TIME TABLE

TIME	Monday	Tuesday	Wednesday	Thursday	Friday
	July 20	July 21	July 22	July 23	July 24
09.00 - 09.45	Registration	Manzato	Lombardo	Kumjian	Sioni
09.45 - 10.30	Manzato	Manzato	Lombardo	Kumjian	Kunz
11.00 - 11.15	Sioni	Sioni	Sioni	Sioni	Sioni
11.15 - 12.00	Manzato	Taszarek	Kumjian	Miglietta	Kunz
12.00 - 12.45	Taszarek	Taszarek	Kumjian	Miglietta	
14.00 - 14.45	Taszarek	Lombardo	Miglietta	Kunz	
14.45 - 15.30	Kumjian	Lombardo	Miglietta	Kunz	
16.00 - 16.45	Kumjian	Poster Session	Kunz	Lombardo	
16.45 - 17.30	Lombardo	Poster Session	Kunz		
18.00	Welcome aperitif				

ADMISSION AND ACCOMMODATION

The course is offered in a hybrid format, allowing participants the flexibility to attend either in person or remotely via the Microsoft Teams platform. Admission to on-site attendance is granted on a first-come, first-served basis to comply with the capacity of the lecture room.

Registration fees:

- Early Bird On-Site Participation: € 650.00 + VAT*
Deadline: May 20, 2026

- Late On-Site Participation: € 800.00 + VAT*
Deadline: July 8, 2026

- Live Streaming Online Participation: € 250.00 + VAT*
Deadline: July 8, 2026

On-site participation includes a complimentary bag, five fixed menu buffet lunches, hot beverages, downloadable lecture notes.
Online participation includes downloadable lecture notes.

Application forms should be submitted online through the website: http://www.cism.it. A confirmation message will be sent to participants whose applications are accepted.
Upon request, and subject to availability, a limited number of on-site participants can be accommodated at the CISM Guest House for € 35 per person per night. To request accommodation, please contact: foresteria@cism.it

** where applicable; bank charges are not included - Italian VAT is 22%.*

CANCELLATION POLICY

Applicants may cancel their registration and receive a full refund by notifying the CISM Secretariat in writing (via email) no later than:
- May 20, 2026, for early bird on-site participation;
- June 20, 2026, for late on-site participation;
- July 8, 2026, for online participation.

No refunds after the deadlines. Cancellation requests received before these deadlines and incorrect payments will be subject to a € 50.00 handling fee.

CISM GRANTS

A limited number of participants from universities and research centers who do not receive support from their institutions can request a waiver of the registration fee and/or free lodging.
Requests should be submitted by email to the CISM Secretariat at: info@cism.it by **May 20, 2026**. Submissions must include the applicant's curriculum vitae and a letter of recommendation from the head of the department or a supervisor, confirming that the institute is unable to provide funding. Preference will be given to applicants from countries that sponsor CISM.

For further information please contact:

CISM (Seat of the course)
Palazzo del Torso - Piazza Garibaldi 18 - 33100 Udine (Italy)
tel. +39 0432 248511 (6 lines)
e-mail: info@cism.it | www.cism.it

Centre International des Sciences Mécaniques
International Centre for Mechanical Sciences

ACADEMIC YEAR 2026
The George M. Homsy Session

SEVERE CONVECTIVE STORMS AND HAIL

CISM Advanced School
coordinated by

Agostino Manzato
National Research Council
Institute of Atmospheric Sciences and Climate
Bologna, Italy

Francesco Sioni
Regional Agency for Environmental Protection
ARPA-FVG, Palmanova, Udine, Italy

Udine *July 20 - 24* 2026

SEVERE CONVECTIVE STORMS AND HAIL

Atmospheric convection drives many meteorological phenomena that pose significant threats to people and property. This course aims to provide participants with a robust and integrated understanding of convective storms, blending theoretical foundations with practical forecasting techniques, with a particular focus on hailstorms. The program will begin with an overview of moist atmospheric thermodynamics. A key tool in this analysis are the radiosoundings and the respective thermodynamic diagrams, which will be explained to help participants develop a solid understanding of their interpretation. Among the most important outputs derived from radiosoundings are the instability indices; the course will delve into their climatology, emphasizing their spatial and temporal variability across complex terrain and different global regions.

