

I TECHNICAL COMMITTEES di ICOLD

Il contributo italiano

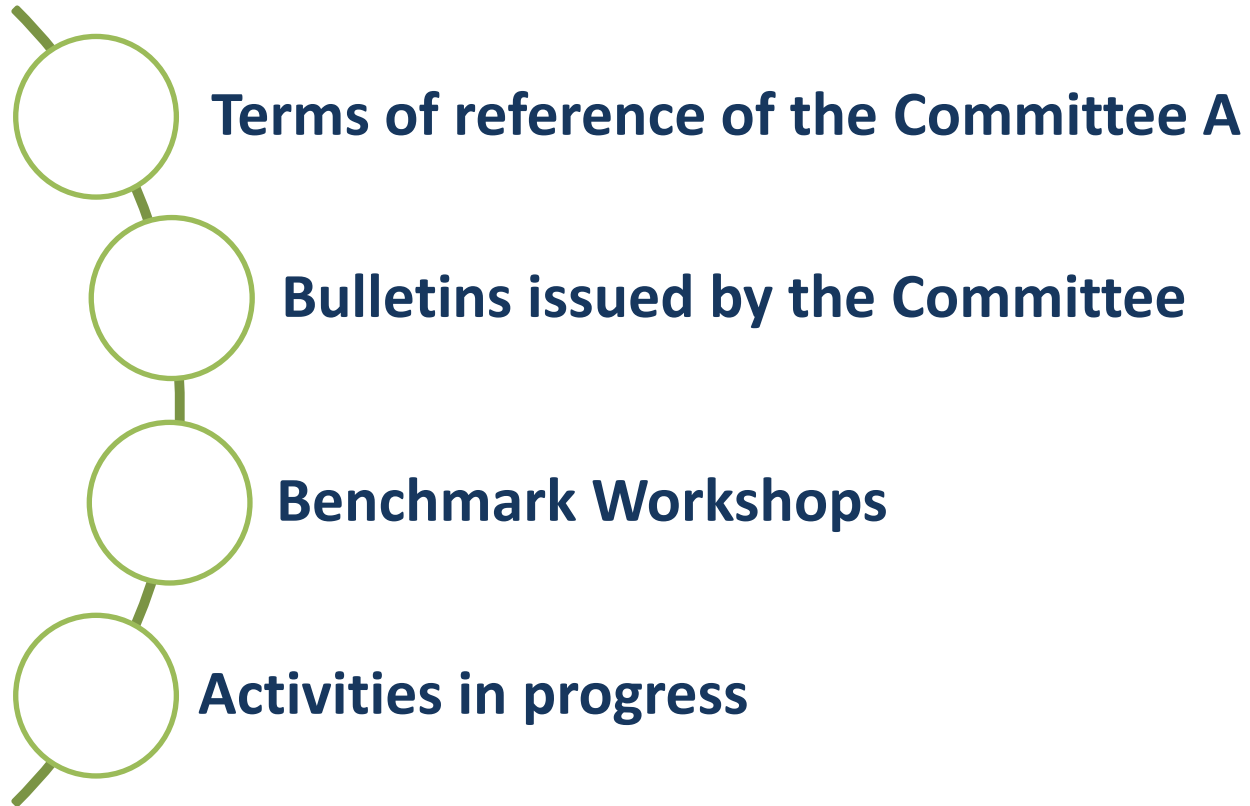


Technical Committee A **«Computational Aspects of Analysis and Design of Dams»**

Guido Mazzà - Chairman



CONTENT





Terms of Reference of the Committee A



Numerical modelling represents nowadays a **key tool for dam engineers** in design making process as well as in the safety reassessment and rehabilitation of existing dams.

However, the application of **numerical models in the dam engineering practice** suffered for many years a **gap** between specialists of numerical modelling and dam engineers.

The **ICOLD Committee A “Computational Aspects of Analysis and Design of Dams”**, appointed in **1988**, has strongly contributed to **create a bridge between specialists of numerical modelling and dam engineers** and to the diffusion of knowledge in the field of numerical modelling.



Terms of Reference of the Committee A



- 1. Prepare recommendations on the role and capabilities of numerical models to deal with problems relevant to dams throughout their life cycle (design, construction, operation, maintenance, rehabilitation, etc.).**
2. Organize Benchmark Workshops to compare numerical models between one another and/or with reference solution, including the dissemination and publication of results.
3. Prepare recommendations on how computational methods can be used to estimate risks and account for uncertainties inherent to dams.
4. Review and consolidate the "state of the art" on new probabilistic approaches to traditionally deterministic inputs and outcomes of numerical modeling.
5. Propose lines of research aiming at establishing valid numerical models for the solution of dam problems presently not amenable to reliable numerical treatment.



