Irstea – Centre d'Antony
Equipe HYDRO – UR HYCAR
1, rue Pierre-Gilles de Gennes, CS 10030
92761 Antony Cedex
tél. 01 40 96 61 21
fax 01 40 96 61 99
www.irstea.fr

https://webgr.irstea.fr/activites/seminaires-et-soutenances/

Séminaire scientifique :

« Eau et pluridisciplinarité : exemples d'études pratiques »

Date et lieu : 10 septembre 2019, 14h-16h30, Salle Chenu (Bâtiment Chenu / Rez-de-chaussée)

Program:

20-25 min of presentation + 20-15 min of questions

14h – 14h10: **Welcome remarks, Charles Perrin & Maria-Helena Ramos (Irstea, Antony, France)**

14h10 – 14h50: ***Analyzing the relationship between statistical scores and the economic performance of probabilistic hydrologic forecasts*, Amaury Tilmant (Université Laval, Québec)**

14h50 – 15h30: ***Quantitative Assessment of Contested Water Uses and Management in the Conflict-Torn Yarmouk Basin,* Nicolas Avisse (Université Laval, Québec)**

15h30 – 16h10: ***Large-scale hydrological services: challenges and opportunities for the co-evolution of knowledge,* Ilias Pechlivanidis (SMHI, Norrköping, Sweden)**

16h10 – 16h30: **General discussion/End of seminar**

Abstracts:

Amaury Tilmant (Université Laval, Québec): *Analyzing the relationship between statistical scores and the economic performance of probabilistic hydrologic forecasts*

Hydrologists often rely on statistical scores like the continuous ranked probability score (CRPS), the normalized root-mean-square error ratio (NRR), the Nash-Sutcliff efficiency (NSE) to assess the reliability and accuracy of hydrological ensemble prediction systems (H-EPS). Although useful, a statistical characterization of the forecasts falls short of providing a measure of their utility to society, which is the ultimate metric for water managers and policy makers. If more reliable and accurate forecasts are desirable, it is often unclear to what extent the reliability and accuracy gains will translate into increased utility, which, depending on the characteristics of the water resources system, could be expressed in terms of flood damage reduction, increased hydropower generation, more reliable water supply, etc. We present a testbed to analyze the relationship between statistical scores and the economic performance of probabilistic hydrologic forecasts. The testbed comprises (i) 20 structurally-different hydrological models, (ii) two data assimilation techniques, (iii) one mid-term (weekly, monthly) and (iv) one short-term (daily) water resources allocation models, (v) hydro-meteorological, infrastructural and water demand data for the case study. Using the hydropower system of the Gatineau River basin in Quebec as a case study, 20 sets of ensemble streamflow forecasts are generated by the hydrological models from the 50-member meteorological forecasts issued by the ECMWF over a period of 6 years (2011-2016). Forecasts are updated daily and have a lead time of 14 days. They are processed in a rolling-horizon mode by the short-term water resources allocation model, which seeks to maximize the energy output over the 14-days period considering the expected future value of the system derived from the mid-term allocation model. Regressions are then developed to examine the relationship between the economic performance (here the production of hydroelectricity) and the scores characterizing the 20 H-EPS. The analysis also reveals where (for what power plant) and when (for what time of the year) the improvement of the forecasts should be prioritized as well as the potential for improvement of the 20 H-EPS.

Nicolas Avisse (Université Laval, Québec): ***Quantitative Assessment of Contested Water Uses and Management in the Conflict- Torn Yarmouk Basin***

The Yarmouk River basin is shared between Syria, Jordan, and Israel. Since the 1960s, Yarmouk River flows have declined more than 85% despite the signature of bilateral agreements. Syria and Jordan blame each other for the decline and have both developed their own explanatory narratives: Jordan considers that Syria violated their 1987 agreement by building more dams than what was agreed on, while Syria blames climate change. In fact, as the two countries do not share information, neither on hydrological flows nor on water management, it is increasingly difficult to distinguish between natural and anthropogenic factors affecting the flow regime. Remote sensing and multi-agent simulation are combined to carry out an independent, quantitative, analysis of Jordanian and Syrian competing narratives. We show that a third cause for which there is no provision in the bilateral agreements actually explains much of the changes in the flow regime: groundwater over-abstraction by Syrian highland farmers.

Ilias Pechlivanidis (SMHI, Norrköping, Sweden): ***Large-scale hydrological services: challenges and opportunities for the co-evolution of knowledge***

Climatic variations can have a significant impact on a number of sectors (i.e. water, energy, health, tourism etc.) and therefore managing such variations through better predictions is crucial. Over the last years, seasonal meteorological forecasting skill has been significantly improved allowing the development of operational large-scale hydrological services in order to address various user needs. Although efforts were put to bridge the knowledge gap between data providers and users, there is still a need for strong user engagement through better communication of results and co-evolution of knowledge. SMHI has been operationally providing key hydro-climatic indicators to address the water-related user needs at different spatiotemporal scales; at the national, continental and global scales, and at (sub-) seasonal time horizons. Driven by experience to address needs at the large-scale, this presentation will highlight the occasional limitations of continental and global services at different scales (forcing data, process representation, parameter calibration), particularly when the impact of human intervention is unknown during the service setup. Examples at the regional scale (i.e. Jucar river system) will also be used to show how challenges can be partially tackled and how services can evolve through co-generation together with users. More importantly, the presentation will highlight the opportunities that can lead to service evolution both from the data providers' and the users' perspective.

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