The history of HEPEX – a community of practice in hydrologic prediction

Maria-Helena Ramos (1)

Florian Pappenberger (2), Andy Wood (3), Fredrik Wetterhall (2), Qj Wang (4), Jan Verkade (5), Ilias Pechlivanidis (6), Jutta Thielen-del Pozo (7), Roberto Buizza (2), John Schaake (8)

(1) Irstea, Antony, France (maria-helena.ramos@irstea.fr), (2) ECMWF, Shinfield Park, Reading, UK, (3) NCAR, Boulder, USA, (4) University of Melbourne, Australia, (5) Deltares, Delft, the Netherlands, (6) SMHI, Norrköping, Sweden, (7) DG JRC, Ispra, Italy, (8) Consultant, USA

www.irstea.fr

EGU 2018, Vienna, 12 Apr 2018

Today

www.hepex.org

An international initiative in hydrology

About HEPEX

What is HEPEX?

HEPEX is a community of researchers and practitioners for hydrologic ensemble prediction. It is a community initiative with many people contributing and working on specific topics related to hydrological forecasting and hydrometeorological ensemble prediction.

HEPEX (for *Hydrologic Ensemble Prediction EXperiment*) seeks to advance the science and practice of hydrologic ensemble prediction and its usage for risk-based decision making by engaging in several ongoing activities, including:

Search

View all posts about:

Select Category

Contribute with a blog post

Photo Gallery

Videos on YouTube

A brief timeline of HEPEX

2004

1st workshop organized by ECMWF, US NWS and EC

2005

2nd workshop Boulder (NOAA)

2007

3rd workshop Stresa (JRC)

2008 to 2012

Topical workshops + Sessions (EGU, AGU, IAHS)

2014

4th workshop, Beijing (BNU)

2015

5th workshop, Maryland (NOAA)

2016

6th workshop Québec (U.Laval)

2017

A brief timeline of HEPEX

From an Experiment to rich Exchanges

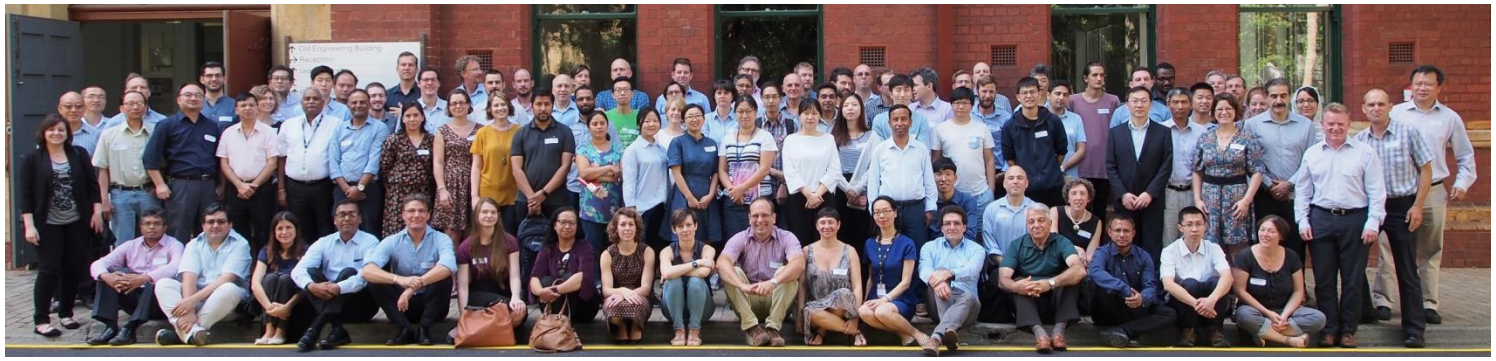
2004

1st workshop organized by ECMWF, US NWS and EC

?

