Annual meeting
**Introduction**

Bruno Wilhelm

**New structure and key actions**

- **WP1** Collecting, storing and sharing paleoflood data  
  Michael Kahle

- **WP2** Integrating and analysing paleoflood data  
  Lothar Schulte

- **WP3** Communicating and disseminating  
  Vic. Baker, Juan Ballesteros

**Future trans-WP projects**

- Special Issue (Global and Planetary Change)  
  Lothar Schulte et al.

**Strategy for the coming year(s)**

- Proposal preparation for the second FWG phase  
  Bruno Wilhelm
Floods Working Group

⇒ Promote collaborations between all those communities
⇒ Foster ‘in-depth’ analysis of results and synthesis on past floods

‘Past flood’ researchers

Leaders
Bruno Wilhelm, Juan Antonio Ballesteros Cánova

Scientific committee
Scott St. George, Markus Stoffel, Rhawn Denniston, Blas L. Valero Garcés, Achim Brauer, Gerardo Benito, Mark G. Macklin, Lothar Schulte, Neil Macdonald, Manfred Mudelsee,

‘Analysis’ researchers
Workshop

‘Cross community workshop on past flood variability’

Grenoble, France, 27-30 June 2016

➢ All workshop material available on the PAGES website

Main objectives identified:

1. Better know each other (different communities)

2. Identify, collect, store and share existing palaeoflood records

3. Actions to communicate on palaeoflood records to a broad audience

4. Identify and communicate on WG guidelines (goals and actions)
1. Better know each other

- Co-sponsoring of 6 sessions in conferences (EGU, AGU, GSA, OSM + proposal for INQUA 2019)

- Project ‘Who is who’
  M. Alhborn -> V. Pellerito

100 detailed member profiles

http://pastglobalchanges.org/ini/wg/floods/meetings
http://pastglobalchanges.org/ini/wg/floods/people
2. Identify, collect, store & share palaeoflood records

- Building of database structure
- Metadata collection (ca. 400 records)

http://pastglobalchanges.org/ini/wg/floods/wp1/data
3. Actions to communicate on palaeoflood records to a broad audience

- **Participation to workshops** (Future Earth E3S, Warmer worlds)

- **Publications:**
  - *Using Archives of Past Floods to Estimate Future Flood Hazards*
    Swierczynski et al. (2017) in *Eos* 98
  
  - *Interpreting historical, botanical, and geological evidence to aid preparations for future floods*
    Wilhelm & 22 authors (submitted) in WIRES Water
  
  - *Recent advances in paleoflood hydrology: from new archives to data compilation and analysis*
    Wilhelm & 8 authors (submitted) invited for Water Security
4. Identify and communicate on WG guidelines

White Paper (November 2017)

Written by 13 authors
Reviewed by members

Aims to structure
the working group activities,
actions and deliverables

http://pastglobalchanges.org/download/docs/working_groups/floods/fwg-white-paper-Nov-17.pdf
Introduction

Bruno Wilhelm

New structure and key actions

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Future trans-WP projects

Special Issue (Global and Planetary Change)  
Lothar Schulte et al.

Strategy for the coming year(s)

Proposal preparation for the second FWG phase  
Bruno Wilhelm
WP1

‘Collecting, storing and sharing paleoflood data’

Michael Kahle
A PAGES Floods WG core project

WP1: Collecting, storing and sharing paleoflood data

Michael Kahle ¹, Rüdiger Glaser ¹, Pierre Francus ², Pages Flood WG ³

¹: Physical Geography, University of Freiburg
²: Institut National de la Recherche Scientifique
³: http://www.pages-igbp.org/ini/wg/floods/people
Goal

- From the Floods WG page:
  - “Compile published data sets on floods for open-access archiving in order to facilitate the visibility of existing data and their inter-comparison”

- Necessary: Common Data Structure across Multiple Proxy Types

- If possible, use Sensor-Archive-Observation concept
  - (Evans et al 2013: [https://doi.org/10.1016/j.quascirev.2013.05.024](https://doi.org/10.1016/j.quascirev.2013.05.024))

- [http://pastglobalchanges.org/ini/wg/floods/wp1](http://pastglobalchanges.org/ini/wg/floods/wp1)
Floods Metadatabase

Everybody is welcome to contribute to the data pool:

- More than 400 historical and paleoflood records worldwide.
- Different Proxy Types

![Diagram showing various archives, databases, and analyses related to flood data](image)
Minimal Data Structure

- Source
- Location
- Time
- Classification
- Reference

Clusters

Figure: Michael Kahle 2017
Common Data Structure

Clusters

- Source
- Location
- Time
- Classification
- Reference

Figure: Michael Kahle 2017
Data Format: LiPD

Mixture of json and csv files in zip

Advantage
- Covers: Sediments, Speleothems, Tree rings, Measurements on fixed points, …
- Well established file format with tools available
- Fine structured

BUT - Enhancements needed for
- Historical documents

https://doi.org/10.5194/cp-12-1093-2016
N. P. McKay and J. Emile-Geay
Single archive approach (by Evans et al. 2013):

Environment → Sensor → Archive → Observation → Conclusion

Flood → Tree → Wood → Ring Density → Flood Magnit.

Temperature

Multiple archive approach:

Precipitation → Cave → Stalagmite → Isotope ratios → Flood Magnit.

Flood

Temperature

Nutrients → Tree → Wood → Ring width → Temperature
Proxy/Sensor in LiPD

Trees
- Ring Width
- Ring Density
- Isotopes
- ...

Speleothems
- Layer Thickness
- Oxygen Isotopes
- Carbon Isotopes
- ...

Sediments
- Oxygen
- Isotopes
- Forams
- Diatoms
- Pollen
- Charcoal
- ...

Historical Documents
- Source
- Quote
- Language
- Author
- ...

Chronology
- Uranium-Thorium
- Carbon 14
- Julian Calendar
- Layer Counting
- ...

Model
- ...

Floods
- Magnitude
- Discharge
- Water Level
- Flood History
- ...

Temperatures
- Air Temp.
- Sea Water Temp.
- ...

Precipitation
- Long Term
- Short Term
- Amount
-...

Phenology
- Amount
- Harvest
- Quality
- Harvest Blooming
- Leave
- Fall
- ...

INTCAL8
- INTCAL13
- ...

A PAGES Floods WG core project: Collaborative Flood Database for Multiple Archive Types
Definition of LiPD Flood Format

Enhance LiPD format to store inferred flood data in a common way
(http://wiki.linked.earth/Category:Floods_Working_Group)

Enhance LiPD format to store observations from historical document archives
(http://wiki.linked.earth/Category:Historical_Documents_Working_Group)

All FWG members are invited to join the WG on Linked Earth and add feedback and/or comments there
(http://wiki.linked.earth/Category:Floods_Working_Group)
Next steps

Compile short example files (5-10 events) for each proxy type and provide it to the community

- **Your help is needed**: If you send me some example data, I can convert it to LiPD-format and upload it to the LiPD Wiki. Email: michael.kahle@geographie.uni-freiburg.de

- Later, LiPD tools will be available to convert/enter your data by yourself.
WP2

‘Integrating and analysing paleoflood data’

Lothar Schulte
WP2: Integrating and analyzing paleoflood data

**Coordinators:** Lothar Schulte*, Manfred Mudelsee, Scott St George and Juan Carlos Peña

*schulte@ub.edu

The integrated study of “real-world data” on past floods derived from historical and natural archives (field data) is an excellent opportunity to document the low-frequency, large-magnitude flood events which have occurred under climate change and/or environmental conditions.

**Actions:**
i) Development of methodological approaches to integrate paleoflood datasets through regional pilot studies in different environments,

ii) Assessment of the contribution and improvements of flood frequency analysis through the use of multi-archive analysis,

iii) Development of methodological and statistical approaches to analyze paleoclimate models in relation to the flood variability,

iv) Investigation of changes in external forcing and atmospheric variability of the flood periods by paleoclimate modeling.