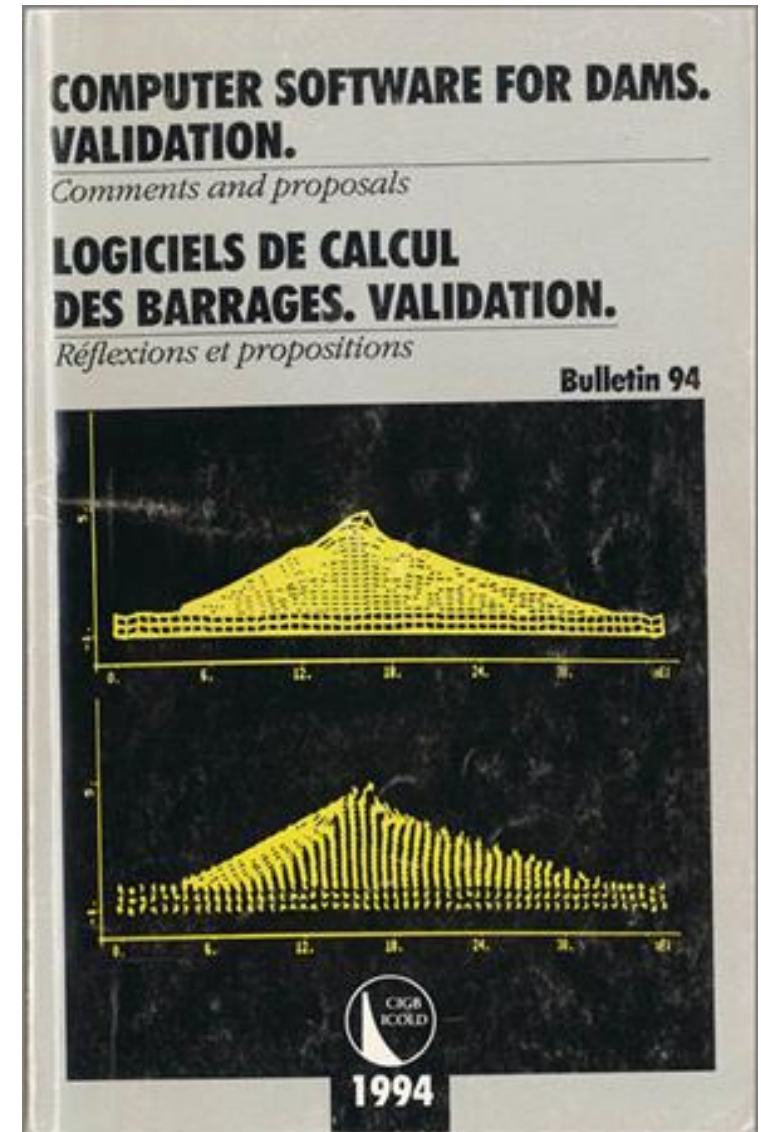
Bulletins issued by the Committee



Bulletin N. 94 (1994) Computer software for dams. Validation

Validation process

The process which ensures and certifies that a given software implemented into a computer program used by dam engineers is adequate for performing a definite task in a correct way



Bulletin N. 122 (2001) Computational Procedures for Dam Engineering

Reliability and Applicability

Critical review of the reliability level and applicability of presently available numerical models and computer programs to represent correctly the various phenomena affecting the dam behavior during the different life stages





Bulletins issued by the Committee



Bulletin N. 155 (2013) Guidelines for use of numerical models in dam engineering

Guidelines

A support to dam engineers to choose the more suitable computational strategies to cope with engineering problems considering potentialities and possible shortcomings of the available numerical models





