Building and disseminating local hydrological narratives under regional warming levels

Jean-Philippe Vidal[1], Blaise Calmel[1, 2], Louis Héraut[1], Eric Sauquet[1]

[1]INRAE, UR RiverLy
[2]Now at Compagnie Nationale du Rhône (CNR)

6 May 2026

Sharing is encouraged

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

INRAE

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

agence de l'eau Loire-Bretagne

Hydrologie Milieux Usages Climat
HMUC
AXE LOIRE

The EXPLORE2 hydrological ensemble

Des futurs de l'eau

Projections over mainland France and Corsica

Some figures

- 3 RCPs with up to 17 EURO-CORDEX GCM-RCM
- 2 bias-correction methods
- up to 9 distributed hydrological models

→ Up to 153 daily streamflow time series 1976-2100 at up to 4 000 stations

Hydrol. Earth Syst. Sci., 30, 2277–2300, 2026
https://doi.org/10.5194/hess-30-2277-2026

Hydrology and Earth System Sciences
Open Access
EGU

A large transient multi-scenario multi-model ensemble of future streamflow and groundwater projections in France

Eric Sauquet[1], Guillaume Evin[2], Sonia Siauve[3], Ryma Aissat[4], Patrick Arnaud[5], Maud Bérel[6], Jérémie Bonneau[1,7], Flora Branger[1], Yvan Caballero[8], François Colléoni[5], Agnès Ducharne[9], Joël Gailhard[10], Florence Habets[11], Frédéric Hendrickx[12], Louis Héraut[1], Benoît Hingray[2], Peng Huang[9], Tristan Jaouen[1], Alexis Jeantet[13], Sandra Lanini[8], Matthieu Le Lay[10], Claire Magand[14], Louise Mimeau[1], Céline Monteil[12], Simon Munier[13], Charles Perrin[15], Olivier Robelin[1,8], Fabienne Rousset[17], Jean-Michel Soubeyroux[17], Laurent Strohmenger[15], Guillaume Thirel[15,16], Flore Tocquer[17], Yves Tramblay[18], Jean-Pierre Vergnes[4], and Jean-Philippe Vidal[1]

[1]UR RiverLy, INRAE, Villeurbanne, France
[2]Univ. Grenoble Alpes, INRAE, CNRS, IRD, Grenoble INP, IGE, Grenoble, France
[3]OiEau, Limoges, France
[4]BRGM – French Geological Survey, Orléans, France
[5]UMR RECOVER, INRAE, Aix-Marseille University, Le Tholonet, France
[6]MTEECPR, La Défense, France
[7]INSA Lyon, DEEP, UR 7429, Villeurbanne, France
[8]UMR 183 G-Eau, INRAE, CIRAD, IRD, AgroParisTech, Institut Agro, BRGM, Montpellier, France
[9]Sorbonne Université/CNRS/EPHE, METIS-IPSL, Paris, France
[10]Département Eau Environnement, EDF-DTG, Saint Martin le Vinoux, France
[11]Geology Laboratory of Ecole Normale Supérieure, Pierre Simon Laplace Research University, CNRS UMR 8538, Paris, France
[12]Département LNHE, EDF-R&D, Chatou, France
[13]CNRM, Université de Toulouse, Météo-France, CNRS, Toulouse, France
[14]OFB, Direction de la recherche et de l'appui scientifique, Nantes, France
[15]Université Paris-Saclay, INRAE, UR HYCAR, Antony, France
[16]Univ Toulouse, CNES/IRD/CNRS/INRAE, CESBIO, Toulouse, France
[17]Météo-France, Direction de la Climatologie et des Services Climatiques, Toulouse, France
[18]UMR Espace Dev, Univ. Montpellier, IRD, Montpellier, France

Correspondence: Eric Sauquet (eric.sauquet@inrae.fr)

Received: 22 April 2025 – Discussion started: 20 May 2025
Revised: 6 February 2026 – Accepted: 12 March 2026 – Published: 22 April 2026

Abstract. A large transient multi-scenario and multi-model ensemble of future streamflow and groundwater projections in France developed in a national project named Explore2 was recently made available. The main objective of Explore2 is to provide rich and spatially-consistent information for the future evolution of hydrological (surface and groundwater) resources and extremes in France to support adaptation strategies. The Explore2 dataset was obtained using a nested multi-scenario multi-model approach to estimate future uncertainty and to assess local climate at the catchment scale: three greenhouse gas (GHG) emission scenarios, a set of 17 combinations of Global Climate Models and Regional Climate Models (GCM/RCM), and two bias correction methods provide the meteorological forcing for nine surface hydrology models and four groundwater hydrology models (one to simulate groundwater recharge and three to simulate groundwater level). In this paper, we present the methodology underlying the dataset, the evaluation of the hydrological models against daily observations of streamflow and groundwater

Published by Copernicus Publications on behalf of the European Geosciences Union.

