

DCNAustria

Disaster Competence Network Austria

Austrian

Disaster Research Days 2019

14.-15.Oktober 2019, Technische Universität Graz

2019

Unsicherheiten in hydrometeorologischen Vorhersageketten

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Übersicht

- ‚grosses‘ international koordiniertes Programm
→ MAP D-PHASE
- ‚kleine‘ kürzliche Masterarbeit
→ was ist wichtiger für die Abflussvorhersage: die Unsicherheit der meteorologischen Prognose oder diejenige der hydrologischen ?

MAP D-PHASE



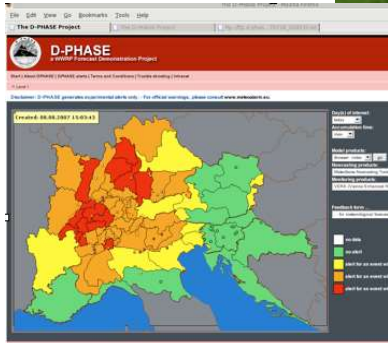
Mesoscale
Alpine
Programme

1st RDP of **WWRC**
→ Mountain Meteorology
→ dry and wet MAP



D-PHASE

2nd **FDP** of **WWRC**
→ demonstration of
achievements
→ example: flood fcst

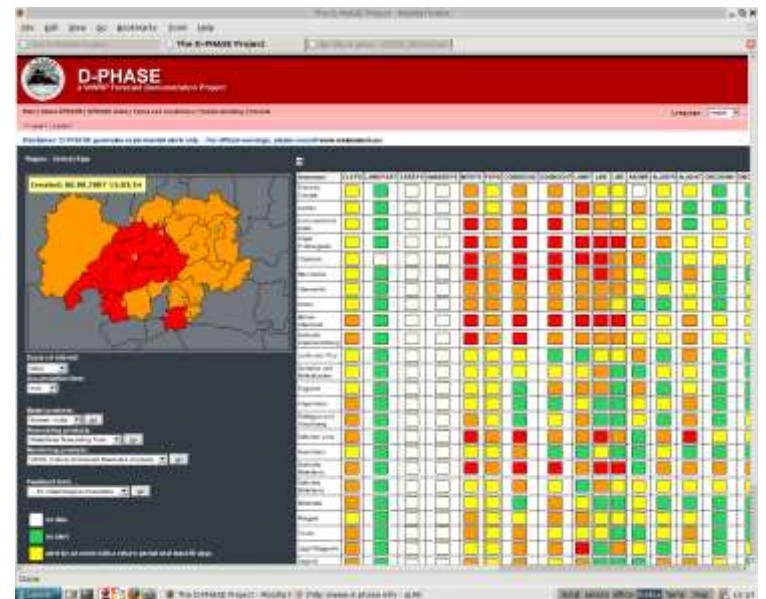
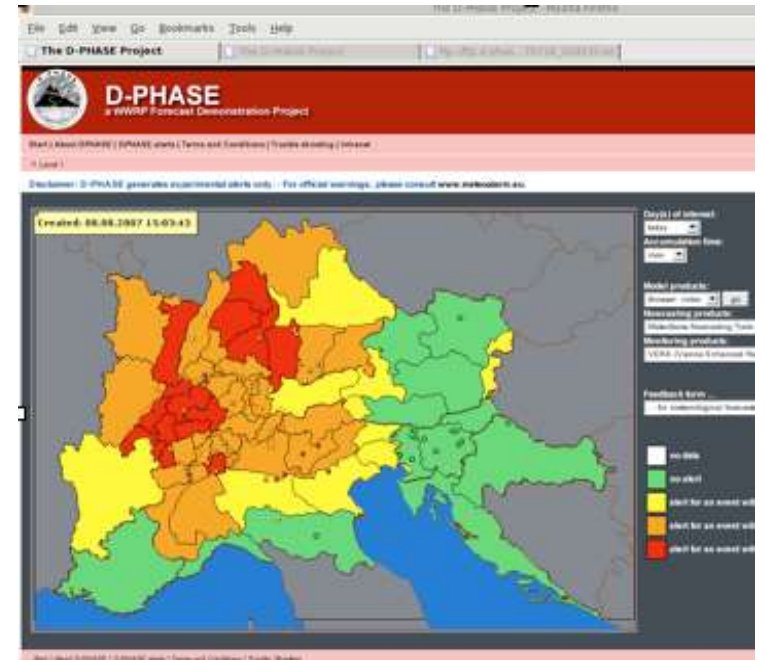


