H2020-MSCA European Training Network

Cloud-MicroPhysics-Turbulence-Telemetry: An inter-multidisciplinary training and research network for enhancing the understanding and modeling of atmospheric clouds ”

14 PhD positions in the EU Horizon 2020 Marie Skłodowska-Curie ACTION ITN ETN Project COMPLETE

Applications are invited for **14 PhD** positions (“Early Stage Researchers”) to be funded by the Marie-Skłodowska-Curie Innovative Training Network “**COMPLETE – Cloud-MicroPhysics-Turbulence-Telem**etry: **An inter-multidisciplinary training network for enhancing the understanding and modeling of atmospheric clouds** within the Horizon 2020 Programme of the European Commission. **COMPLETE** is a consortium of high profile universities, research institutions and companies located in **Italy, France, Germany, Israel, Poland and UK**.

Number of positions available
14 PhD positions

Research Fields
Turbulence, Atmospheric physics and dynamics, Environmental monitoring, Scientific computing and data processing

Keywords
Warm clouds, turbulent entrainment, remote sensing, radiosondes, LIDAR, aerosol spectrometers, Lagrangian tracking, droplet generators, in-situ experiments, laboratory experiments

Career Stage
Early Stage researcher (ESR)

Benefits and salary
The successful candidates will receive an attractive salary in accordance with the MSCA regulations for Early Stage Researchers. The exact salary will be confirmed upon appointment and is dependent on the country correction factor (to allow for the difference in cost of living in different EU Member States). The salary includes a living allowance, a mobility allowance and a family allowance (if already married). The guaranteed PhD funding is for 36 months. In addition to their individual scientific projects, all fellows will benefit from further continuing education, which includes internships and secondments, a variety of training modules as well as transferable skills courses and active participation in workshops and conferences.

Eligibility criteria
Applicants need to fully satisfy three eligibility criteria:

- **Early-stage researchers** (ESR) are those who are, at the time of recruitment by the host, in the first four years (full- time equivalent) of their research careers. This is measured from the date when they obtained the degree which formally entitles them to embark on a doctorate, either in the country in which the degree was obtained or in the country in which the research training is provided, irrespective of whether or not a doctorate was envisaged.
- **Conditions of international mobility of researchers:** Researchers are required to undertake transnational mobility (i.e. move from one country to another) when taking up the appointment. At the time of selection by the host organization, researchers must not have resided or carried out their main activity (work, studies, etc.) in the country of their host organization for more than 12 months in the 3 years immediately prior to their recruitment. Short stays, such as holidays, are not taken into account.
- **English language**: Network fellows (ESRs) must demonstrate that their ability to understand and express themselves in both written and spoken English is sufficiently high for them to derive the full benefit from the network training.

A more detailed information on the eligibility criteria can be found in t**he Marie Skłodowska-Curie Actions**

H2020 Guide for Applicants.

General contact persons for COMPLETE

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Recruitment procedure

Description of the available positions is listed below. All candidates are invited to get in touch with the host institution contact persons. As above specified, applicants will need to prove that they are eligible according to the ESR definition, international mobility requirement and English language proficiency.

Project Abstract: Clouds are the largest source of uncertainty in weather prediction, climate science, and remain a weak link in modeling atmospheric circulation. This is rooted in the fact that clouds depend on the physical and chemical processes over a huge range of scales, from the collisions of micron-sized droplets and particles to the airflow dynamics on the scales of thousands of meters. Since ambiguities related to representation of clouds in climate models prevail, explorative observations are still needed. The challenge is on the one hand to establish connections across this range of scales, from aerosol and particle microphysics to macro-scale turbulent dynamics in clouds, and on the other to combine knowledge and training across vastly different scientific and engineering disciplines. The aim of COMPLETE is to develop an inter/multidisciplinary training network that will prepare high-potential early stage researchers (ESRs) with both scientific and industrially-oriented skills that will advance our understanding in these multi-scale complex natural phenomena. COMPLETE will vastly improve Europe's position as a global leader in technology, science and innovation to address climate change challenges. The training programme will combine the scientific investigation of specific aspects of cloud physics and related turbulent dynamics with training in key professional skills. This comprises an exceptional experimental programme that includes field experiments, laboratory and numerical simulations, the design and development of advanced fast temperature probes, velocity MEMS and innovative atmospheric mini radio-sondes; all aimed at the production of new, Lagrangian based, cloud fluctuation datasets, required to reduce the fragmentation of results and knowledge in this field.