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ICOLD Benchmark Workshops

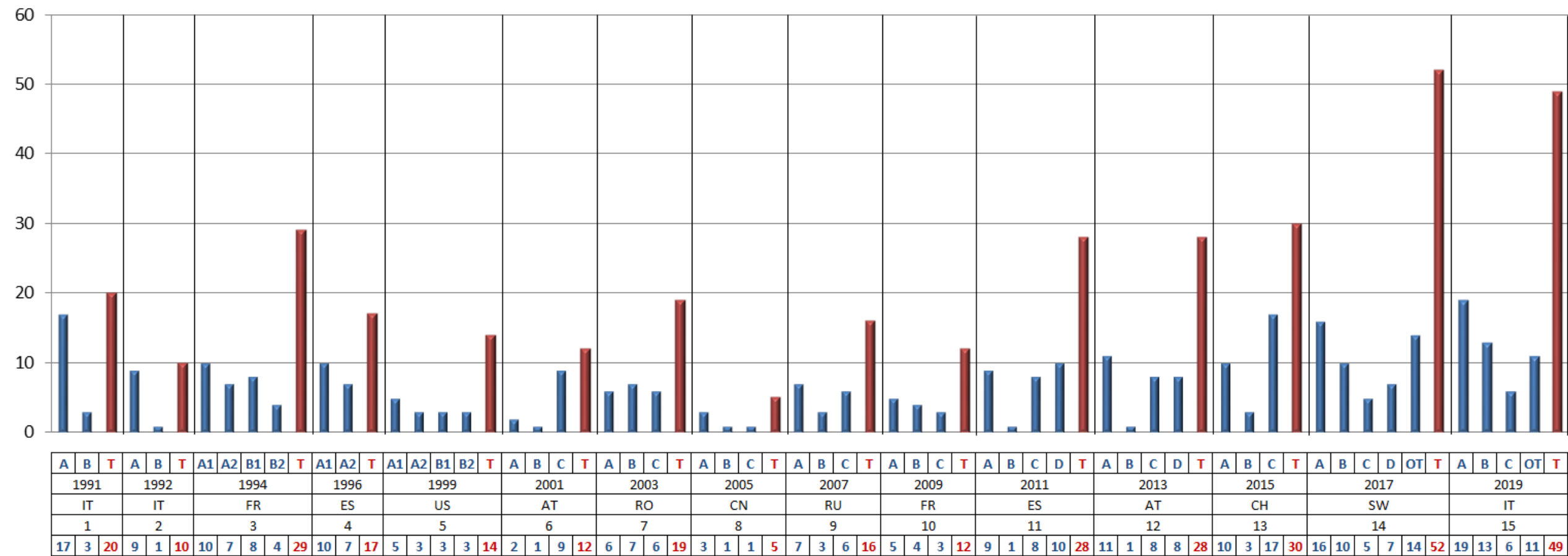


Bergamo	1991/1992
Paris	1994/2009
Madrid	1996
Denver	1999
Salzburg	2001
Bucarest	2003
Wuhan	2005
Saint Petersburg	2007
Valencia	2011
Graz	2013
Lausanne	2015
Stockholm	2017
Milan	2019





ICOLD Benchmark Workshops



Contributors to the 15 Benchmark Workshops held from 1991 to 2019 per theme and date.
49 themes proposed in total (red bars indicate the total number of contributors)



ICOLD Benchmark Workshops



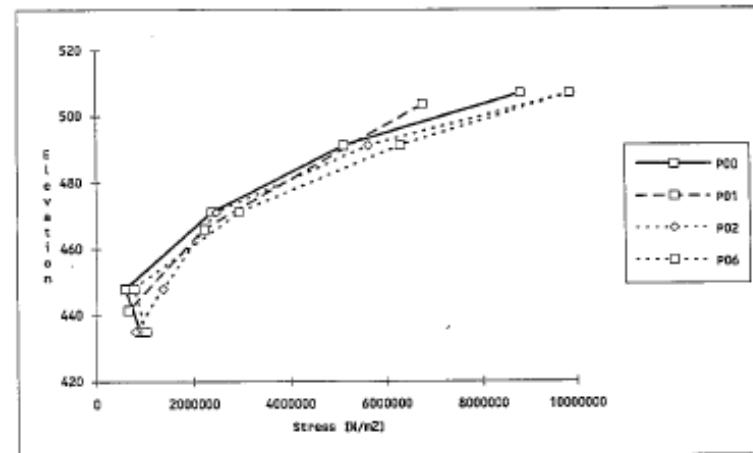
Talvacchia Dam (Italy): one of the reference dams in the first three BWs (1st and 2nd BWs, Bergamo 1991 and 1992; 3rd BW, Paris 1994).