D-PHASE: *Demonstration of Probabilistic Hydrological and Atmospheric Simulation of flood Events in the Alpine region*

- 9 countries, 6 months (6-11 2007)
- 30 atmospheric models/ 7 hydrological models in over 40 catchments

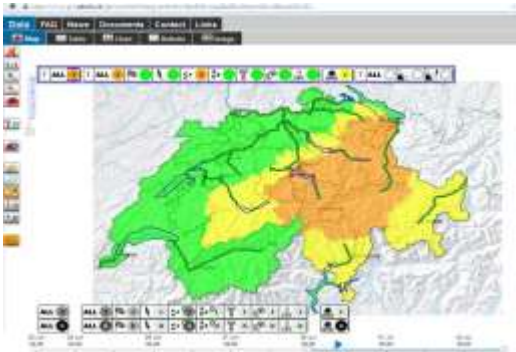
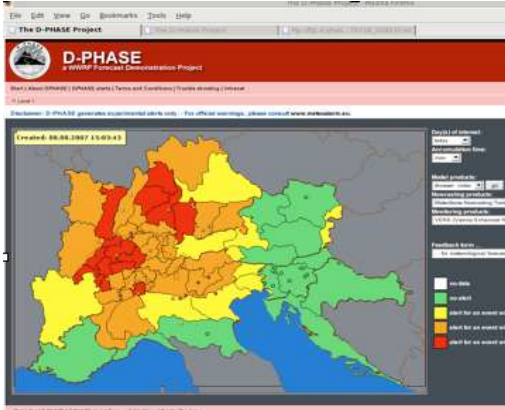
Key elements of D-PHASE

- Centralised **Visualisation Platform** (forecasts & alerts; in real-time): all get all
- Data **archiving** (→ research / analysis);
- **Nowcasting** tools;
- Systematic integration of **end users**;
- **Evaluation**, objective and subjective.