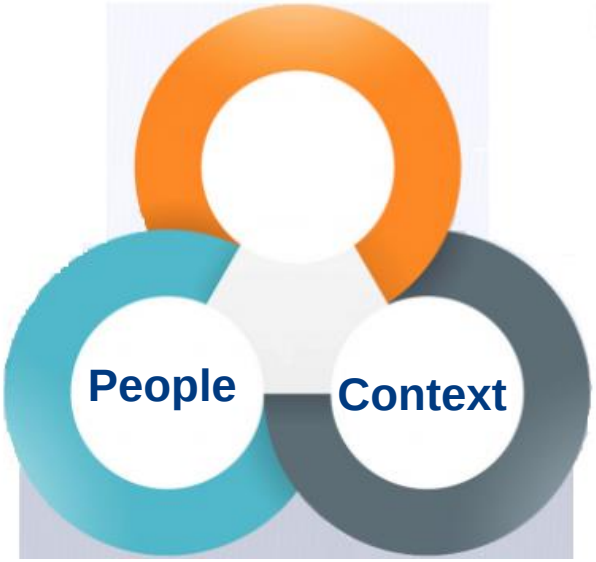
2018

7th workshop Melbourne (CSIRO, BoM, U. Melb.)



Catalyzers and pillars of success

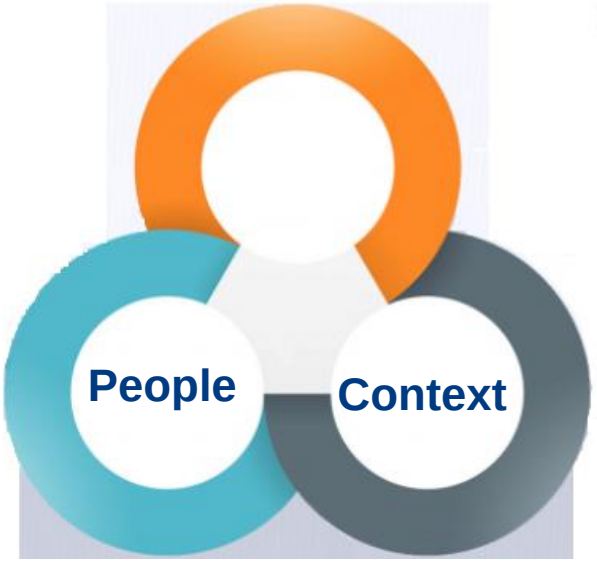
- **People:** from operational, research, agencies settings
- **Context:**
  - **Scientific:** medium-range meteo ensemble prediction since 90's



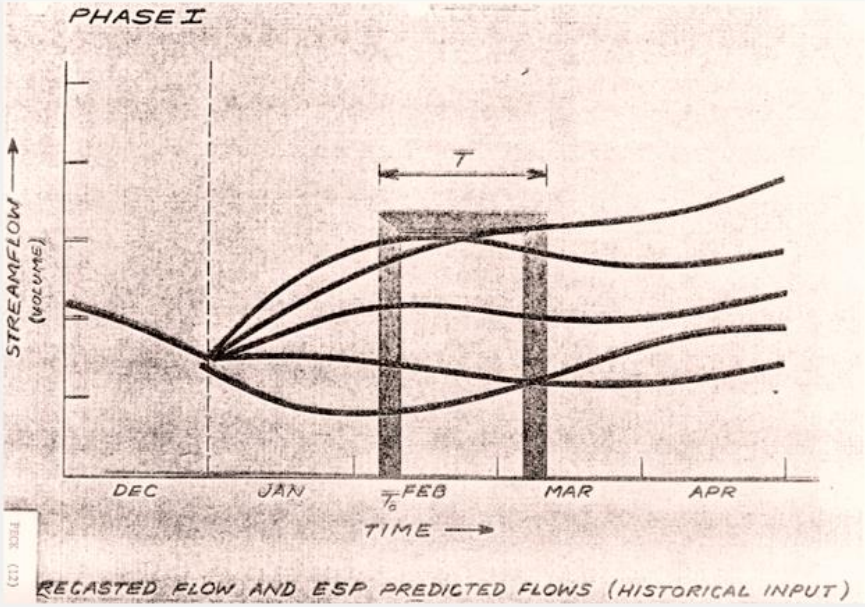
https://www.ecmwf.int/en/about/media-centre/news/2017/twenty-five-years-ensemble-forecasting

Catalyzers and pillars of success

- **People:** from operational, research, agencies settings
- **Context:**
  - **Scientific:** medium-range meteo ensemble prediction since 90's
  - **Operational:** long-range prediction based on scenarios used in the water supply / hydropower sectors for seasonal streamflow forecasts (ESP) since 80's



Catalyzers and pillars of success



An ESP illustrated by JC Schaake in 1978, from "Extended streamflow prediction techniques: description and applications during 1977", Proc. of the Climate Diagnostics Workshop. John Schaake is a co-founder of HEPEX.

