

STARS4Water & DRHYM Workshop

When: Wednesday 24 April 13:30 CEST to Thursday 25 April 13:30 CEST

Where: INRAE Antony, 1 rue Pierre-Gilles de Gennes, 92160 Antony

Participants: STARS4Water & DRHYM partners and registered attendees

Format: On-site & Online (Session I and Session II) & On-site only (Session III)

Registration: <https://sondages.inrae.fr/index.php/594839?lang=en>

Deadline: 8 April 2023

Wednesday 24 April		
13:30 – 14:00	Welcome	INRAE
14:00 – 15:30	Data-driven hydrology and machine learning algorithms for water management & risk assessment (I)	Session I: Details below
15:30 – 15:50	Break	
15:50 – 17:30	Data-driven hydrology and machine learning algorithms for water management & risk assessment (II)	Session II: Details below
19:00	S4W Dinner in Antony or in Paris (tbd)	
Thursday 25 April		
09:00 – 12:00	Hands-on practice session	Session III: Details below
12:00 – 13:30	Lunch at INRAE	
13:30	End of workshop	

Organizing committee:

- Maria-Helena Ramos (INRAE UR HYCAR, France) (Chair)
- Helen Baron (UK Centre for Ecology & Hydrology, United Kingdom)
- Antoine Degenne (INRAE UR HYCAR, France)
- Harm Duel (Deltares, The Netherlands)
- Virginie Keller (UK Centre for Ecology & Hydrology, United Kingdom)
- Daniel Klotz (Johannes Kepler University Linz, Austria)
- Stefan Kollet (Forschungszentrum Jülich, Germany)



Supporting Stakeholders for
Adaptive, Resilient and
Sustainable Water Management

Data-driven hybrid
hydrological models
DRHYM project



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Data-driven hydrology and machine learning algorithms for water management and risk assessment

The hydrological community has been paying particular attention to the advantages of using machine-learned hydrologic models or model components in the last years. Their aims span over a variety of open opportunities for research and operations in the water sector, such as:

- to unlock data sets and data services from earth observations initiatives that are underexploited by public and private stakeholders in water resources planning;
- to improve the accuracy and spatial resolution of hydrological models and enhance the evaluation of impacts on water resources availability for ecosystems, agriculture and industries;
- to bring together observed and modelled data available from different hydrological components and for different water management objectives within a river basin, such as water quality management, reservoir operations, surface and groundwater supply systems;
- to enhance our ability to describe the feedbacks between climate change and people, drought and flood risks, and to quantify the human influence on droughts and floods.

From input data processing to model output prediction, novel techniques have been explored to support a large number of hydrological applications:

- forecasting of extreme events (floods and droughts),
- predicting water use patterns and projecting future water demand,
- detecting patterns in reservoir management and predicting releases,
- regionalizing hydrological model's parameters over large river basins,
- regionalizing groundwater information at the catchment scale.

This workshop aims to bring together hydrologists and data-driven experts to explore pathways to bring new data sets and data-driven modelling approaches from hydrologic research to the more practical and operational planning level in river basins.

The workshop is a joint-initiative of the Horizon Europe STARS4Water Project and the French national ANR project DRHYM

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Session I: 14:00 – 15:30 Wednesday 24 April

	Invited speaker	Title
14:00 – 14:30	(tbc)	(tbc)
14:30 – 14:50	Pedro Martinez-Santos (UCM, SP)	Predictive mapping by means of ML algorithms
14:50 – 15:10	Leandro Avila (FZ Jülich, DE)	Downscaling GRACE total water storage based on LSTM models and TSMP simulations
15:10 – 15:30	(tbc)	(tbc)
<i>20 min break</i>		

Session II: 15:50 – 17:30 Wednesday 24 April

	Invited speaker	Title
15:50 – 16:10	Antoine Degenne (INRAE, FR)	Hydrological modeling using hybrid process-based and machine learning modeling
16:10 – 16:30	Helen Baron (UKCEH, UK)	Forecasting reservoir storage with the Random Forest
16:30 – 16:50	Annine Kenne (JKU, AT)	Progress in reservoir modeling with ML
16:50 – 17:20	(tbc)	(tbc)
17:20 – 17:30	Final discussions	
<i>19:00 - Dinner (in Paris or Antony; tbd)</i>		

Session III: 09:00 – 12:00 Thursday 25 April

09:00 – 12:00	Daniel Klotz (JKU) and Helen Baron (UKCEH)	Hands-on session (on-site only)
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In this hands-on session, we invite participants to explore the power of differentiable models for solving time series regression tasks, such as rainfall-runoff modeling. We will start by playing around with automatic differentiation (commonly known as *autodiff*), the backbone of deep learning. This will give participants an understanding of the basics of current deep learning approaches. We will build both basic linear and non-linear regression models – and experience the flexibility and scalability of the approach firsthand. Then, we will tackle concepts from Recurrent Neural Networks (which are currently the best performers for rainfall-runoff modeling) and touch on the concept of modern attention mechanisms (the basic building blocks of transformers; the form of neural network architecture that is currently used for large language models). The goal of the workshop is to get a feeling for the different approaches and the crucial role of data in building effective deep learning models.