Beneficiaries: *Politecnico di Torino, Imperial college London, Max Planck Institut für Dynamik und Selbstorganisation, Universytet Warszawski, Tel Aviv University, CNRS, Envisens, Pentalum, Sitael*

Partner organizations: *Max Planck Institut für Meteorologie, Istituto per le Scienze dell'Atmosfera e del Clima/CNR, Bayerische Forschungsallianz, Umweltforschungsstation Schneefernerhaus, MTF z.o.o., I3P, Ramot, Regione Piemonte*

ESR 9: Small-scale turbulence and spatial distribution of droplets in clouds.

Objectives: The project is aimed at joint investigation of droplet spatial distribution and small-scale turbulence in clouds. We plan measure positions and velocities of cloud droplets in a two-dimensional plane enlightened by a laser sheet technique. We will build a device allowing for uniform illumination of cloud volume of the area ~50x50 cm^2 and of variable thickness (~1 mm to ~2 cm). This will allow for visualization of cloud droplets within this volume and quantitative multi-scale (from below Kolmogorov scale to Taylor microscale) measurements of droplet clustering and small scale turbulence. We will test a prototype of this instrument in a laboratory cloud chamber at UW and in wind tunnels at MPG. We will use the instrument to measure properties of clouds in a mountain laboratory (preferably Schneefernenhaus at Zugspitze). We will perform collocated measurements of temperature fluctuations in cloud with our Ultra-Fast Thermometer and/or turbulence measurements with a fine instrument by TAU and PTL in order to investigate small-scale effects of inhomogeneous/homogeneous turbulent mixing in clouds.

Expected Results: Quantitative information about droplet spatial distribution and small-scale turbulent mixing in clouds disseminated in scientific publications, increased experience in development of new sensors.

Host: Uniwersytet Warsawski, Poland

Contact person: Prof. Szymon Malinowski (malina@fuw.edu.pl),
dr. Marta Waclawczyk (marta.waclawczyk@igf.fuw.edu.pl)

ESR 10: Sub-grid scale modelling of particle transport in Large Eddy Simulations of fluid flows.

Objectives: The project is aimed at numerical modelling of transport and interactions of Stokes particles, such as cloud droplets and other aerosols. In high Reynolds number flows, say in a cumulus cloud, there is a gap of 2-4 decades between the Kolmogorov scale and the size of transported droplets. Therefore, even Direct Numerical Simulations of the flow require sub-grid scale (SGS) modelling to account for droplet transport and interactions within one grid cell. In DNS, although not straightforward, this modelling is conceptually tractable as the SGS flow is laminar and, essentially, linear. The SGS modelling of Stokes particles in LES is a major theoretical challenge as the SGS flow, unlike in the DNS, is complex and multi-scale. The project will concern theoretical and numerical modelling of the dispersed phase dynamics in LES simulations of the continuous phase flow. We will focus on the correct modelling of collisions and coalescence of Stokes particles in turbulent flows comparing SGS models in true LES with filtered DNS simulations (a priori LES analysis) as the reference results.

Expected Results: Improved numerical model of droplet coalescence in Large Eddy Simulations. Qualitative understanding of the dependence of particle coalescence rate on the details of the SGS model.

Host: Uniwersytet Warsawski, Poland

Contact person: Prof. Szymon Malinowski (malina@fuw.edu.pl),
dr. Marta Waclawczyk (marta.waclawczyk@igf.fuw.edu.pl)