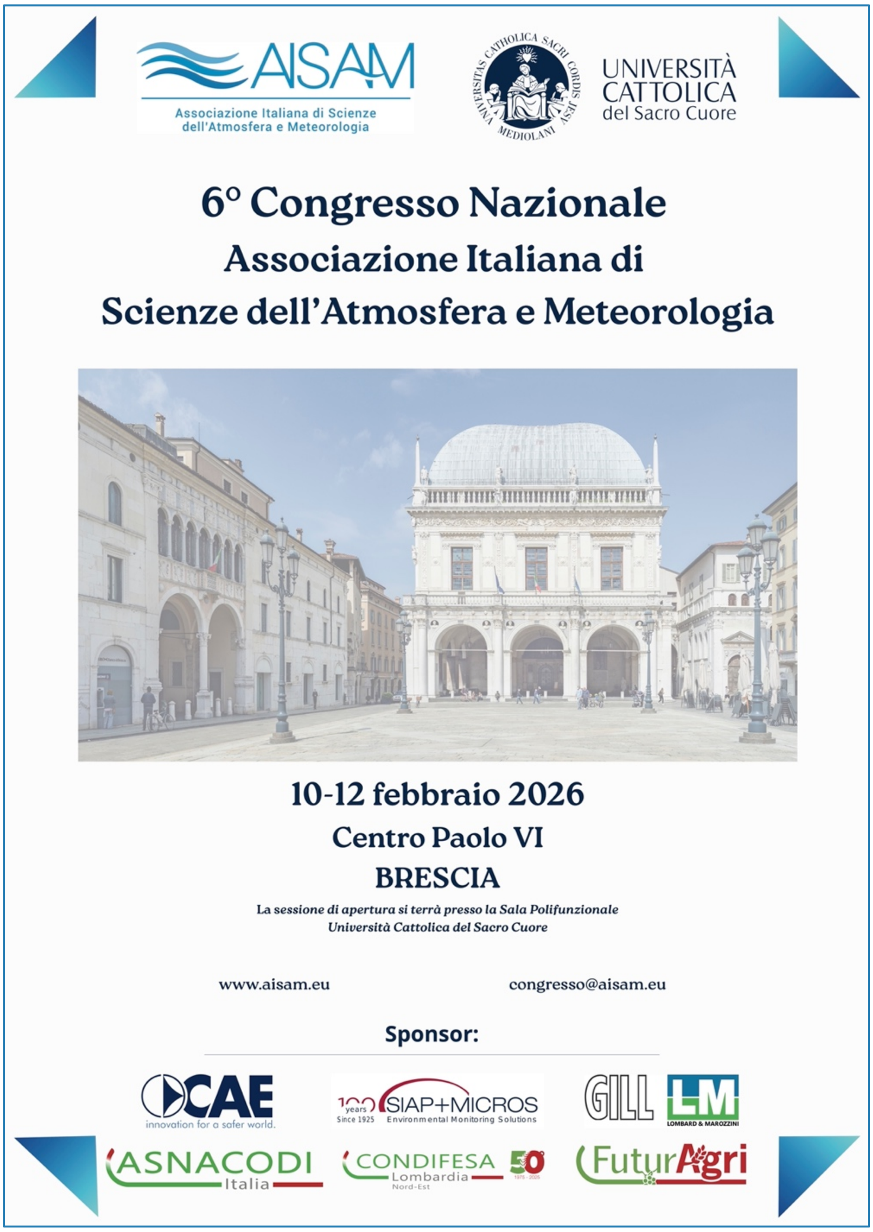

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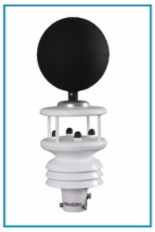

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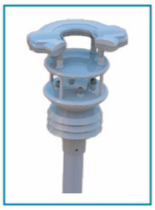

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GIOVEDI' 12 febbraio 2026

9:00am - 9:30am

Invited speaker: Prof. Dino Zardi

Location: **Aula Magna - Centro Paolo VI - Via Gezio Calini 30**

Investigating multi-scale transport and exchange processes associated with slope winds: the TEAMx 2025 campaign on Monte Baldo.