Sauquet et al. (2026). A large transient multi-scenario multi-model ensemble of future streamflow and groundwater projections in France. *Hydrology and Earth System Sciences* 30 8, pages 2277–2300. DOI: 10.5194/hess-30-2277-2026

Evin et al. (2026). Uncertainty sources in a large ensemble of hydrological projections: Regional Climate Models and Internal Variability matter. *Hydrology and Earth System Sciences* 30 4, pages 1023–1051. DOI: 10.5194/hess-30-1023-2026

The EXPLORE2 hydrological ensemble

Projections over mainland France and Corsica

Some figures

- 3 RCPs with up to 17 EURO-CORDEX GCM-RCM
- 2 bias-correction methods
- up to 9 distributed hydrological models

→ Up to 153 daily streamflow time series 1976-2100 at up to 4 000 stations

In summary

- **Large** ensemble (Sauquet et al., 2026)

Hydrol. Earth Syst. Sci., 30, 2277–2300, 2026
https://doi.org/10.5194/hess-30-2277-2026

Hydrology and Earth System Sciences

A large transient multi-scenario multi-model ensemble of future streamflow and groundwater projections in France

Eric Sauquet[1], Guillaume Evin[2], Sonia Siauve[3], Ryma Aissat[4], Patrick Arnaud[5], Maud Bérel[6], Jérémie Bonneau[1,7], Flora Branger[1], Yvan Caballero[8], François Colléoni[5], Agnès Ducharne[9], Joël Gailhard[10], Florence Habets[11], Frédéric Hendrickx[12], Louis Héraut[1], Benoît Hingray[2], Peng Huang[9], Tristan Jaouen[1], Alexis Jeantet[13], Sandra Lanini[8], Matthieu Le Lay[10], Claire Magand[14], Louise Mimeau[1], Céline Monteil[12], Simon Munier[13], Charles Perrin[15], Olivier Robelin[1,8], Fabienne Rousset[17], Jean-Michel Soubeyroux[17], Laurent Strohmenger[15], Guillaume Thirel[15,16], Flore Tocquer[17], Yves Tramblay[18], Jean-Pierre Vergnes[4], and Jean-Philippe Vidal[1]

[1]UR RiverLy, INRAE, Villeurbanne, France
[2]Univ. Grenoble Alpes, INRAE, CNRS, IRD, Grenoble INP, IGE, Grenoble, France
[3]OiEau, Limoges, France
[4]BRGM – French Geological Survey, Orléans, France
[5]UMR RECOVER, INRAE, Aix-Marseille University, Le Tholonet, France
[6]MTEECPR, La Défense, France
[7]INSA Lyon, DEEP, UR 7429, Villeurbanne, France
[8]UMR 183 G-Eau, INRAE, CIRAD, IRD, AgroParisTech, Institut Agro, BRGM, Montpellier, France
[9]Sorbonne Université/CNRS/EPHE, METIS-IPSL, Paris, France
[10]Département Eau Environnement, EDF-DTG, Saint Martin le Vinoux, France
[11]Geology Laboratory of Ecole Normale Supérieure, Pierre Simon Laplace Research University, CNRS UMR 8538, Paris, France
[12]Département LNHE, EDF-R&D, Chatou, France
[13]CNRM, Université de Toulouse, Météo-France, CNRS, Toulouse, France
[14]OFB, Direction de la recherche et de l'appui scientifique, Nantes, France
[15]Université Paris-Saclay, INRAE, UR HYCAR, Antony, France
[16]Univ Toulouse, CNES/IRD/CNRS/INRAE, CESBIO, Toulouse, France
[17]Météo-France, Direction de la Climatologie et des Services Climatiques, Toulouse, France
[18]UMR Espace Dev, Univ. Montpellier, IRD, Montpellier, France

Correspondence: Eric Sauquet (eric.sauquet@inrae.fr)

Received: 22 April 2025 – Discussion started: 20 May 2025
Revised: 6 February 2026 – Accepted: 12 March 2026 – Published: 22 April 2026