**Work flow**

2016-2018 Pilot project Bernese Alps (Advances presented at OSM 2017 and EGU 2018)

2017 Session on Multiproxy paleoflood reconstruction at PAGES OSM Zaragoza

2017-2018 Special Issue GLOPLACHA: Multi-proxy and multi-archive integration of paleofloods

2018/19 New regional projects

2018 Collaboration the Swiss initiative "Climate Change and its consequences on Hydrology in Switzerland Hydro-CH2018“
WP2: Integrating and analyzing paleoflood data

**Coordinators:** Lothar Schulte*, Manfred Mudelsee, Scott St George and Juan Carlos Peña

*schulte@ub.edu

**Strategy, activities, actions**

2016-2018 Pilot project Bernese Alps
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**2018/19 New regional projects**

**2018 Collaboration with the Swiss initiative Hydro-CH2018“**

**2019 INQUA Session**

**2020 Collaboration with the Paleoflood conference (?)**
WP2: Integrating and analyzing paleoflood data

Study area: Catchments in the alpine Bernese Aare

Location and type of archives

Problem definition: How to integrate multiproxy datasets?
- Catchments size and geographical location?
- Length of series and resolution?
- Flood periods or single episodes?
- Which proxies are suitable and robust flood signals?
- Which series are comparable?
- Similar or different sensitivity of proxies according to the regional settings, environment and processes.
- At which time scale multiproxy paleo-flood integration makes sense?
- Which series allow to reconstruct paleo-discharges?
Approach and results depend on:
- data selection/discrimination
- Thresholds
- Data structure and filters
- Aims (what do we aim to focus on?)
WP2: Integrating and analyzing paleoflood data

**Coordinators:** Lothar Schulte*, Manfred Mudelsee, Scott St George and Juan Carlos Peña

*schulte@ub.edu

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**2016-2018 Pilot project Bernese Alps**
(Advances presented at OSM 2017 and EGU 2018)

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Multi-proxy and multi-archive integration of paleofloods

**2018/19 New regional projects**

**2018 Collaboration with the Swiss initiative Hydro-CH2018”**

**2019 INQUA Session**

**2020 Collaboration with the Paleoflood conference (?)**
Collaboration with other initiatives:

Hydro-CH2018
"Climate Change and its consequences on Hydrology in Switzerland Hydro-CH2018"

Past, current, and future changes in flood magnitude and frequency in Switzerland

Hydro-CH2018 synthesis report chapters:
„Future Changes in Hydrology“
Commissioned by the Federal Office for the Environment (FOEN)

Prof. Peter Molnar (ETH-IFU-Zurich)
Dr. Virginia Ruiz-Villanueva (ISE-UNIGE)

Past, current, and future changes in flood magnitude and frequency in Switzerland

Time line and next steps

Table of Contents
1. Introduction
2. Palaeofloods: changes in ancient floods
3. Historical floods: changes in floods since the 16th Century
4. Recent floods: changes in floods since the 20th Century
5. Understanding flood changes
6. Climate change effects on floods
7. Synthesis and Open Questions
Palaeohydrology and Fluvial Archives - hydrological extreme and critical events (HEX)

Jurgen Herget (herget@greg.uni-bonn.de)
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Alessandro Fontana (alessandro.fontana@unipd.it)
Dept. of Geoscience, Padova University, Italy

Becky Briant (b.briant@bbk.ac.uk)
Dept. of Geography, Birkbeck University of London, United Kingdom

Lothar Schulte, Spain (schulte@ub.edu)
Dept. of Geography, University of Barcelona, Spain

Palaeohydrology addresses all components of the water cycle (rivers, lakes, groundwater, etc.), although in practice most of the previous research has focused on river channels and discharges, especially geomorphological and stratigraphic indicators of previous floods. Fluvial archives and landforms like river terraces and stacked fluvial sediments, alluvial fans, or lacustrine successions, tree-rings, speleothems and historical documents provide information of previous environmental conditions, including specific events and episodes. A hydrological event is defined as having a magnitude higher (flood) or lower (drought) than a critical threshold, including extreme events of significantly differing magnitudes. Events may be unique or clustered in time and can significantly mark the landscape. Eventually, a succession of extreme events may lead to alluvial terrace formation in addition to the traces of a distinct event itself, which can be well illustrated by outburst floods.

In the session, a multi-disciplinary approach will be applied by bringing together scientists from different disciplines for idea exchanges about:

- Extreme hydrological events addressing the spatial and temporal patterns of extremes in different world regions using multi-archives and multidisciplinary perspectives.
- Collection and presentation of results from research on palaeohydrology and fluvial archives that are relevant for understanding and managing global environmental change.
- Human perception, resilience and response. For Holocene and historical events, consequences such as abandonment or shifting of settlements are important to assess the impact of floods or droughts and their magnitude and duration also recently and in the near future.
- New methods and techniques for palaeohydrological reconstruction, integration of data from different archives in a multidisciplinary database and Quaternary river evolution, such as remote sensing, geochronology, modelling, numerical simulation, geochemical and isotopic analysis, which are constantly developed and further improved.