Dino Zardi[1,2], Francesco Barbano[3], Elena Barbaro[4], Alessandro Bracci[5], Christophe Brun[6], Warren R. L. Cairns[4], Sebastiano Carpentari[1], Massimo Cassiani[1,7], Franz Conen[8], Giulio Cozzi[4], Costanza Di Felice Fabrizi[2,9], Paolo Di Girolamo[10], Luca Di Liberto[5], Davide Dionisi[11], Marco Di Paolantonio[11], Silvana Di Sabatino[3], Giorgio Doglioni[1], Annika Einbock[8], Angelo Finco[12], Giacomo Gerosa[12], Lorenzo Giovannini[1], Riccardo Marzuoli[12], Christian Nardon[1], Ahmed Njimongbet[1], Fedinando Pasqualini[5], Nathan Philippot[6], Davide Plebani[12,13], Davide Poggi[14], Federico Porcù[3], Akanksha Rajput[1], Claudia Rossetti[4], Mira Shivani Sankar[2,15], Donato Summa[16], Nadia Vendrame[2]

[1]Department of Civil, Environmental and Mechanical Engineering (DICAM), University of Trento, Trento, Italy.; [2]Center Agriculture Food Environment (C3A), University of Trento, Trento, Italy.; [3]Department of Physics and Astronomy “Augusto Righi”, University of Bologna, Italy.; [4]Institute of Polar Sciences, National Research Council (CNR-ISP), Italy.; [5]Institute of Atmospheric Sciences and Climate, National Research Council (CNR-ISAC), Italy.; [6]Laboratoire des Écoulements Géophysiques et Industriels (LEGI), Université Grenoble Alpes, France.; [7]Stiftelsen NILU, Kjeller, Norwa; [8]Department of Environmental Sciences, University of Basel, Switzerland.; [9]National Doctoral School in Polar Sciences, University of Venice “Ca' Foscari”, Italy.; [10]Department of Health Sciences (DISS), University of Basilicata, Potenza, Italy.; [11]Institute of Marine Sciences, National Research Council (CNR-ISMAR), Rome, Italy.; [12]Faculty of Mathematical, Physical and Natural Sciences, Catholic University of the Sacred Heart, Brescia, Italy.; [13]Department of Earth and Environmental Sciences, KU Leuven, Belgium.; [14]Department of Environment, Land and Infrastructure Engineering (DIATI), Politecnico di Torino, Italy.; [15]University School for Advanced Studies (IUSS Pavia), Pavia, Italy.; [16]Institute of Methodologies for Environmental Analysis, National Research Council (IMAA-CNR), Tito Scalo, Italy.

Atmospheric transport processes over mountainous terrains are intrinsically affected by a variety of landforms, surface covers, atmospheric stability situations and interactions among different airflows, typical occurring on multiple space and time scales. Our understanding of the interplay of such factors is still far from being fully understood. In particular, the peculiar properties of atmospheric turbulence controlling the exchanges of momentum, heat and mass between the land surface, the atmospheric boundary layer and upper levels are still largely unexplored.

As a contribution to filling these gaps, the research project DECIPHER implemented observational and modelling actions aimed at disentangling mechanisms controlling atmospheric transport and mixing processes over mountain areas at different space- and timescales, in the framework of the larger international research effort TEAMx (Serafin et al. 2018, Rotach et al. 2021).

As part of the project, field measurements were performed at selected areas to investigate transport and exchange processes associated with thermally-driven slope winds and other local winds, and their connections with various ambient and weather conditions.

In particular, an intensive field campaign was organised over an east-facing steep slope of Monte Baldo (45°39'56.0"N, 10°49'10.9"E), an approximately north-south oriented mountain range in the Southern Alps. Several different instruments were operated from mid-June to mid-October 2025 to cover atmospheric processes at different scales. Turbulent processes were monitored through multi-level flux towers installed at different elevations, along with thermohygrometers distributed along the slope to capture the vertical structure of the ambient atmosphere. Mass and optical sensors monitored concentrations and properties of particulate matter. The 3-D structures of local along- and cross-slope winds and vertical temperature profiles were also observed with multiple wind lidars based at different points. Moreover, tropospheric profiles were obtained from a tethered balloon and a Raman lidar. Further non-conventional measurements included high-frequency profiling of turbulence near the surface and distributed soil moisture monitoring using a cosmic-ray neutron sensor.