The course will then transition into the dynamic aspects of convection. Different convective modes will be examined, each with its typical life cycle and associated hazards. Particular attention will be given to how complex terrain influences the evolution of convective systems. Real case studies and idealized model simulations will highlight how orographic features and sea-atmosphere interactions influence storm development and maintenance. Another key focus of the course will be the initiation of convection, exploring various triggering mechanisms such as bores, gravity waves, cold pools, and upslope flows along mountainous terrain.
Hailstorms, as one of the most damaging convective weather phenomena, can cause extensive damage to buildings, crops, and vehicles. The course will thoroughly examine hail microphysics, covering the processes of formation, growth, and melting, integrating theoretical knowledge with practical applications. Participants will gain insights into hail measurement and detection focusing on remote sensing techniques. The principles of radar operation will be discussed in detail, especially with regard to dual-polarization. A dedicated part of the course will deal with the ground-impacts from hailstorms and especially with the evaluation of hazards. The hail risk will be assessed through probabilistic models which also have insurance applications.
In addition to hail, other convective phenomena such as tornadoes, lightning and heavy convective rainfall will also be examined.
This analysis will be conducted using a combined approach that integrates observational data with numerical modeling simulations. Daily weather briefings will provide an operational forecasting component, enabling participants to apply their knowledge to real-time convective scenarios. Finally, the potential impact of global warming on convective weather will also be addressed, taking into account both emerging observational trends and projections from numerical models.
The course is intended for graduate and PhD students, post-doctoral and senior researchers, operational weather forecasters and anyone interested in deepening their knowledge of deep atmospheric convection over mid-latitudes.

PRELIMINARY SUGGESTED READINGS

Allen, J. T. et al. (2020). Understanding hail in the earth system. Reviews of Geophysics, 58(1), e2019RG000665.

Kumjian, M.R.,et al. (2024). Radar and hail: Advances in scattering, detection, and sizing. In Precipitation Science, Scattering and Processing Algorithms Vol. 2. Institution of Engineering and Technology.

Kumjian, M. R., & Lombardo, K. (2020). A hail growth trajectory model for exploring the environmental controls on hail size: Model physics and idealized tests. Journal of the Atmospheric Sciences, 77(8).

Taszarek, M., Brooks, H. E., & Czernecki, B. (2017). Sounding-derived parameters associated with convective hazards in Europe. Monthly Weather Review, 145(4).

Kunz, M., et al. (2020). Ambient conditions prevailing during hail events in central Europe. Natural Hazards and Earth System Sciences, 20(6).

Lombardo, K., & Kading, T. (2018). The behavior of squall lines in horizontally heterogeneous coastal environments. Journal of the Atmospheric Sciences, 75(4).

Wu, F., and K. Lombardo (2021). Precipitation Enhancement in Squall Lines Moving over Mountainous Coastal Regions. Journal of the Atmospheric Sciences, 78.

Manzato, A., Riva, V., Tiesi, A., & Marcello Miglietta, M. (2020). Observational analysis and simulations of a severe hailstorm in northeastern Italy. Quarterly Journal of the Royal Meteorological Society, 146(732).

Raupach, T. H., et al. (2021). The effects of climate change on hailstorms. Nature reviews earth & environment, 2(3).

Pilguj, N.,et al. (2022). Are trends in convective parameters over the United States and Europe consistent between reanalyses and observations?. Journal of Climate, 35(12).

Manzato, A., et al. (2025). Relationships between Environmental Parameters and Storm Observations in Po Valley: Are They Climate Change Invariant?. Journal of Applied Meteorology and Climatology, 64(3).

INVITED LECTURERS

Matthew Kumjian - Pennsylvania State University, University Park, USA
6 lectures on: Hail microphysics (energetics, kinetics, hail formation and growth); Hailstone melting and aerodynamic behaviors; Introduction to dual-polarization radar variables with applications in convective storms; Future of hail detection and quantification.

Michael Kunz - Karlsruhe Institute of Technology, Germany
6 lectures on: Hailstorm damage patterns across Europe and meteorological drivers: link between hail occurrence and atmospheric conditions; Large-scale hazard mapping from single events; Modeling hail risk for insurance applications; Hail hazard in a changing climate.

Kelly Lombardo - Pennsylvania State University, University Park, USA
6 lectures on: Gravity waves and bores in convection initiation, organization, evolution and maintenance (coastal and nocturnal convection); Impact of mountains on the evolution of organized convection traversing the terrain (cold pools, upstream and downstream environments).

Agostino Manzato - CNR-ISAC Bologna, Italy
4 lectures on: Introduction to thermodynamics of moist air and pseudo-adiabatic lifting; Atmospheric profiling with radiosoundings and their thermodynamic diagrams; Climatology of cloud-to-ground lightnings, hail and rain in northeastern Italy.

Mario Marcello Miglietta - CNR-ISAC Padua, Italy
4 lectures on: Precursors of tornadoes in Mediterranean region; Case studies of hailstorms over northeastern Italy; Conceptual models for intense orographic precipitation in the Mediterranean region; Environmental conditions favorable to Mediterranean tropical-like cyclones.

Francesco Sioni - ARPA FVG Palmanova, Udine, Italy
1.5 lecture splitted in 5 weather briefings of 15 minutes focused on: real-time forecasting of convective phenomena;
1.5 lecture on: case studies of giant hail in north-eastern Italy with emphasis on operational forecasting decisions.

Mateusz Taszarek - Adam Mickiewicz University Poznan, Poland
5 lectures on: Skew-T and hodograph charts; Convective parameters and their climatology; Convective environments associated with severe storms in the world and their future evolution with global warming; Convective modes with associated hazards.

LECTURES

All lectures will be given in English. Lecture notes can be downloaded from the CISM web site. Instructions will be sent to accepted participants.