities. This VM grant provided a real opportunity for the PFG2 to be presented and qualitatively evaluated to new end-user which could give the necessary initial impulse for other national authorities for the air traffic to implement the PARAFOG software as a decision support system for fog monitoring and forecasting at their territory.

Pointed benefits:

1. "Identifying knowledge brokers enabling rapid exchange between academia, operational agencies, industry and end-users to ensure full exploitation for societal benefit."
2. "Capacity building to enhance knowledge exchange between academia, industry, and end-users for exploiting the full potential of ABL profiling for societal benefit. "
3. Fostering and establishment of cooperation between operational agencies and academia dedicated to filling the ABL observation gap and to implement a new improved ABL higher-level product for operational use at national level.
4. "Demonstration of the relevance of ABL profiling for improved forecast of high impact severe weather..."
5. "Build capacity in exploiting advanced ABL profiling data for short-term weather forecasts, aviation hazards..."
6. Potential opportunity to "Enlarge the network capacity by engaging existing ABL profiling systems in Europe that are not yet integrated within the emerging networks."

This VM grant contribute to the achievement of the main objective of the PROBE "to create a cooperation hub for the identified groups (Academia, Research structures, Industry, Operational agencies, and End-users) to share the expertise on atmospheric boundary layer (ABL) profiling to maximize its use and societal impact..."

Description of the virtual collaboration (including constructive reflection on activities undertaken, identified successful practices and lessons learned).

(max.500 words)

The grantee mainly collaborated with Dr. Marc-Antoine Drouin (LMD/IPSL), to obtain knowledge in initialization and the workflow of the PARAFOG software. Dr. Drouin provided an access to the PARFOG software files, as well as additional programs and the necessary information for preprocessing of the meteorological data required by the PARFOG program.

The following virtual collaboration can be indicated

- ✓ General introduction of PFG2 software - the general methodology developed, theoretical basis and applied scientific techniques, installation instruction, operating system (OS) and software products requirements, packages and libraries, input data and the necessary formats, optional and required parameters, variables dimensions, NetCDF data converter programs, configuration files, and set up specific parameters;

Dr. Jean-François Ribaud (LMD/IPSL) and Dr. Martial Haeffelin (I-CEO /IPSL) were so kind to get involved and contributed with their experience while supervising the project collaborated.

The main advantage of VM grant is the convenience of communication at any time, no matter what time of day it is. As a minus can be pointed out the impossibility to make a real contact, through which it is much easier to communicate and gives the opportunity to show something real, to exchange literature, to get acquainted with the measuring instruments and to feel the atmosphere in another. working environment.