Preliminary outcomes from the analysis of the resulting huge dataset allow for identifying interesting patterns of local circulations and their connections with turbulence structure, as well as with the surrounding flow and stability conditions, under different weather situations.

Besides research achievements, DECIPHER was also a remarkable and unique opportunity to consolidate relationships of scientific cooperation among the numerous partners involved, and to successfully test new observational techniques and logistic solutions for the nontrivial deployment of such a major field campaign. Hence it contributed to build-up It was a great opportunity for growing a scientific community characterised by complementary expertise, a remarkable amount of personnel involved, and the numerosity and diversity of instruments enabled to plan and perform the unusual effort adequate for phenomena, whose complexity would not be captured with any fewer instruments. Buildup of a scientific community

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Serafin, S., Adler, B., Cuxart, J., De Wekker, S.F.J., Gohm, A., Grisogono, B., Kalthoff, N., Kirshbaum, D.J., Rotach, M.W., Schmidli, J., Stiperski, I., Večenaj, Ž. and Zardi D. (2018): Exchange Processes in the Atmospheric Boundary Layer Over Mountainous Terrain. Atmosphere, 9, 102. https://doi.org/10.3390/atmos9030102

9:30am - 11:00am	**PROCESSI-I** Location: **Aula Magna - Centro Paolo VI - Via Gezio Calini 30** Session Chair: **Giacomo A. Gerosa** Session Chair: **Patrizia Favaron**

Fiumi atmosferici nel Mediterraneo ed eventi meteo-idrologici estremi sul centro-nord Italia

Silvio Davolio[1,2], Isacco Sala[1], Alessandro Comunian[1], Daniele Mastrangelo[2], Sante Laviola[2], Giulio Monte[2], Barbara Tomassetti[3], Annalina Lombardi[3,4], Marco Verdecchia[4], Federico Grazzini[5], Valentina Colaiuda[6]

[1]Dipartimento di Scienze della Terra, Università di Milano, Milano, Italy; [2]Istituto di Scienze dell'atmosfera e del clima, Consiglio Nazionale delle Ricerche, (ISAC-CNR), Bologna, Italia; [3]Centro di Eccellenza CETEMPS, Università dell'Aquila, Coppito (L'Aquila), Italia; [4]Dipartimento di Scienze Fisiche e Chimiche, Università dell'Aquila, Coppito (L'Aquila), Italia; [5]ARPAE Servizio IdroMeteoClima, Bologna, Italia; [6]Agenzia Regionale di Protezione Civile – Regione Abruzzo, L'Aquila, Italia

Studi recenti di eventi di precipitazioni estreme e alluvioni che hanno interessato l'Italia centro-settentrionale e l'area alpina in particolare hanno rivelato che oltre al contributo locale dovuto all'evaporazione dal Mar Mediterraneo, una quantità rilevante di umidità può giungere da regioni remote per mezzo di un intenso trasporto confinato all'interno di corridoi lunghi e stretti, noti come fiumi atmosferici.

Il progetto nazionale ARMEX, finanziato nell'ambito PRIN2022 dal Ministero dell'Università e della Ricerca, ha l'obiettivo di esplorare i fiumi atmosferici nel Mediterraneo e la loro connessione con eventi idrometeorologici estremi sull'Italia. Il progetto coinvolge competenze sia nella modellistica meteorologica e idrologica, sia nel monitoraggio da satellite. Vengono qui presentati alcuni risultati del progetto.