Seismic analysis. Comparison of results: some examples

FLEXIBLE FOUNDATION AND INCOMPRESSIBLE FLUID

MAX ABS PRINCIPAL STRESSES P1 AND THEIR TIME OF OCCURRENCE

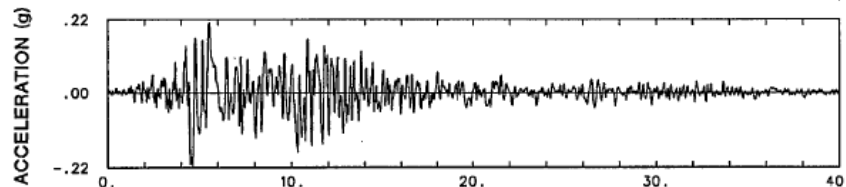
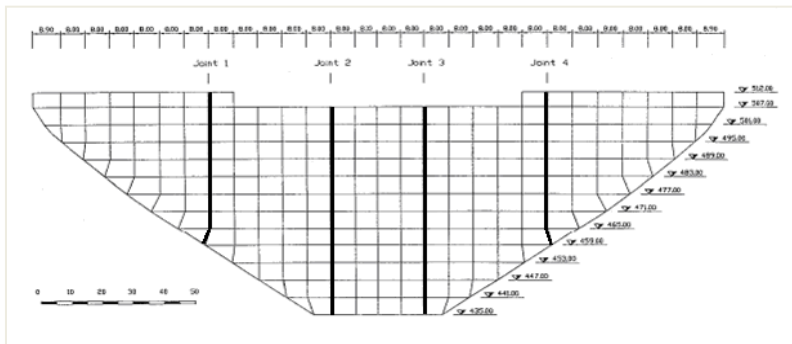
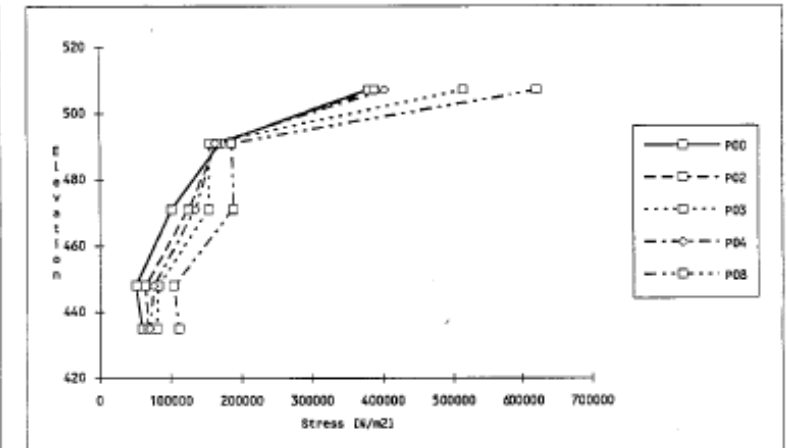
CENTRAL CANTILEVER