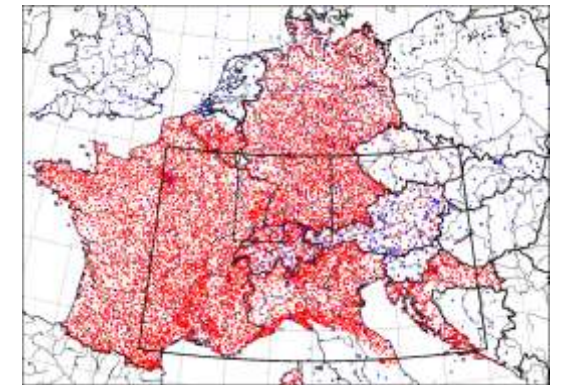


D-PHASE Achievements

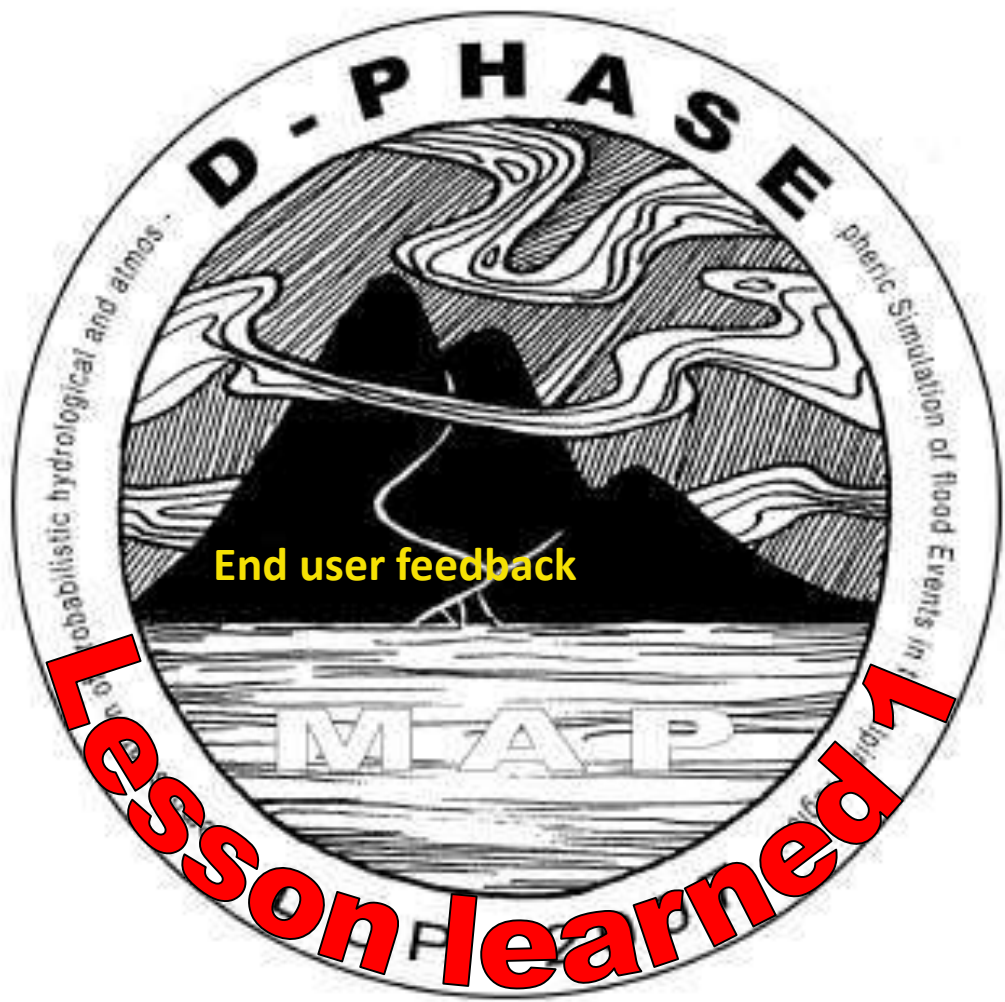
- Participation of **users** (45 end user institutions)
→ *incl: subjective* evaluation
- Scientific results
→ *incl: objective* evaluation
- Unprecedented **data set**
→ model intercomparison / validation
- Outreach:
 - D-PHASE as role model for Swiss **natural hazards platform (GIN)**
 - MesoVICT:
new WWRP project on mesoscale verification
 - Many operational hydrological services started to use model-based input (I, CH, D)