The session is organised in cooperation of the groups of Global Continental Palaeohydrology GLOCOPH, Fluvial Archives Group FLAG, INQUA International Focus Group HEX of the same title like the session has and the PAGES Flood Working Group FWG.

It is the aim of the organisers of the session to publish the contributions in a special issue of Quaternary International.
6th International Palaeoflood Conference
New Zealand 2020
27 Jan – 7 Feb*

- 2 day Pre-conference fieldtrip (27-28 Jan): Central North Island volcanic breakout floods
- 3 day Conference (29-31 Jan)
  - papers & posters hosted by Massey University, Palmerston North
  - Fieldtrip: Manawatu and Whanganui flood histories
- 6-7 day Post-conference fieldtrip (1-7 Feb): South Island alpine floods and flood histories (glaciers, alluvial fans, lakes, gorges, braidplains)

Pre-conference fieldtrip to start in Auckland
Post-conference fieldtrip to finish in Christchurch

*All Dates are provisional

Expressions of interest: Prof. Ian Fuller, Massey University
i.c.fuller@massey.ac.nz
WP3

‘Communicating and disseminating paleoflood science’

Juan Ballesteros
Strategy, activities, actions

Work Package 3: Communicating and disseminating paleoflood science

Paleoflood community

Engineering & Classical hydro.

Stakeholders

Don’t miss engage with classical hydrologist, point the focus on stakeholders

Specific Actions:

• Meetings with Stakeholders in Brussels (Com. EoU) 2016, 2018
• Analyses study cases showing add value of paleofloods in a compressive way (in collaboration with St. George)
• Design Scientific Brief
• Explore the possibility of a COST-action H2020
Annual meeting - Program

Introduction

Bruno Wilhelm

New structure and key actions

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WP3 Communicating and disseminating Vic. Baker, Juan Ballesteros

Future trans-WP projects

Special Issue (Global and Planetary Change) Lothar Schulte

Strategy for the coming year(s)

Proposal preparation for the second FWG phase Bruno Wilhelm
Special Issue

Pluridisciplinary analysis and multi-archive reconstruction of paleofloods

Guest-editors: Lothar Schulte, Daniel Schillereff and Juan I. Santisteban

- Papers:
  4. Evin, G.; Wilhelm, B.; Jenny, J.P.; Favre, A.C.: Bayesian MCMC flood frequency analysis integrating paleoflood data
  9. Perla, J.C.; Schulte, L.: A paleoclimate model of the atmospheric variability related to flood frequencies in the Hasli-Aare river, Swiss Alps from 1300 to 2010 AD.
  16. St. George, S.: The societal value of historical and paleoflood research in Manitoba, Canada. (3000-word Viewpoint article)
Timelines

The average timeline for Special Issue publication based on historic data for article submission/review and issue production and related titles are provided below:

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<td>Paper submission</td>
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<td>Reviewing process and revision submission</td>
<td>6-9 months</td>
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<tr>
<td>Production process (online publication)</td>
<td>2-3 months</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11-18 months</strong></td>
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Please set the timeline for your Special Issue based on the above data and your experiences:

- First submission date (*Please enter the date the first submission is expected*):
  15th February 2018

- The date by which all papers should be submitted to the Guest Editors for review and the EVISE® submission site will be closed (*First Submission date + Time for Paper submission as listed above*):
  Extended to 30th June 2018

  31st May 2018

- The date by which all manuscripts should be fully reviewed and final decisions made on all manuscripts; and those failed to meet the deadline may be excluded (*Submission Deadline + Time for Reviewing process and revision submission as listed above*):
  15th October 2018

- The date the Special Issue is expected to be published (*Acceptance Deadline + Time for production process*):
  15th December 2018
Proposal preparation for the second FWG phase

Juan Ballesteros & Bruno Wilhelm

- To be submitted in October 2018
- Content based on the *White Paper*
- Possible changes in the “leading group”
- How involving motivated people more?
- Any feedback, recommendations?
- Interest to contribute, propose, coordinate a project?