RIGID FOUNDATION AND COMPRESSIBLE FLUID

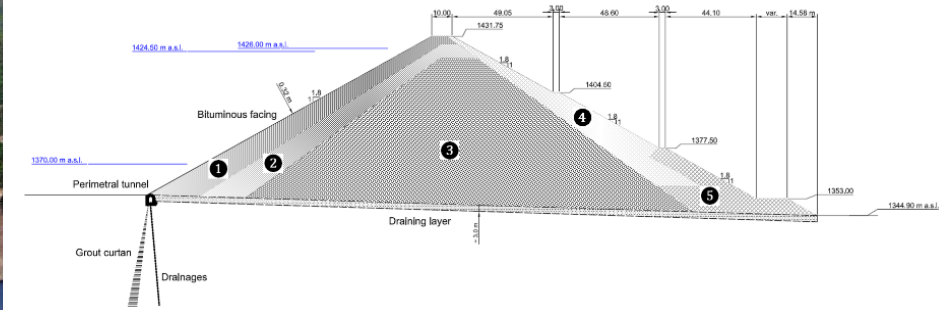
MAX ABS PRINCIPAL STRESSES P1 AND THEIR TIME OF OCCURRENCE

CENTRAL CANTILEVER



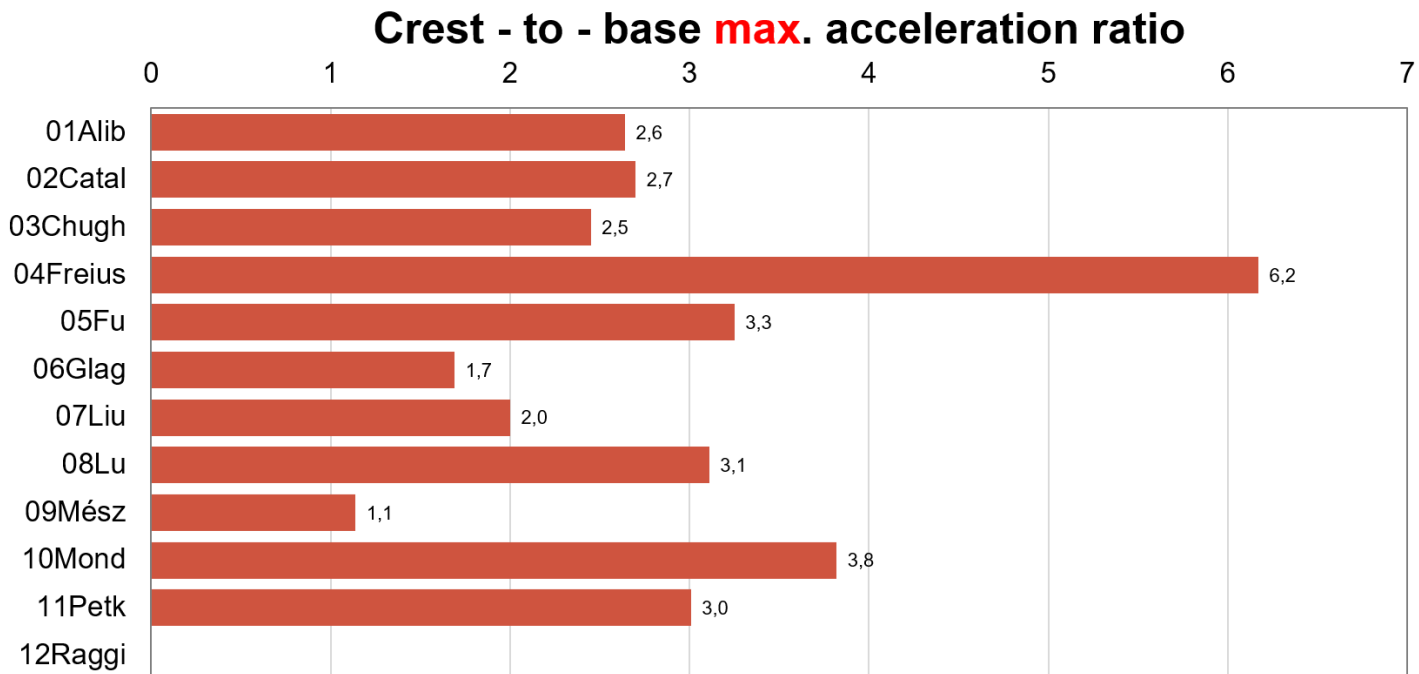


ICOLD Benchmark Workshops



Menta Dam (Italy): Seismic analysis of an embankment dam (15th BW, Milan 2019).

Seismic Behaviour under 0.26g EQKs. Crest-to base max. acceleration ratio.





Activities in progress



- Preparation of new **Bulletins**
- Organization of further **Benchmark Workshops**
- Organization of **joint activities** with other ICOLD Committee
- Propose training and dissemination activities to fill the generational gap
- Strengthen the interaction with universities to promote educational activities





Non-linear Modelling of Concrete Dams

- ✓ Provide **guidance for the application of non-linear analysis** techniques for the design and evaluation of concrete hydraulic structures.
- ✓ Examine procedures that show how to take into account the **non-linear behavior of constituent materials**.
- ✓ Examine **procedures** for the analysis of transient processes such as **seismic response**, settlements, **thermal effects**, **creep** and **shrinkage**, freeze-thaw effects, **alkali-silicate-reaction** and leaching .



Capitalization of results of the Benchmark Workshops

- ✓ Prepare a **synthesis of the results of the BWs held so far**, updating the results obtained in future workshops (*).
- ✓ Make a **critical assessment of the methodologies applied and lessons learned**.
- ✓ Define **methodological references** in the field of numerical modelling.
- ✓ Prepare **recommendations** to be applied in numerical modelling process.

(*) Contribution of the Italian Support Team: **Giulia Buffi, Giorgia Faggiani, Antonella Frigerio, Alessia Vecchiotti, Mauro Vecchiotti**



Activities in progress

Joint activities with other ICOLD Committees



Organization of joint activities with the aim to facilitate the integration of complementary knowledge and promote structural monitoring and improve the disposability of experimental data:

- Preparation of a **joint Bulletin on Arch Dams** with the **Committee on Concrete for Dams**
- Organization of a **joint workshops** with other Committees (Vienna 2018 with the **Committee on Seismic Aspects of Dams**, Ottawa 2019 with the **Committee on Concrete for Dams**)



Activities in progress

Next Benchmark Workshops



16th and 17th Benchmark Workshops:

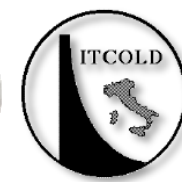
- **Ljubljana** (Slovenia) - Spring 2022
- **Sofia** (Bulgaria) - Fall 2023



A proposal to host the 18th Benchmark Workshop in USA has been recently received by USACE.



Chairmen/Chairperson of the Committee



**Olgierd
Zienkiewicz**

**Gabriella
Giuseppetti**



**Michele
Fanelli**



Alain Carrère

**Ignacio Escuder Bueno
Guido Mazzà**

