
Institute of Meteorology and Water Management - National Research Institute (IMGW-PIB)

PhD student -

**Atmospheric turbulence and surface fluxes on differential manifolds.
Project: Numerical Weather Prediction for sustainable Europe**

Salary (payroll): up to 1000 EUR net of tax (up to 8000 PLN of full remuneration cost) and state health insurance. Benefits e.g. private health insurance scheme are available. Final salary will be negotiated. **Duration: 33 months** with the possibility of extension to the fourth year subject to resources.

Project leader: dr Zbigniew Piotrowski

Location: IMGW-PIB headquarter in Warsaw, Poland.

IMGW-PIB and the Project

The Institute of Meteorology and Water Management - National Research Institute is a research-development unit and the Polish national meteorological and hydrological service. IMGW-PIB carries research within the European Consortium for Small-scale Modeling (COSMO) www.cosmo-model.org, a coalition of weather services on the development of operational numerical weather prediction models.

The **Numerical Weather Prediction for Sustainable Europe** project is financed by the European fund within the **Smart Growth Operational Programme 2014–2020**, Measure 4.4. “Boosting human potential in R&D sector“, through the **First Team 1/2016** award of **Foundation for Polish Science**. The project aims at accelerating the operationalization of the EULAG dynamical core of COSMO model, complementary to the CELO priority project of COSMO Consortium.

The research and implementation tasks include integration of EULAG dynamical core within the COSMO numerical weather prediction framework. Unique formulation of EULAG dynamical core employs the lowest model level at the Earth’s surface, moreover, it is capable of carrying Implicit Large Eddy Simulations, when no explicit subgridscale parameterization is necessary. Research and implementation work is needed to fully exploit these EULAG features to augment COSMO forecasting capabilities.

Summary of the position

The focus of the position is on the investigation and optimization of numerical and physical formulation of the COSMO-EULAG at and near the surface. This includes the assessment and testing of several strategies for surface and atmosphere interaction, encompassing both the established solution of the diffusion equation and evaluation of custom numerical devices to enable ILES approach for simulating weather. Physical parametrizations are to be investigated to provide meaningful tendencies at the Earth’s surface. Technical adaptation of the COSMO framework involving Fortran programming will be necessary within the frame of this position.

Main duties and key responsibilities

- Research on the optimal formulation of surface to atmosphere transport in the context of additional model level at the surface and the ILES capability of EULAG dynamical core.

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- Participation in the development of the optimal implementation of the three-dimensional generalized Laplace operator in curvilinear coordinates in both: Cartesian and spherical geometries.
 - Evaluation of the COSMO-EULAG within the realistic weather scenarios.
 - Preparation of COSMO-EULAG documentation.
 - Preparation of scientific publications for the leading journals.
 - Communicating the project results by public dissemination activities and presentations at the workshops and conferences.

Personal attributes

- Enthusiasm to work independently and in a small team.
- Positive attitude towards working in an international environment.
- Ability to communicate with professionals and the general public.
- Dedication to advance the cutting-edge technologies for dynamical cores of the numerical weather prediction models.
- Willingness to accept the operational priorities of the national weather service environment.
- Commitment to advance the scientific standards at the IMGW-PIB and attention to the details.

Qualification and experience required

- MSc in physics, mathematics, engineering or similar, preferably with strong theoretical background including numerical methods, linear algebra and differential geometry.
- Ability to understand and work with complex sets of partial differential equations such as primitive equations for atmospheric flows.
- Good understanding of continuum mechanics/fluid dynamics concepts.
- Good knowledge of modern high-level language such as Fortran or C++ and Unix.
- Experience with numerical simulations of physical phenomena.

Desired qualifications:

- Knowledge of geophysical fluid dynamics.
- Experience in the development of meteorological/geophysical software and/or the modern software engineering standards.
- Scientific achievements(including good/very good grades) and/or peer-review publication record.
- Experience in conducting numerical experiments using HPC resources.
- Experience with L^AT_EX.

The working language is English. Candidate must be able to communicate, read and write fluently in English. The successful candidate is expected to be able to travel several times a year and collaborate with partners at MeteoSwiss in Zurich and Deutscher Wetterdienst in Offenbach. She/He will also participate in the training sessions at the leading institutions and/or spend a number of weeks at the fellowships with the foreign partners. Candidates are expected to be enrolled in the recognized programme of PhD studies or to enrol at the earliest possible opportunity, e.g. at the University of Warsaw. The successful candidate will hold dual status of the doctoral student and the full-time employee of the IMGW-PIB. The doctoral student status is connected with limited teaching duties and taking several classes. For detailed rules, please refer to: PhD programme at the University of Warsaw, Faculty of Physics.

Our offer

We offer an unique position which provides the opportunity to work on leading edge numerical methods and modelling concepts applied to the next-generation numerical weather prediction for Europe, to collaborate with internationally renowned research groups and major weather services, and to develop production quality weather prediction software, within a motivated team. We offer opportunities for training in the field of modern technologies, numerical modelling and meteorology, international internships and cooperation, and a competitive salary (based upon qualifications and experience).

Documentation

Please send the following information to the propoze@imgw.pl with the keyword **SFDM** in the subject:

- CV and the cover letter explaining the interest and skills of the applicant,
- email addresses (and, if possible, phone numbers) of the two academic/professional referees who may be contacted by the recruiting committee,
- proof of the degree certificates and the transcript of records or similar document, along with the scans of original documents,
- list of scientific and software development achievements,
- other proofs of qualifications as desired, up to five conference or journal publications, pdf of MSc thesis,
- passport-size photo.

Deadline and policies

Initial consideration will be given to applications received by the **December, 31st 2016**. After this date, the applications will be considered as long as the position is filled. Employment should start as soon as possible. Candidates are responsible for preparation of the documents needed for Polish visa (if applicable) and must be able to submit visa application within a week after receiving the invitation for the interview or the final job offer (suitable invitation letter will be provided). IMGW-PIB is committed to the equal opportunity policy and all suitable candidates are encouraged to apply.