There are a lot of 'Fathers of ' This and That in science and engineering. Here, perhaps, we can recognize CADWR's Joyce Peters as the 'Mother of ESP Forecasting'. That's quite a legacy.

HEPEX Blog post by A. Wood *et al*.: The origins of ESP

https://hepex.irstea.fr/tracing-the-origins-of-esp/

Catalyzers and pillars of success

- **People:** from operational, research, agencies settings
- **Context:**
  - **Scientific:** medium-range meteo ensemble prediction since 90's
  - **Operational:** long-range prediction based on scenarios used in the water supply / hydropower sectors for seasonal streamflow forecasts (ESP) since 80's
- **Goal:** specific, achievable and actionable

HEPEX Goal

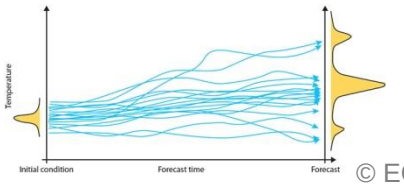
to foster the **development** and demonstrate the **added value** of hydrological ensemble predictions for **operational water resources management**, **risk** assessment and **emergency** management to **make decisions** that have important **consequences** for economy, public health and safety.

Transdisciplinary

Impact-based

An integrative view of the hydrological forecasting system, with the community acting as a facilitator to exchange ideas, data, methods and experiences

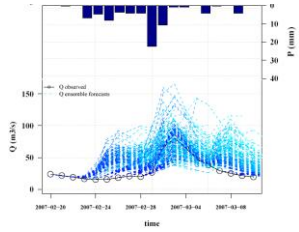
An evolving context



© ECMWF

1960-70

- Early research on atmospheric predictability and uncertainty in the **1960-70**
- Development of ensemble prediction methods for monthly to seasonal predictions in hydrology and meteorology in the US and UK in the **1980s**
- Development of the first medium-range (up to 10 days) operational weather ensemble prediction systems at ECMWF and NCEP in the **1990s**
- First runs of EFAS (EU flood forecasting) with numerical weather ensemble predictions in **2005**
- Hydro systems becoming fully operational in **2010s**


© IRSTEA

today

- *Hyper resolution modelling, Coupled Earth Systems, Global/Continental forecasting, Impact-based forecasting, Multi-sensor DA / Citizen data, Economic Value, etc.*

Achievements

- A wider **operational adoption** of probabilistic and ensemble techniques in operational services and for different applications:
  - flood forecasting
  - drought and longer range prediction