Rotach et al. 2009, **BAMS**

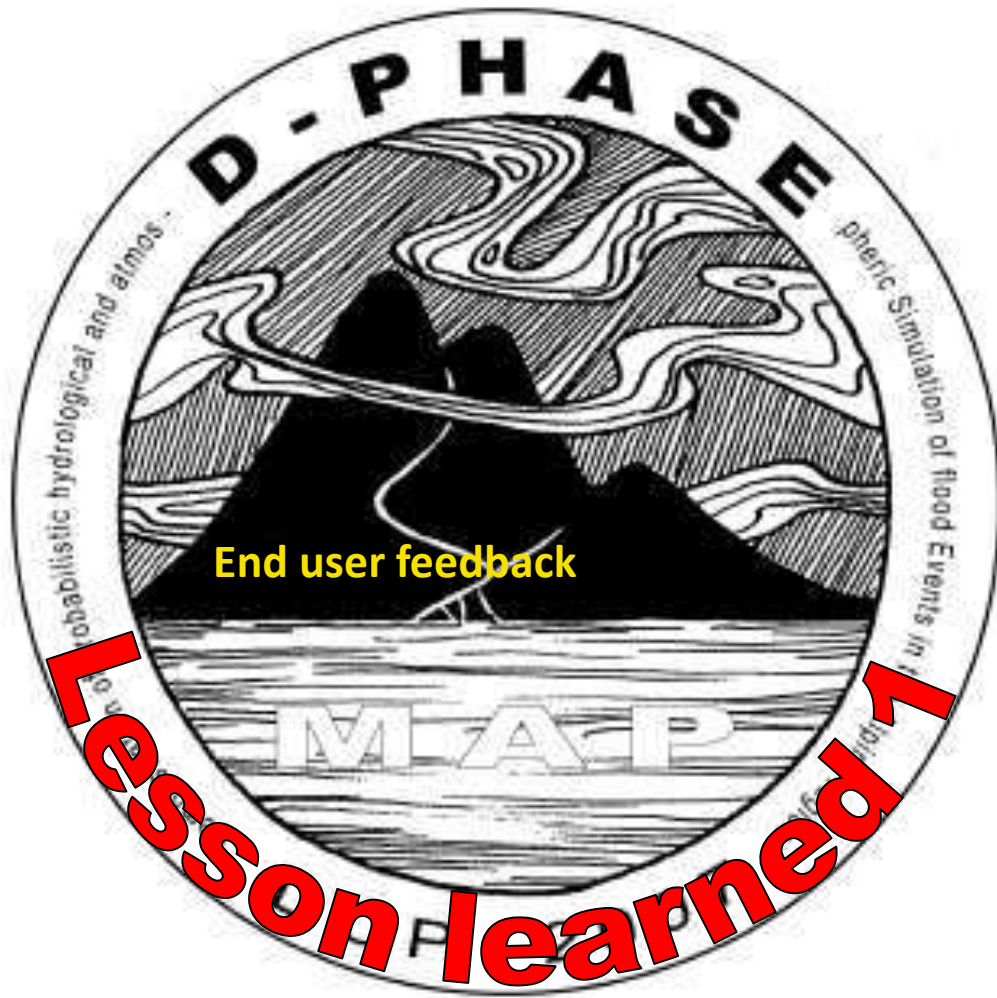


JDC = Joint D-PHASE/COPS
Verification data set
(Dorninger et al. 2009)



End user feedback

Lesson learned 1

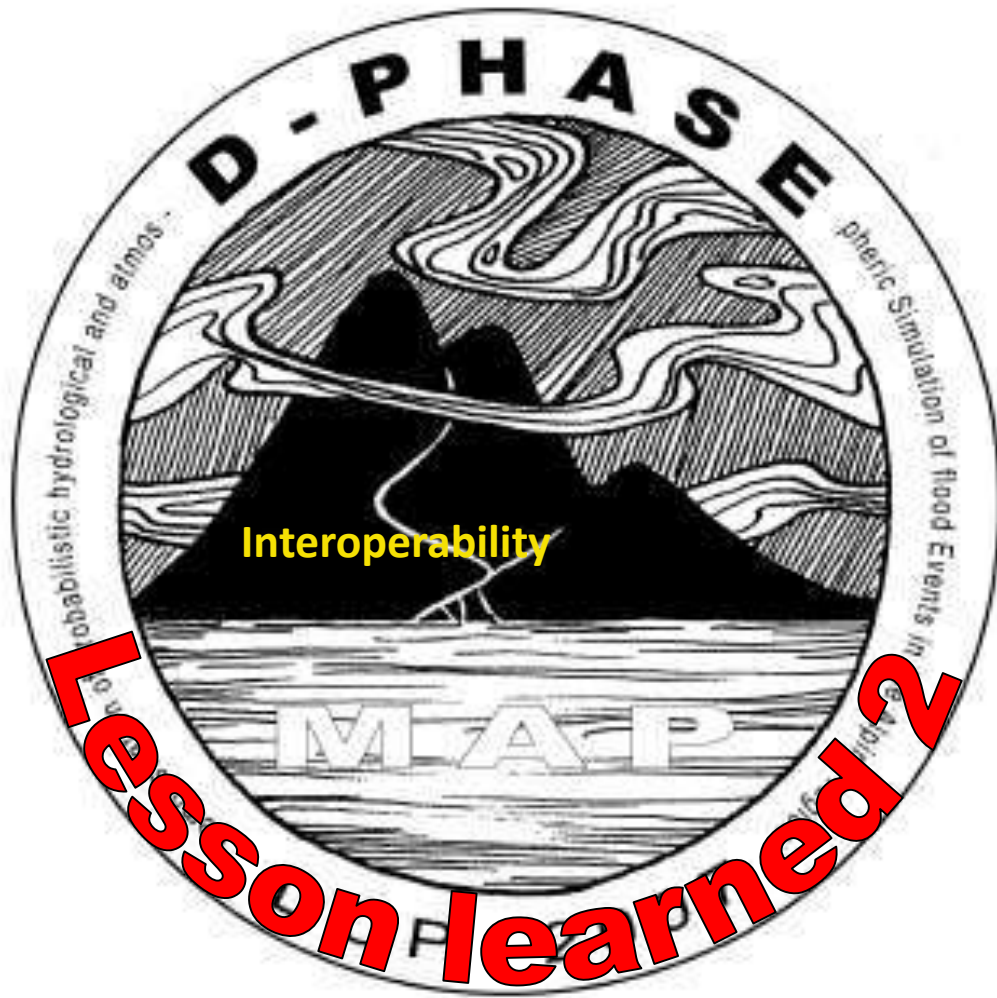


- take end users early on board
- resolution needs to further increase (and will)
- EPS's need careful support (for interpretation)
- 'Ensemble thinking' for air pollution modelling, heat wave warnings, health impact (e.g., pollen), ...