Abstract. A large transient multi-scenario and multi-model ensemble of future streamflow and groundwater projections in France developed in a national project named Explore2 was recently made available. The main objective of Explore2 is to provide rich and spatially-consistent information for the future evolution of hydrological (surface and groundwater) resources and extremes in France to support adaptation strategies. The Explore2 dataset was obtained using a nested multi-scenario multi-model approach to estimate future uncertainty and to assess local climate at the catchment scale: three greenhouse gas (GHG) emission scenarios, a set of 17 combinations of Global Climate Models and Regional Climate Models (GCM/RCM), and two bias correction methods provide the meteorological forcing for nine surface hydrology models and four groundwater hydrology models (one to simulate groundwater recharge and three to simulate groundwater level). In this paper, we present the methodology underlying the dataset, the evaluation of the hydrological models against daily observations of streamflow and groundwater

Published by Copernicus Publications on behalf of the European Geosciences Union.

Sauquet et al. (2026). A large transient multi-scenario multi-model ensemble of future streamflow and groundwater projections in France. *Hydrology and Earth System Sciences* 30 8, pages 2277–2300. DOI: 10.5194/hess-30-2277-2026

Evin et al. (2026). Uncertainty sources in a large ensemble of hydrological projections: Regional Climate Models and Internal Variability matter. *Hydrology and Earth System Sciences* 30 4, pages 1023–1051. DOI: 10.5194/hess-30-1023-2026

The EXPLORE2 *Des futurs de l'eau* hydrological ensemble

Projections over mainland France and Corsica

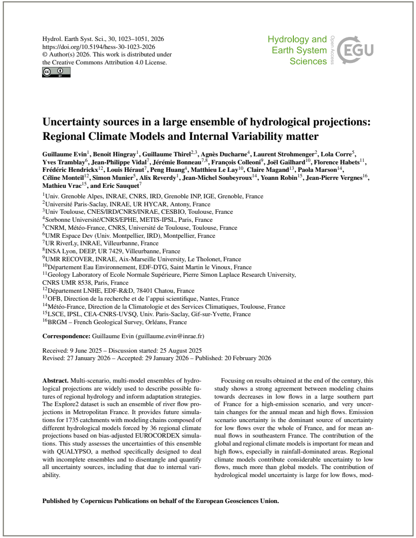
Some figures

- 3 RCPs with up to 17 EURO-CORDEX GCM-RCM
- 2 bias-correction methods
- up to 9 distributed hydrological models

→ Up to 153 daily streamflow time series 1976-2100 at up to 4 000 stations

In summary

- **Large** ensemble (Sauquet et al., 2026)
- **Complex** ensemble (Evin et al., 2026)



Hydrol. Earth Syst. Sci., 30, 1023–1051, 2026
https://doi.org/10.5194/hess-30-1023-2026

Hydrology and Earth System Sciences

Uncertainty sources in a large ensemble of hydrological projections: Regional Climate Models and Internal Variability matter

Guillaume Evin[1], Benoit Hingray[1], Guillaume Thirel[2,3], Agnès Ducharne[4], Laurent Strohmenger[2], Lola Corre[5], Yves Tramblay[6], Jean-Philippe Vidal[7], Jérémie Bonneau[7,8], François Colleoni[9], Joël Gailhard[10], Florence Habets[11], Frédéric Hendrickx[12], Louis Héraut[7], Peng Huang[4], Matthieu Le Lay[10], Claire Magand[13], Paola Marson[14], Céline Monteil[12], Simon Munier[5], Alix Reverdy[1], Jean-Michel Soubeyroux[14], Yoann Robin[15], Jean-Pierre Vergnes[16], Mathieu Vrac[15], and Eric Sauquet[7]

[1]Univ. Grenoble Alpes, INRAE, CNRS, IRD, Grenoble INP, IGE, Grenoble, France
[2]Université Paris-Saclay, INRAE, UR HYCAR, Antony, France
[3]Univ Toulouse, CNES/IRD/CNRS/INRAE, CESBIO, Toulouse, France
[4]Sorbonne Université/CNRS/EPHE, METIS-IPSL, Paris, France
[5]CNRM, Météo-France, CNRS, Université de Toulouse, Toulouse, France
[6]UMR Espace Dev (Univ. Montpellier, IRD), Montpellier, France
[7]UR RiverLy, INRAE, Villeurbanne, France
[8]INSA Lyon, DEEP, UR 7429, Villeurbanne, France
[9]UMR RECOVER, INRAE, Aix-Marseille University, Le Tholonet, France
[10]Département Eau Environnement, EDF-DTG, Saint Martin le Vinoux, France
[11]Geology Laboratory of Ecole Normale Supérieure, Pierre Simon Laplace Research University, CNRS UMR 8538, Paris, France
[12]Département LNHE, EDF-R&D, 78401 Chatou, France
[13]OFB, Direction de la recherche et de l'appui scientifique, Nantes, France
[14]Météo-France, Direction de la Climatologie et des Services Climatiques, Toulouse, France
[15]LSCE, IPSL, CEA-CNRS-UVSQ, Univ. Paris-Saclay, Gif-sur-Yvette, France
[16]BRGM – French Geological Survey, Orléans, France