Achievements

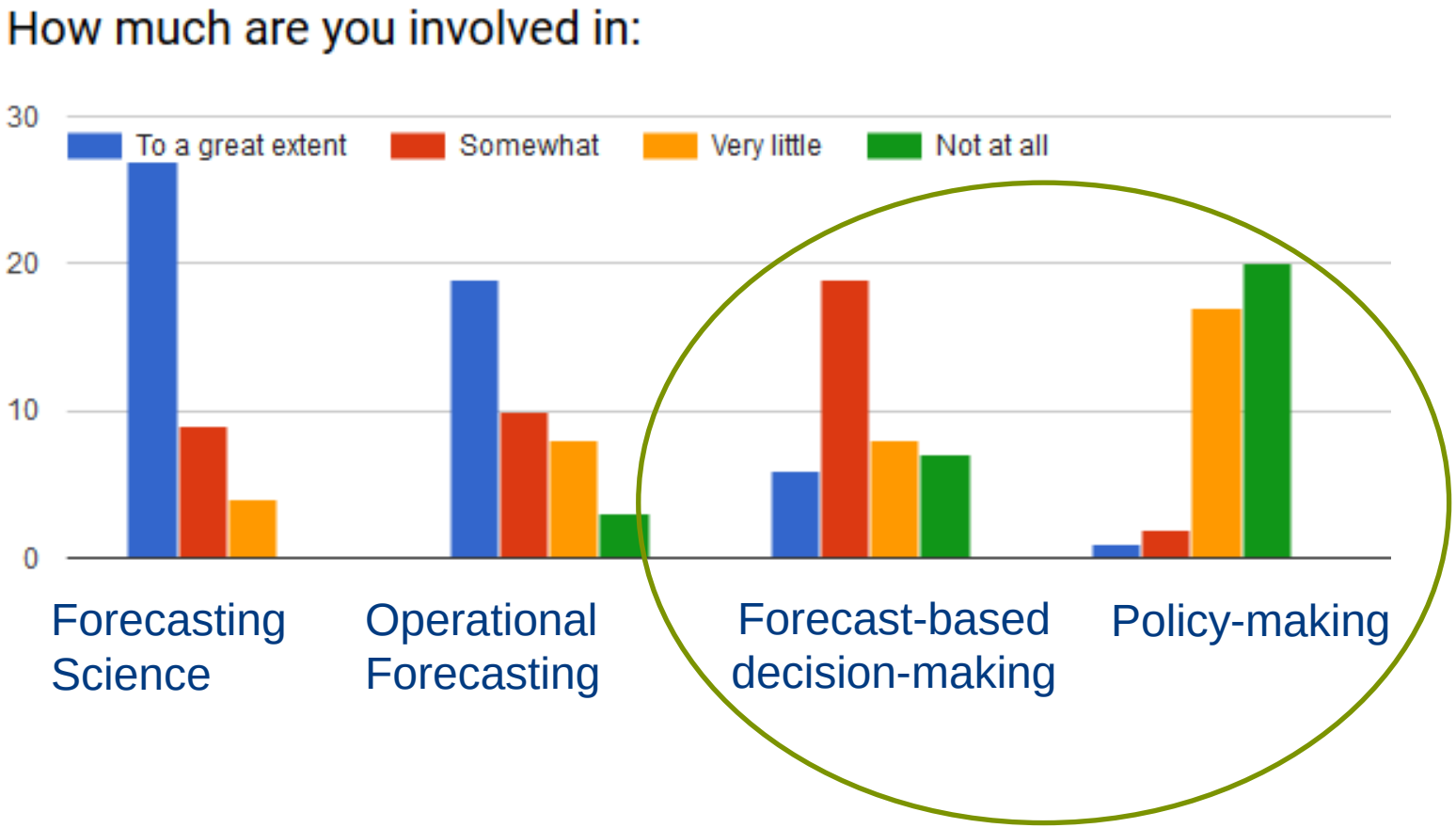
Unfunded / volunteer effort since 2004!

- Increased **awareness of the added value** of reliable probabilistic information to make decisions:
  - Societal value: preparedness, uncertainty reduction
  - Economic value: strategic and optimized management of resources