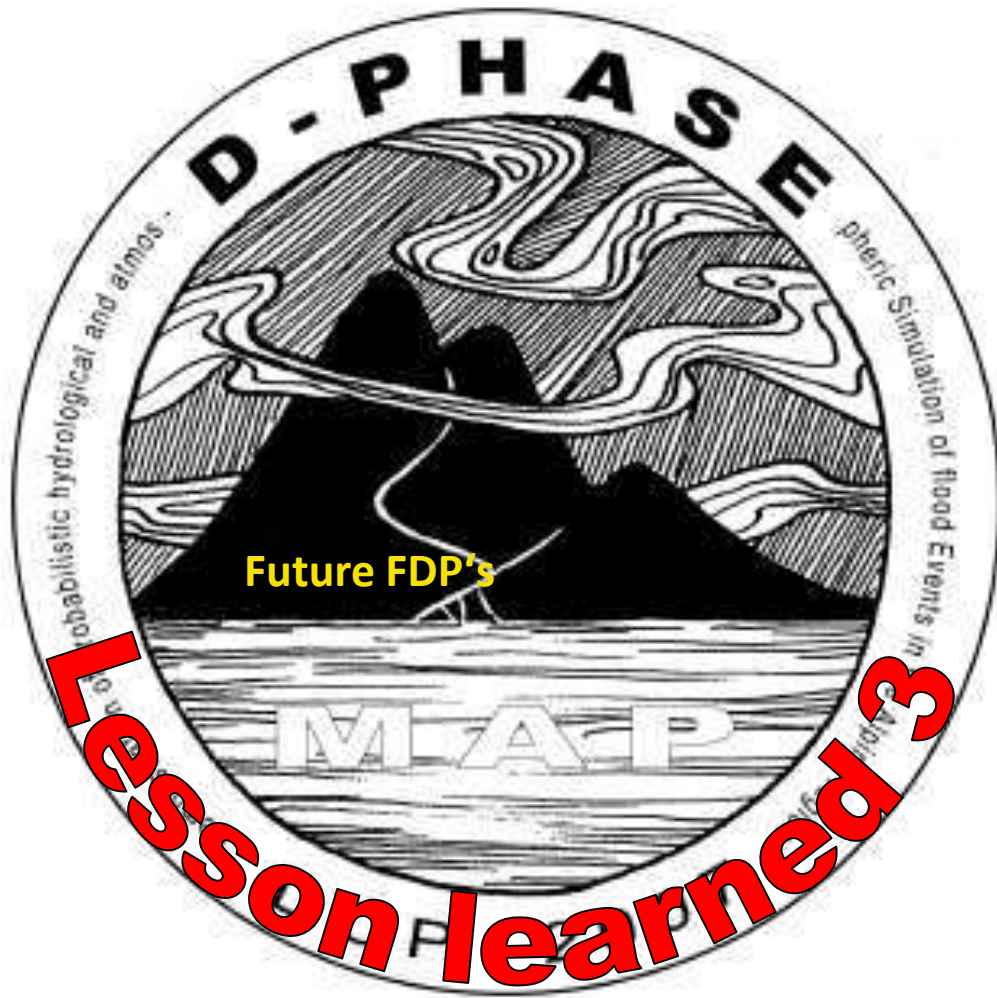


Interoperability

Lesson learned 2



- International agreements needed (procedures, thresholds)
- Multi-model availability by far exceeds multi-model use...
- In the transformation to operations the commercial value of meteorological data is a barrier



- Research Task Team:
'increase involvement of users and NMHSs from developing countries in future FDP's...'
- Participation is not for free
→ but commitment pays back!