Correspondence: Guillaume Evin (guillaume.evin@inrae.fr)

Received: 9 June 2025 – Discussion started: 25 August 2025
Revised: 27 January 2026 – Accepted: 29 January 2026 – Published: 20 February 2026

Abstract. Multi-scenario, multi-model ensembles of hydrological projections are widely used to describe possible futures of regional hydrology and inform adaptation strategies. The Explore2 dataset is such an ensemble of river flow projections in Metropolitan France. It provides future simulations for 1735 catchments with modeling chains composed of different hydrological models forced by 36 regional climate projections based on bias-adjusted EUROCORDEX simulations. This study assesses the uncertainties of this ensemble with QUALYPSO, a method specifically designed to deal with incomplete ensembles and to disentangle and quantify all uncertainty sources, including that due to internal variability.

Focusing on results obtained at the end of the century, this study shows a strong agreement between modeling chains towards decreases in low flows in a large southern part of France for a high-emission scenario, and very uncertain changes for the annual mean and high flows. Emission scenario uncertainty is the dominant source of uncertainty for low flows over the whole of France, and for mean annual flows in southeastern France. The contribution of the global and regional climate models is important for mean and high flows, especially in rainfall-dominated areas. Regional climate models contribute considerable uncertainty to low flows, much more than global models. The contribution of hydrological model uncertainty is large for low flows, mod-

Published by Copernicus Publications on behalf of the European Geosciences Union.

Sauquet et al. (2026). A large transient multi-scenario multi-model ensemble of future streamflow and groundwater projections in France. *Hydrology and Earth System Sciences* 30 8, pages 2277–2300. DOI: 10.5194/hess-30-2277-2026

Evin et al. (2026). Uncertainty sources in a large ensemble of hydrological projections: Regional Climate Models and Internal Variability matter. *Hydrology and Earth System Sciences* 30 4, pages 1023–1051. DOI: 10.5194/hess-30-1023-2026

The EXPLORE2 hydrological ensemble

Projections over mainland France and Corsica

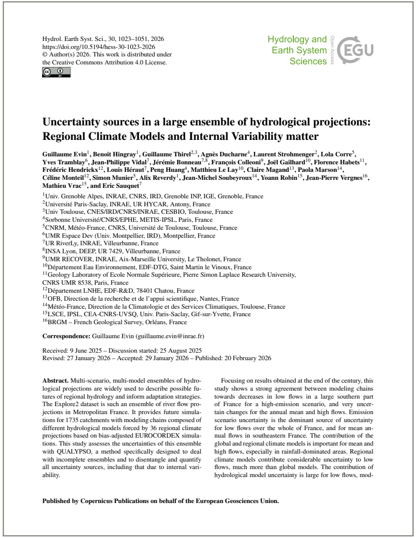
Some figures

- 3 RCPs with up to 17 EURO-CORDEX GCM-RCM
- 2 bias-correction methods
- up to 9 distributed hydrological models

→ Up to 153 daily streamflow time series 1976-2100 at up to 4 000 stations

In summary

- **Large** ensemble (Sauquet et al., 2026)
- **Complex** ensemble (Evin et al., 2026)
- **… to be used for adaptation**



Hydrol. Earth Syst. Sci., 30, 1023–1051, 2026
https://doi.org/10.5194/hess-30-1023-2026

Hydrology and Earth System Sciences
Open Access
EGU

Uncertainty sources in a large ensemble of hydrological projections: Regional Climate Models and Internal Variability matter

Guillaume Evin[1], Benoit Hingray[1], Guillaume Thirel[2,3], Agnès Ducharne[4], Laurent Strohmenger[2], Lola Corre[5], Yves Tramblay[6], Jean-Philippe Vidal[7], Jérémie Bonneau[7,8], François Colleoni[9], Joël Gailhard[10], Florence Habets[11], Frédéric Hendrickx[12], Louis Héraut[7], Peng Huang[4], Matthieu Le Lay[10], Claire Magand[13], Paola Marson[14], Céline Monteil[12], Simon Munier[5], Alix Reverdy[1], Jean-Michel Soubeyroux[14], Yoann Robin[15], Jean-Pierre Vergnes[16], Mathieu Vrac[15], and Eric Sauquet[7]

