POLITECNICO DI MILANO

PhD in INGEGNERIA AMBIENTALE E DELLE INFRASTRUTTURE / ENVIRONMENTAL AND INFRASTRUCTURE ENGINEERING - 39th cycle

Research Area n. 3 - Environmental and Hydraulic Engineering and Geomatics

PNRR 117 Research Field: IMPROVEMENTS IN OBSERVATIONAL DATA AND NATURAL SOURCES REPRESENTATION IN REGIONAL AIR QUALITY MODELLING SYSTEMS

Monthly net income of PhDscholarship (max 36 months)
€ 1195.5
In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	As part of the European Green Deal's zero pollution ambition, the EU Commission tabled a proposal for a revision of the Ambient Air Quality Directives. According to the proposal, Member States must ensure the accuracy of model applications (with a view to enabling increased use of modelling for air quality assessment - Article 5) and adopt methods to combine models' results with observations to determine exceedances (Article 7). ARIANET Srl provides, since year 2000, operational Air Quality Modelling Systems (AQMSs) to multiple regional environmental protection agencies (ARPAs) to support their activities related to air quality management and forecast. The objectives of the research activities are:
	1. to improve the accuracy of AQMS forecasts by means of data fusion/assimilation techniques combining Air Quality Models with Earth Observations (EO, e.g. information via remote-sensing technologies - satellites -, ground-based sensors, operational stations providing pollutant and meteorological vertical profiles - lidar-ceilometers, weather balloons, for example -);
	2. to update the models used to estimate the natural emissions from vegetation (e.g. VOCs and pollens) and

	caused by the action of the wind on the soils (aeolian resuspension of dust) and on the sea (sea salts).
Methods and techniques that will be developed and used to carry out the research	To meet the 1st objective the Ph.D. candidate will develop/apply assimilation techniques implemented in the FARM Chemical Transport Model (CTM) to national and possibly regional scale data. This model is also used by ENEA within CAMS to perform European-scale air quality forecasts that require the use of both ground-based and satellite observations. As for the 2nd objective, further investigations are needed to improve the models used to estimate the emissions from vegetation (effects of climate change, drought, etc.; inclusion of pollens observed in the national territory: Cupressus, Corylus avellana,Urticaceae, etc.) and from the action of wind on desert areas (e.g. Saharan dust - ARIANET Srl is involved in modelling activities in Middle East) and on the sea (collaboration with ENEA on new parameterizations to take into account both the sea salinity and the source functions adopted to estimate wind-driven emissions).
Educational objectives	At the end of the research activity, the Ph.D. candidate will be able to use the different components of an AQMS to simulate the chemical-physical processes involving airborne pollutants at regional scales, critically reviewing the results and implementing new features.
Job opportunities	Following the rising interest in atmospheric modelling, further prompted by the ongoing revision of the Ambient Air Quality Directives, there is a growing need for modellers both in the private (mainly consulting firms) and in the public sector (environmental agencies, research centres, universities).
Composition of the research group	1 Full Professors 1 Associated Professors 0 Assistant Professors 0 PhD Students
Name of the research directors	Prof. Giovanni Lonati, Dr. Camillo Silibello

Contacts
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	597.75 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	ARIANET Srl (www.aria-net.it)
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	ARIA Technologies (www.aria.fr)
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research:

•ENEA, (Italian National Agency for New Technologies, Energy and Sustainable Economic Development)
•University of Bologna

Educational activities (purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences): approximately 1630,00 euros per PhD candidate per year, on average.

Teaching assistantship (availability of funding in recognition of support to teaching activities by the PhD student): there are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

Computer availability and desk availability: individual assignment for the entire career.