Uncertainty – flash flood modelling



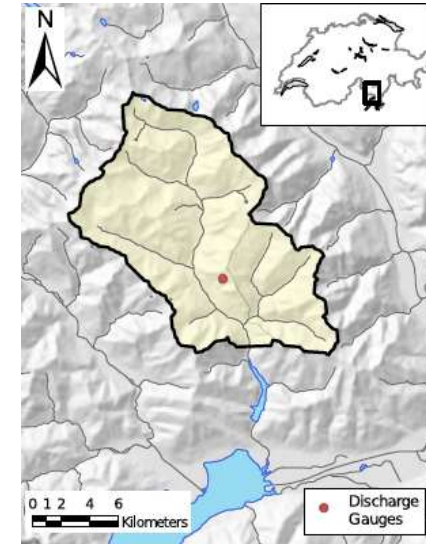
Verzasca Valley
7-8 August 1978

Picture from Antonio Giordani

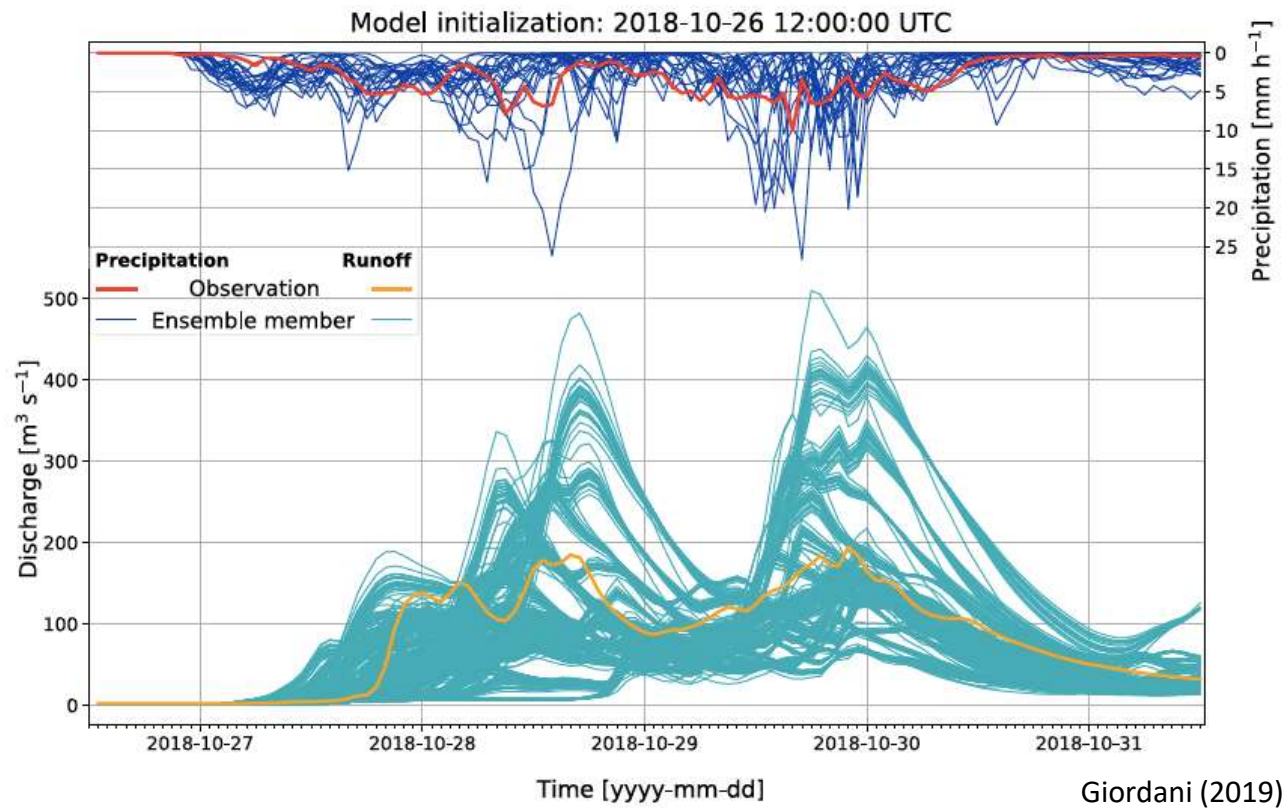
Hydrological Ensemble forecast

*(based on Antonio Giordani (2019), MSc Thesis, UIBK,
in collaboration with Massimiliano Zappa, WSL)*

- Small catchment in southern Switzerland:
Verzasca (186 km²)
- Atmospheric EPS: COSMO-E (Klasa et al. 2018)
 - 2.2 km horizontal grid spacing
 - 21 members (clustered from IFS EPS)
- Hydrological model: PREVAH (Viviroli et al 2009)
 - semi-distributed
 - 25 physical parameter combinations
- A total of 21x25=**525** simulations per initiation time
- Example: October 26-31, 2018