[1]Univ. Grenoble Alpes, INRAE, CNRS, IRD, Grenoble INP, IGE, Grenoble, France
[2]Université Paris-Saclay, INRAE, UR HYCAR, Antony, France
[3]Univ Toulouse, CNES/IRD/CNRS/INRAE, CESBIO, Toulouse, France
[4]Sorbonne Université/CNRS/EPHE, METIS-IPSL, Paris, France
[5]CNRM, Météo-France, CNRS, Université de Toulouse, Toulouse, France
[6]UMR Espace Dev (Univ. Montpellier, IRD), Montpellier, France
[7]UR RiverLy, INRAE, Villeurbanne, France
[8]INSA Lyon, DEEP, UR 7429, Villeurbanne, France
[9]UMR RECOVER, INRAE, Aix-Marseille University, Le Tholonet, France
[10]Département Eau Environnement, EDF-DTG, Saint Martin le Vinoux, France
[11]Geology Laboratory of Ecole Normale Supérieure, Pierre Simon Laplace Research University, CNRS UMR 8538, Paris, France
[12]Département LNHE, EDF-R&D, 78401 Chatou, France
[13]OFB, Direction de la recherche et de l'appui scientifique, Nantes, France
[14]Météo-France, Direction de la Climatologie et des Services Climatiques, Toulouse, France
[15]LSCE, IPSL, CEA-CNRS-UVSQ, Univ. Paris-Saclay, Gif-sur-Yvette, France
[16]BRGM – French Geological Survey, Orléans, France

Correspondence: Guillaume Evin (guillaume.evin@inrae.fr)

Received: 9 June 2025 – Discussion started: 25 August 2025
Revised: 27 January 2026 – Accepted: 29 January 2026 – Published: 20 February 2026

Abstract. Multi-scenario, multi-model ensembles of hydrological projections are widely used to describe possible futures of regional hydrology and inform adaptation strategies. The Explore2 dataset is such an ensemble of river flow projections in Metropolitan France. It provides future simulations for 1735 catchments with modeling chains composed of different hydrological models forced by 36 regional climate projections based on bias-adjusted EUROCORDEX simulations. This study assesses the uncertainties of this ensemble with QUALYPSO, a method specifically designed to deal with incomplete ensembles and to disentangle and quantify all uncertainty sources, including that due to internal variability.

Focusing on results obtained at the end of the century, this study shows a strong agreement between modeling chains towards decreases in low flows in a large southern part of France for a high-emission scenario, and very uncertain changes for the annual mean and high flows. Emission scenario uncertainty is the dominant source of uncertainty for low flows over the whole of France, and for mean annual flows in southeastern France. The contribution of the global and regional climate models is important for mean and high flows, especially in rainfall-dominated areas. Regional climate models contribute considerable uncertainty to low flows, much more than global models. The contribution of hydrological model uncertainty is large for low flows, mod-

Published by Copernicus Publications on behalf of the European Geosciences Union.

Sauquet et al. (2026). A large transient multi-scenario multi-model ensemble of future streamflow and groundwater projections in France. *Hydrology and Earth System Sciences* 30 8, pages 2277–2300. DOI: 10.5194/hess-30-2277-2026

Evin et al. (2026). Uncertainty sources in a large ensemble of hydrological projections: Regional Climate Models and Internal Variability matter. *Hydrology and Earth System Sciences* 30 4, pages 1023–1051. DOI: 10.5194/hess-30-1023-2026

LA FRANCE S'ADAPTE
Vivre à +4°C

The trajectory for adaptation

TRACC

Trajectoire de Réchauffement de Référence pour l'Adaptation au Changement Climatique

- National reference warming trajectory for climate change adaptation
- Regulatory framework since January 2026 (JO, 2026b, 2026a)

Regional Warming Levels (RWLs) & time horizon

- +2.0°C in 2030
- +2.7°C in 2050
- +4.0°C in 2100

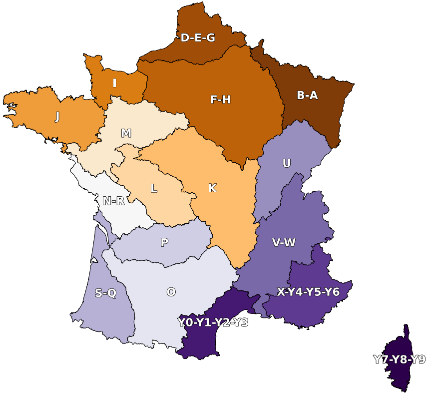
Soubeyroux et al. (2024). *À quel Climat s'adapter en France selon la TRACC ?. Partie 1 – Concepts et données de base pour les températures et précipitations*. Météo-France. 20 pages. URL: https://hal.science/hal-04797481v3