Utilizzando le rianalisi ERA5 e il dataset di precipitazioni ArCIS, e applicando un algoritmo di identificazione, opportunamente adattato alla peculiare e complessa morfologia della regione, è stato possibile evidenziare le principali caratteristiche climatologiche dei fiumi atmosferici nel Mediterraneo e la loro connessione con eventi idrometeorologici estremi sul centro-nord Italia dal 1960 ad oggi. Inoltre, attraverso l'analisi di diversi casi studio, simulazioni numeriche ad alta risoluzione hanno dimostrato che la presenza di un intenso fiume atmosferico – proveniente dalle aree tropicali dell'Africa o dall'Atlantico – rappresenta un elemento distintivo degli eventi estremi. Gli esperimenti modellistici hanno permesso di investigare le caratteristiche, i meccanismi dinamici e gli impatti dei fiumi atmosferici, i quali si sono rivelati un ingrediente fondamentale per il verificarsi di precipitazioni estreme. Infine, si sta esplorando la predicibilità a scala sub-stagionale di eventi estremi caratterizzati dalla presenza di fiumi atmosferici.

Bridging Scales in Urban Climate Modelling: A Multisource Analysis of Thermo-Hygrometric Dynamics in the Coastal City of Bari, Italy

Gianluca Pappaccogli[1], Andrea Zonato[2], Alberto Martilli[3], Riccardo Buccolieri[1], Piero Lionello[1]

[1]DiSTeBA - Univ of Salento, Lecce, Italy; [2]CIMA Research Foundation, Savona, Italy; [3]Environmental Department, CIEMAT, Madrid, Spain

The thermal and moisture regimes of coastal cities arise from the interplay between mesoscale atmospheric circulations and local urban form, creating highly heterogeneous microclimates that directly affect heat exposure, energy demand, and outdoor comfort. This study presents an integrated multi-source approach to evaluate thermo-hygrometric variability in Bari (southern Italy), a representative Mediterranean coastal city characterized by strong land–sea interactions. The analysis combines in situ observations, remote-sensing data, and urban-canopy modelling to disentangle the relative roles of mesoscale forcing and microscale heterogeneity. Eight canyon-level sensors were deployed across districts with distinct morphology, vegetation density, and distance from the coastline, continuously monitoring air temperature and, at five sites, relative humidity during the summer of 2023. These measurements were complemented with high-resolution ECOSTRESS land-surface-temperature (LST) data and numerical simulations from the Multi-Layer Urban Canopy Model (MLUCM BEP+BEM) driven by ERA5 reanalysis. Morphological and radiative parameters around each site were quantified within a 500 m radius following the Local Climate Zone (LCZ) classification. Statistical analyses based on repeated-measures ANOVA quantified temporal and spatial variability in air temperature and humidity, enabling a robust assessment of the significance of observed differences. Results show that nocturnal temperature differences across Bari are relatively limited (< 2 °C), while after sunrise, the development of a sea–land-breeze circulation induces marked divergence among sites. Inland neighbourhoods warm and dry rapidly, reaching up to 5–6 °C higher air temperatures than coastal areas, which remain moderated by maritime ventilation. Conversely, relative humidity exhibits an inverse pattern, increasing along the coastline and decreasing inland. Evening cooling is slower in dense central districts due to greater heat storage, a pattern also captured by ECOSTRESS LST data. These findings highlight the dual control exerted by mesoscale dynamics and local morphology, with compact built-up zones and impervious surfaces amplifying daytime heat accumulation and delaying nocturnal release. Simulations with MLUCM BEP+BEM reproduce the observed intra-urban variability with notable accuracy, outperforming ERA5 near-surface reanalysis fields. Model-sensitivity tests demonstrate that the choice of boundary forcing significantly affects MLUCM BEP+BEM performance: sea-based forcings yield the best agreement near the coastline, while interpolated configurations perform better inland. Across all scenarios, the model captures microscale-driven variability of comparable magnitude to mesoscale contributions, confirming its suitability for reproducing canopy-layer processes under different urban and meteorological conditions. Overall, this research demonstrates that integrating mesoscale and microscale datasets provides a coherent framework for interpreting the spatial structure of thermal and moisture fields in coastal cities. The multi-source methodology—combining field measurements, satellite observations, and a physics-based urban-canopy model—offers a transferable approach for diagnosing urban heat exposure and informing climate adaptation. In particular, the MLUCM BEP+BEM model proves effective in distinguishing coastal–inland gradients and quantifying the influence of urban form and land cover on local climate. These results