Photos: MHR

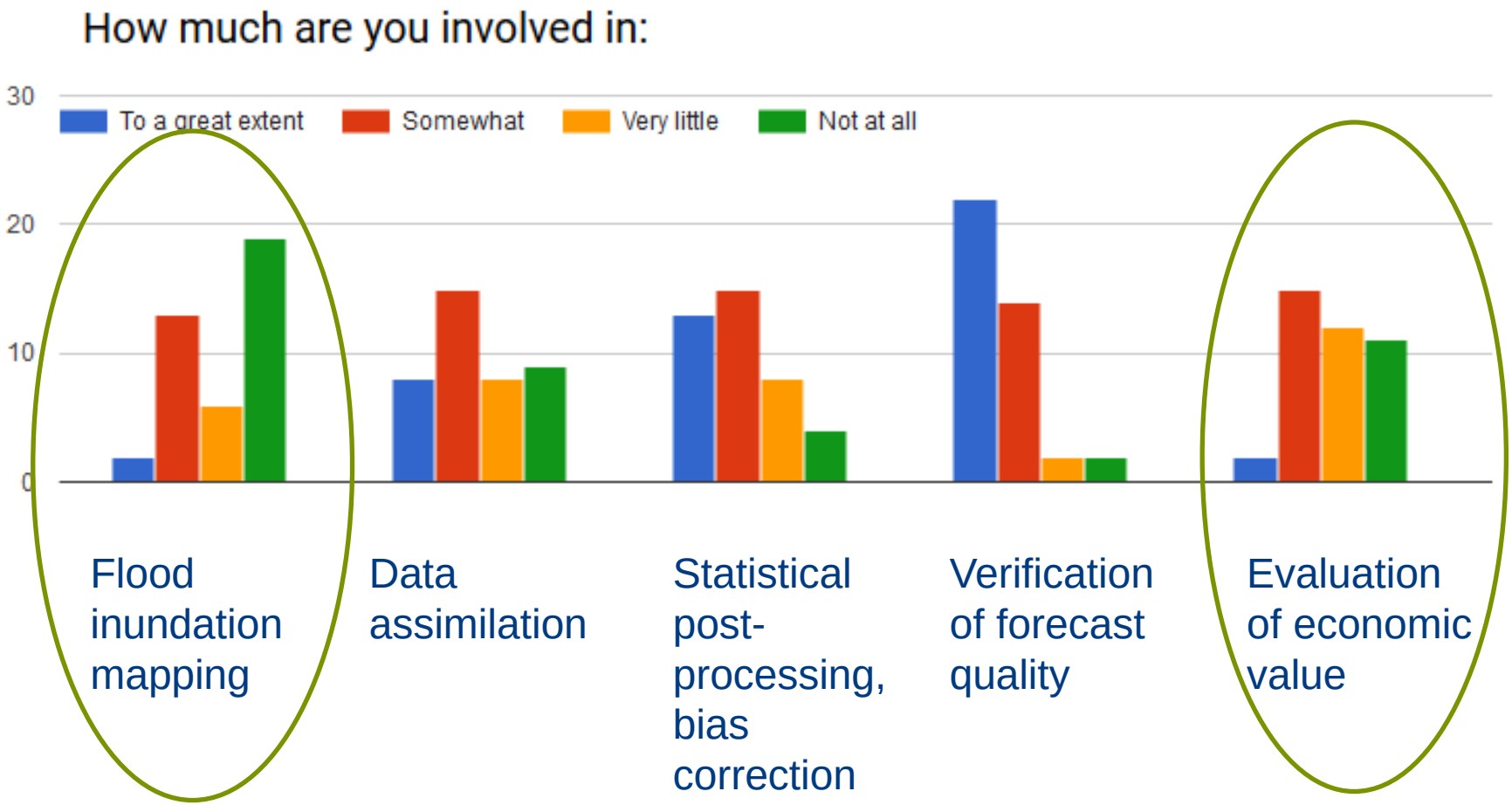
Our challenges

2018 Survey



Our challenges

2018 Survey



"The future of hydrological forecasting is...."

2018 Survey

Communication and interaction with social media

Scientific innovations that make sense for operations (not disconnected from operational constraints)

Closing the water cycle in Earth-system models

Predictions seamlessly integrated over space (from sub-catchments to continents) and lead-times (hours to seasons)

Enhancing synergies from both ensemble and high-resolution deterministic systems (complexity ⇔ uncertainty)

See also:
HEPEX Blog post by F. Wetterhall: **The challenges for HEPEX over the next decade**

Thanks to all the community

HEPEX current and past chairs:

Ilias Pechlivanidis (SMHI, Sweden), since 2018
QJ Wang (Univ. of Melbourne, Aust.), since 2015
Fredrik Wetterhall (ECMWF, UK), since 2014
Andy Wood (NCAR, USA), since 2012

Roberto Buizza (ECMWF, UK) (2004-2007)
Florian Pappenberger (ECMWF, UK) (2011-2014)
Maria-Helena Ramos (IRSTEA, France) (2014-2018)
John Schaake (Consultant, USA) (2004-2012)
Jutta Thielen (DG JRC, Italy) (2007-2014)

www.hepex.org