Soubeyroux et al. (2025). *À quel climat s'adapter en France selon la TRACC ?. Partie 2 : Variabilité, extrêmes et impacts climatiques*. Météo-France. 47 pages. URL: https://hal.science/hal-04991790v3

Defining local hydrological narratives for the TRACC

The NarraTRACC

1. Selecting a basin with homogeneous responses
   - Ensuring spatial consistency across local water ressources studies
   - Keeping regional diversity in hydrological responses
2. Selecting a RWL
   - 20-yr window around RWL pivot year
   - Specific to each climate projection (Soubeyroux et al., 2024)
3. Computing basin-average indicators
   - Changes in indicators widely-used by local managers
     - high flows: annual daily maximum with 10-yr return period
     - average flows: interannual average
     - low flows: interannual average of annual 10-day minimum
   - Computing spatial median over the target basin



Calmel et al. (2025). *Définition de narratifs hydrologiques par niveau de réchauffement défini par la TRACC (narraTRACC)*. Version V1. 23 pages. DOI: 10.57745/FE356V

Defining local hydrological narratives for the TRACC

The NarraTRACC

4. Clustering on basin-scale indicators

- Imposed number of clusters: 4
- k-means on PCA

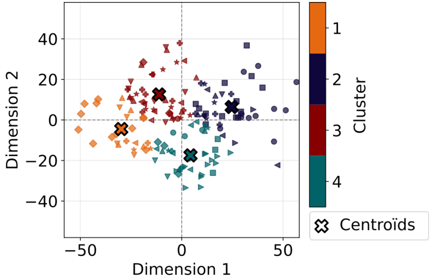
5. Filtering out projections

Removing projections with hydrological models

- with too low present-day performance across all calibration stations of the target basin
- with too few output stations across the target basin

6. Removing outliers

- Within each cluster
- Outside a sphere of median distance from centroïd plus 2 standard deviations



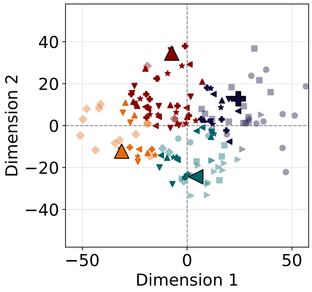
Calmel et al. (2025). *Définition de narratifs hydrologiques par niveau de réchauffement défini par la TRACC (narraTRACC)*. Version V1. 23 pages. DOI: 10.57745/FE356V

Defining local hydrological narratives for the TRACC

The NarraTRACCs

7. Selecting the NarraTRACCs

- Single projection within each cluster
- MinMax approach to ensure highest contrast across clusters



Raw results

- Character chain: Emission scenario / GCM / RCM / bias-correction / hydrological model
- Not that user-friendly...

Calmel et al. (2025). *Définition de narratifs hydrologiques par niveau de réchauffement défini par la TRACC (narraTRACC)*. Version V1. 23 pages. DOI: 10.57745/FE356V

Categorizing narraTRACCs

Imagining families

The four families

X	Intensification of extremes	$\Delta_{low} < -15\%$ & $\Delta_{high} > +15\%$
E	Intensification of low-flows	$\Delta_{low} < -15\%$ & $\Delta_{high} <= +15\%$
C	Intensification of floods	$\Delta_{low} >= -15\%$ & $\Delta_{high} > +15\%$
M	Moderate changes	$\Delta_{low} >= -15\%$ & $\Delta_{high} <= +15\%$

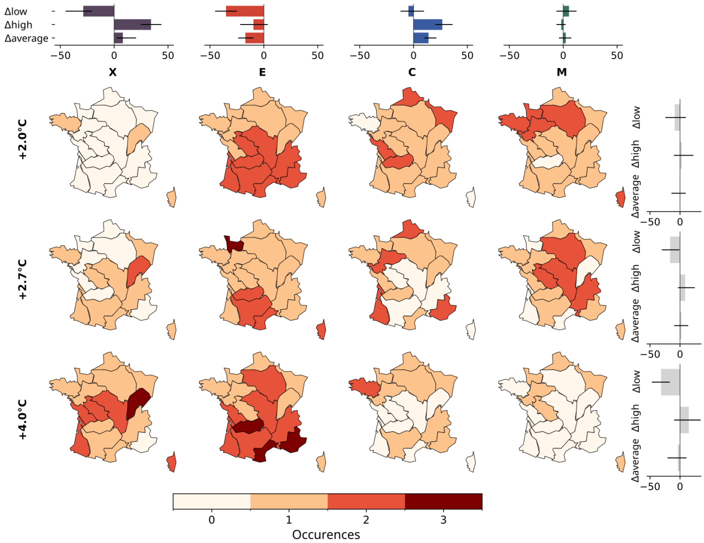
Example of region K (Upper Loire) under +4.0°C