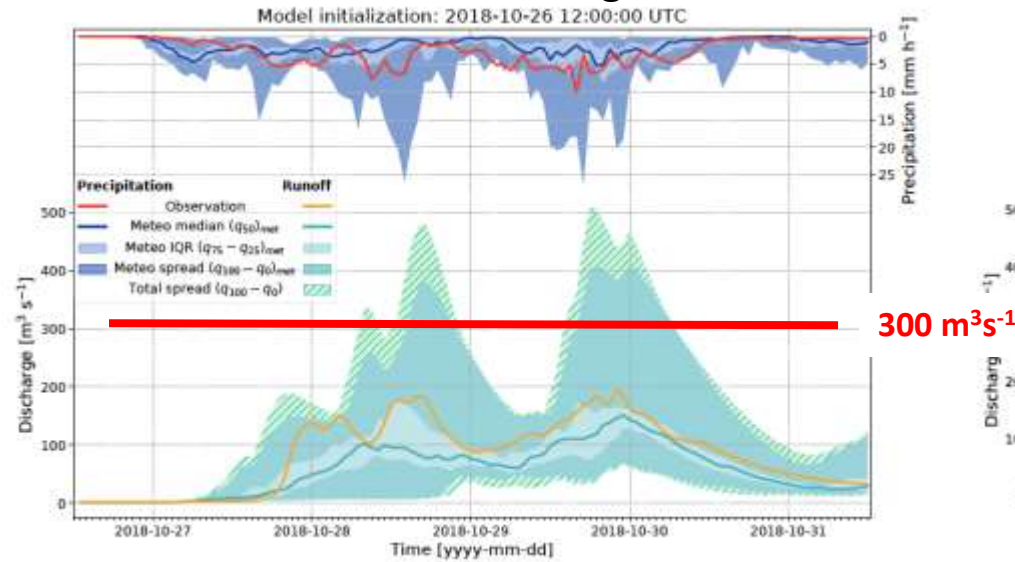


Hydrological Ensemble forecast

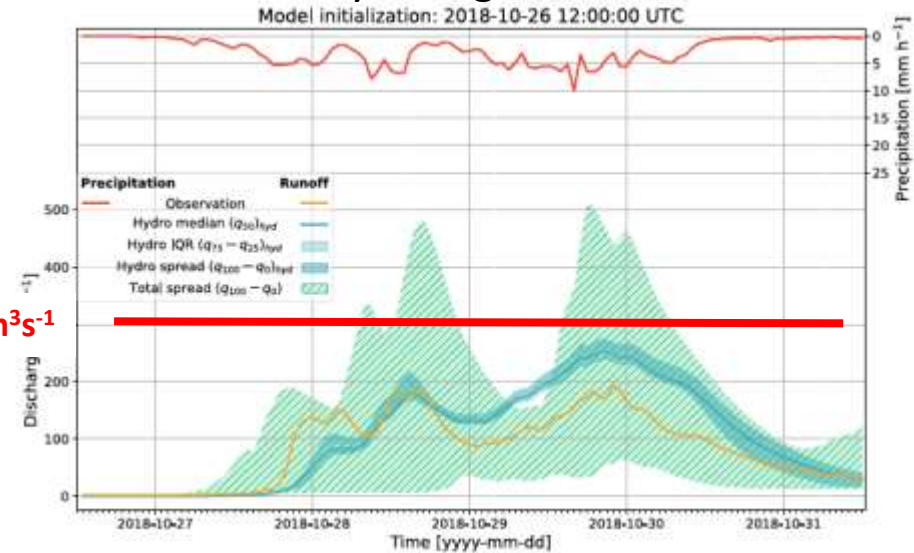


Hydrological Ensemble forecast

Uncertainty from meteorological ensemble



Uncertainty from hydrological ensemble



Giordani (2019)

Hydrological Ensemble forecast

- dominant contribution to uncertainty: meteorological input
- Example for small catchment → quite general result
- Impact-oriented modelling (like hydrology)
 - needs realistic meteorological input
- In many ways related to exchange processes in the MoBL
 - convection & CI
 - moisture abundance
 - dynamic flow modification
- TEAMx
 - Multi-Scale Transport and Exchange Processes in the Atmosphere over Mountains
- Similar for many other types of impact-oriented forecast models



Thank you for your attention!

Gegründet im J:
wichtigste Forsc

Mathias W. Rotach (ACINN)

ie größte und
www.uibk.ac.at.

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