By participating in this workshop, you will (1) gain an understanding of differentiable models, (2) develop hands-on experience building and applying deep learning models for rainfall-runoff modeling, and (3) get a feeling for the role of architectures and data. Most importantly, however, the workshop will provide you with a good foundation for continued exploration of deep learning in environmental applications.

Practical information

- INRAE is located at 1 rue Pierre-Gilles de Gennes, 92160 Antony (see below)
- The number of on-site registrations is limited by the room capacity
- Virtual participation will be provided to online registered participants though Zoom
- Except for lunch and coffee break, participants should cover their own expenses (local transport, accommodation, meals and travel costs).

Contact:

Maria-Helena Ramos, Research Scientist

Email: maria-helena.ramos@inrae.fr

How to get to INRAE @ Antony (south Paris)

Address

1 rue Pierre-Gilles de Gennes, 92160 Antony

Phone: +33 (0) 1 40 96 61 21

Visitors: an ID card may be asked at the front desk



Hotels nearby or in Paris:

- Hotel Montbriand, 1 Av. de la Providence, 92160 Antony: <https://hotel-montbriand-antony.com/>
- Hotel IBIS Budget Fresnes, 30 Av. Division Leclerc (~20 min walking distance from INRAE): <https://all.accor.com/hotel/B3A8/index.en.shtml>
- Hotels in Paris: choosing closer to RER B or RER C train stations can be easier for public transportation



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How to come to INRAE

By plane:

- The closest airport is the “Orly Airport (ORY)”. If you arrive by this airport, you can take the shuttle (“Orlyval”) to the station “Antony” (about 10 min). From there to INRAE, you can take a bus (line 286) or walk (20 min)
- If you arrive by “Charles de Gaulle Airport (CDG)”, you can take the RER B (suburban train) and get off at station “Antony” (about 1 hour). From there to INRAE, you can take a bus (line 286) or walk (20 min)

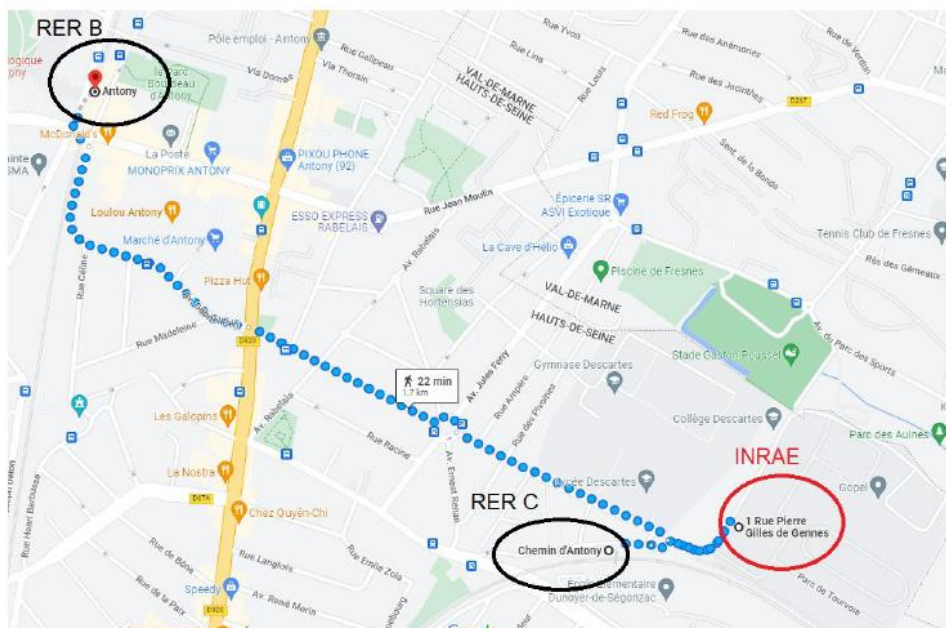
By public transportation from Paris:

If you are coming from Paris, e.g. by train, you can:

- take RER C suburban train (check the stations in Paris: <https://www.transilien.com/fr/page-lignes/ligne-c>) and get off at “Chemin d’Antony” (travel takes about 30 min; 1 train every 30 min), and then walk (5 min)
- take RER B suburban train (check the stations in Paris: <https://www.transilien.com/fr/page-lignes/ligne-b>) and get off at “Antony” (travel takes about 20 min; 1 train every 5-8 min), and then walk (20 min)
- For both suburban trains and for general public transportation in Paris, visit <https://www.ratp.fr/>

Map:

Walking from RER B station “Antony” or from RER C station “Chemin d’Antony” to INRAE:



Google Map: <https://goo.gl/maps/KAF7N89oxZtTGv4x5>