historical-rcp85_IPSL-CM5A-MR_HIRHAM5_ADAMONT_MORDOR-TS	X1
historical-rcp85_CNRM-CM5_ALADIN63_ADAMONT_EROS	X2
historical-rcp85_HadGEM2-ES_CCLM4-8-17_ADAMONT_MORDOR-TS	E1
historical-rcp85_NorESM1-M_WRF381P_ADAMONT_SMASH	E2

Calmel et al. (2025). *Définition de narratifs hydrologiques par niveau de réchauffement défini par la TRACC (narraTRACC)*. Version V1. 23 pages. DOI: 10.57745/FE356V

Categorizing narraTRACCs

Evolution of family occurences with increasing RWLs



Describing narraTRACCs

From characters to sentences

Getting to actual narratives

- Automating descriptions
- Based on changes sequentially in average flows, both extremes, andt hen refining on floods and low flows

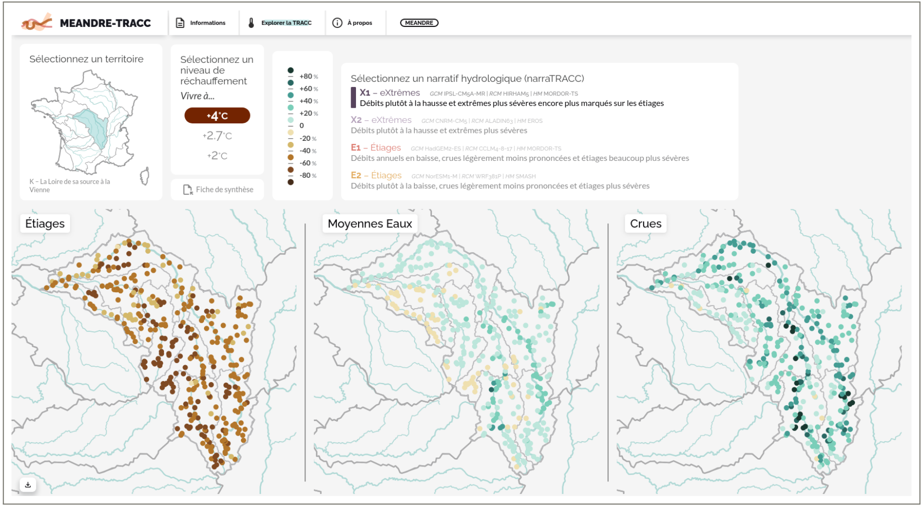
Example of region K (Upper Loire) under +4.0°C

historical-rcp85_IPSL-CM5A-MR_HIRHAM5_ADAMONT_MORDOR-TS	X1	Slightly increasing annual streamflow, more severe extremes, and even more for low flows
historical-rcp85_CNRM-CM5_ALADIN63_ADAMONT_EROS	X2	Slightly increasing annual streamflow ,and more severe extremes
historical-rcp85_HadGEM2-ES_CCLM4-8-17_ADAMONT_MORDOR-TS	E1	Decreasing annual streamflow, slightly less severe floods, and much more severe low flows
historical-rcp85_NorESM1-M_WRF381P_ADAMONT_SMASH	E2	Slightly decreasing annual streamflow, slightly less severe floods, and more severe low flows

Calmel et al. (2025). *Définition de narratifs hydrologiques par niveau de réchauffement défini par la TRACC (narraTRACC)*. Version V1. 23 pages. DOI: 10.57745/FE356V

Disseminating narraTRACCs

https://meandre-tracc.explore2.inrae.fr/



Thought as an extension to the https://meandre.explore2.inrae.fr/ portal (see last year talk, Vidal et al., 2025)

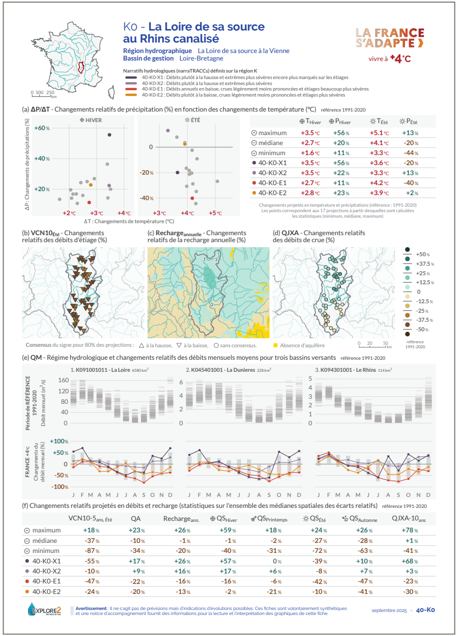
Documenting narraTRACCs

For traceability and reproducibility

In the EXPLORE2 *Des futurs de l'eau* dataverse

- Technical note (Calmel et al., 2025)
- Summary table of narraTRACS (Héraut et al., 2025b)
- Summary sheets for subbasins (Héraut et al., 2025a)
- Reading guide for summary sheets (Sauquet et al., 2025)

https://entrepot.recherche.data.gouv.fr/dataverse/explore2-tracc



Building and disseminating local hydrological narratives under regional warming levels

- Defining
- Categorizing
- Describing
- Disseminating
- Documenting

jean-philippe.vidal@inrae.fr

This work was funded and co-constructed with Julien Colin, Benoît Prévost, and Mathilde Hoareau (Loire-Bretagne Water Agency) within the EHCLO project

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

agence de l'eau Loire-Bretagne

Hydrologie Milieux Usages Climat
HMUC
AXE LOIRE

References I

Calmel, B. et al. (2025). *Définition de narratifs hydrologiques par niveau de réchauffement défini par la TRACC (narraTRACC)*. Version V1. 23 pages. DOI: 10.57745/FE356V.

Evin, G. et al. (2026). Uncertainty sources in a large ensemble of hydrological projections: Regional Climate Models and Internal Variability matter. *Hydrology and Earth System Sciences* 30 4, pages 1023–1051. DOI: 10.5194/hess-30-1023-2026.

Héraut, L. et al. (2025a). *Analyse des débits et de la recharge potentielle des aquifères par niveau de réchauffement et par secteur hydrographique — Fiche de synthèse*. Version V4. DOI: 10.57745/QDCSBZ. URL: https://doi.org/10.57745/QDCSBZ.

Héraut, L. et al. (2025b). *Sélections de narratifs hydrologiques (narraTRACC) par niveau de réchauffement sur chaque secteur hydrographique*. Version V1. DOI: 10.57745/KAHIWJ. URL: https://doi.org/10.57745/KAHIWJ.

JO (Jan. 25, 2026a). Arrêté du 23 janvier 2026 fixant la trajectoire de réchauffement de référence pour l'adaptation au changement climatique. *Journal Officiel de la République Française*, TECR2530223A (21), page 13. URL: https://www.legifrance.gouv.fr/eli/arrete/2026/1/23/TECR2530223A/jo/texte.

— (Jan. 25, 2026b). Décret n° 2026-23 du 23 janvier 2026 relatif à la trajectoire de réchauffement de référence pour l'adaptation au changement climatique. *Journal Officiel de la République Française*, TECR2530221D (21), page 11. URL: https://www.legifrance.gouv.fr/eli/decret/2026/1/23/TECR2530221D/jo/texte.

Sauquet, E. et al. (2026). A large transient multi-scenario multi-model ensemble of future streamflow and groundwater projections in France. *Hydrology and Earth System Sciences* 30 8, pages 2277–2300. DOI: 10.5194/hess-30-2277-2026.

References II

Sauquet, É. et al. (2025). *Notice de lecture des fiches des changements hydrologiques (recharge et débit) par niveau de réchauffement*. Version V3. DOI: 10.57745/FGAOCD. URL: https://doi.org/10.57745/FGAOCD.

Soubeyroux, J.-M. et al. (2024). *À quel Climat s'adapter en France selon la TRACC ? Partie 1 – Concepts et données de base pour les températures et précipitations*. Météo-France. 20 pages. URL: https://hal.science/hal-04797481v3.

Soubeyroux, J.-M. et al. (2025). *À quel climat s'adapter en France selon la TRACC ? Partie 2 : Variabilité, extrêmes et impacts climatiques*. Météo-France. 47 pages. URL: https://hal.science/hal-04991790v3.

Vidal, J.-P. et al. (2025). "Hydroclimate services are more than just providing data". In: EGU General Assembly 2025 (Vienna, Austria, Apr. 27–May 2, 2025). DOI: 10.5194/egusphere-egu25-9933.