Variabilité hydrologique et fluctuations climatiques (NAO, SOI) de 3 hydrosystèmes au Maghreb (Bassins de la Soummam et du Tensift, Nappe du Haouz)
PHC Maghreb 30254WL

Benoit LAIGNEL(1), Imen TURKI(1) , Zeineddine NOUACEUR(2), Zineb ZAMRANE(3), Nour-Eddine LAFTOUHI(3), Gil MAHE(4), Nadir BENHAMICHE(5), Khodir MADANI(5)

1. UMR 6143 CNRS M2C, Université de Rouen, Place Emile Blondel, 76821 Mont-Saint-Aignan Cedex, benoit.laignel@univ-rouen.fr
2. UMR CNRS 6266 IDEES, Université de Rouen, 76821 Mont-Saint-Aignan Cedex
3. Laboratoire GEOHYD, Université Cadi Ayyad de Marrakech, BP 2390, 40000 Marrakech
4. UMR 5569 HydroSciences Montpellier, 300 avenue du Professeur Emile Jeanbrau à Montpellier
5. Laboratoire 3BS, Université Abderrahmane Mira de Béjaia, Route tergua ouzemmour, 06000 Béjaia

INTRODUCTION & ISSUE

The determination of the impact of climate change on hydrological systems and their water resources constitutes a major issue of the 21st century for which scientists must answer

**To provide answers,
we must first try to understand how the climate is expressed in hydrosystems**

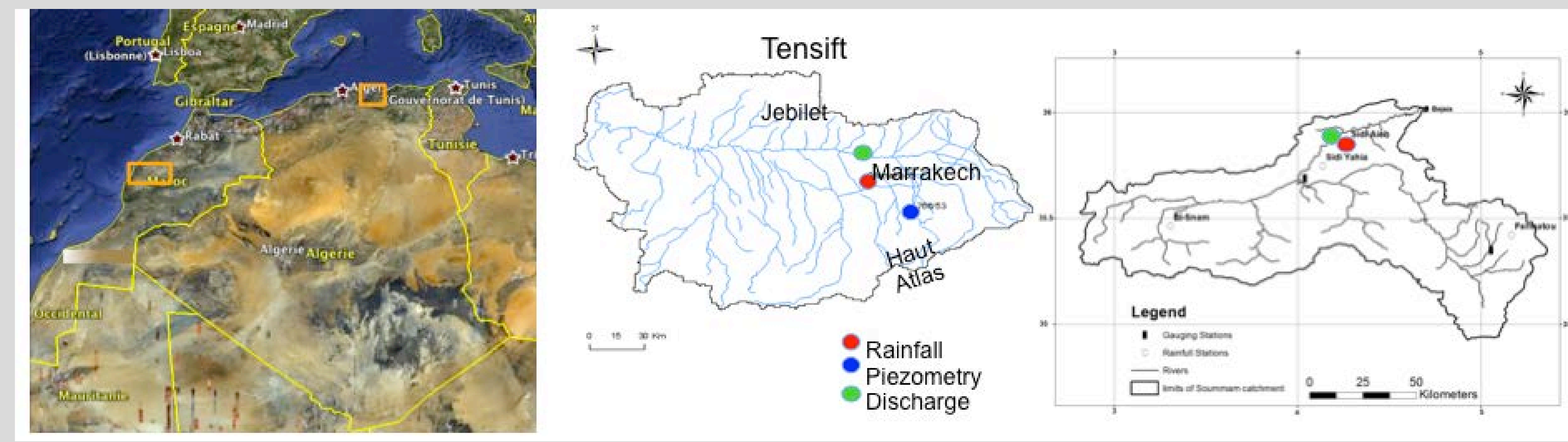
**For several years, in the framework of many regional, national and international programs and PhD, the M2C laboratory of the University of Rouen tries to understand
how the climate is recorded in hydrological systems located:**

(1) in different climatic and geomorphological contexts on both sides of the Atlantic Ocean & the Mediterranean Sea,

(2) in different hydrological compartments (surface water and groundwater)

(3) at different spatial scales (small watersheds less than 1000 square km & main rivers in the world)

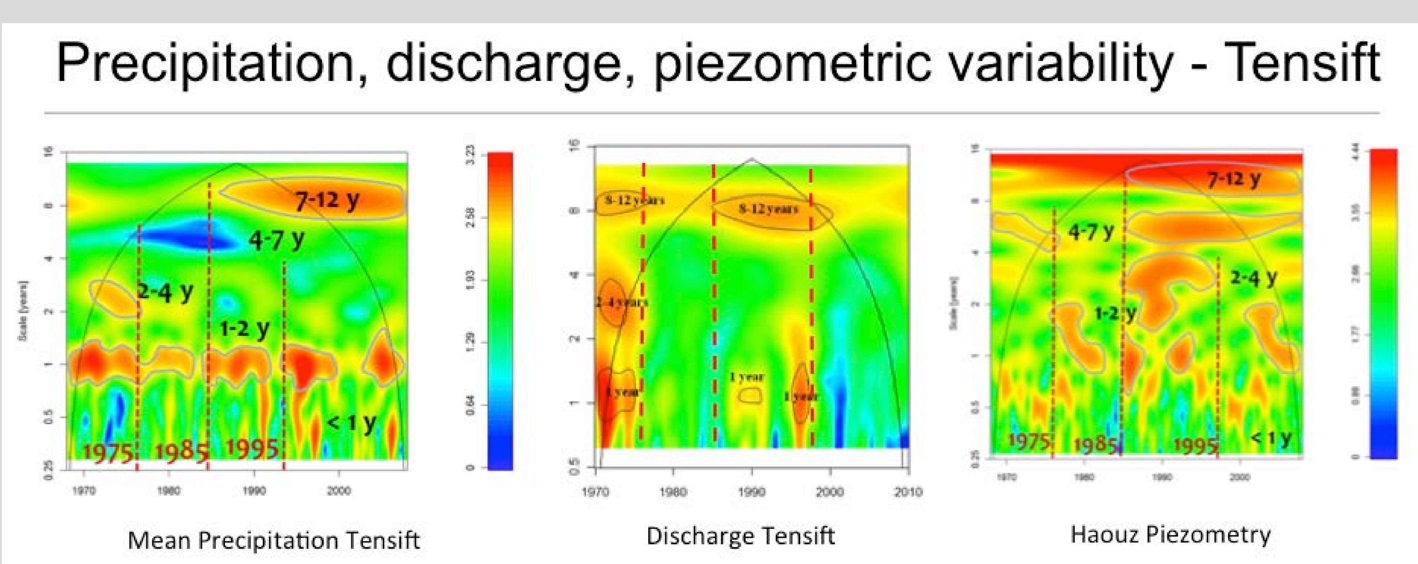
CONTEXT, DATA & METHOD



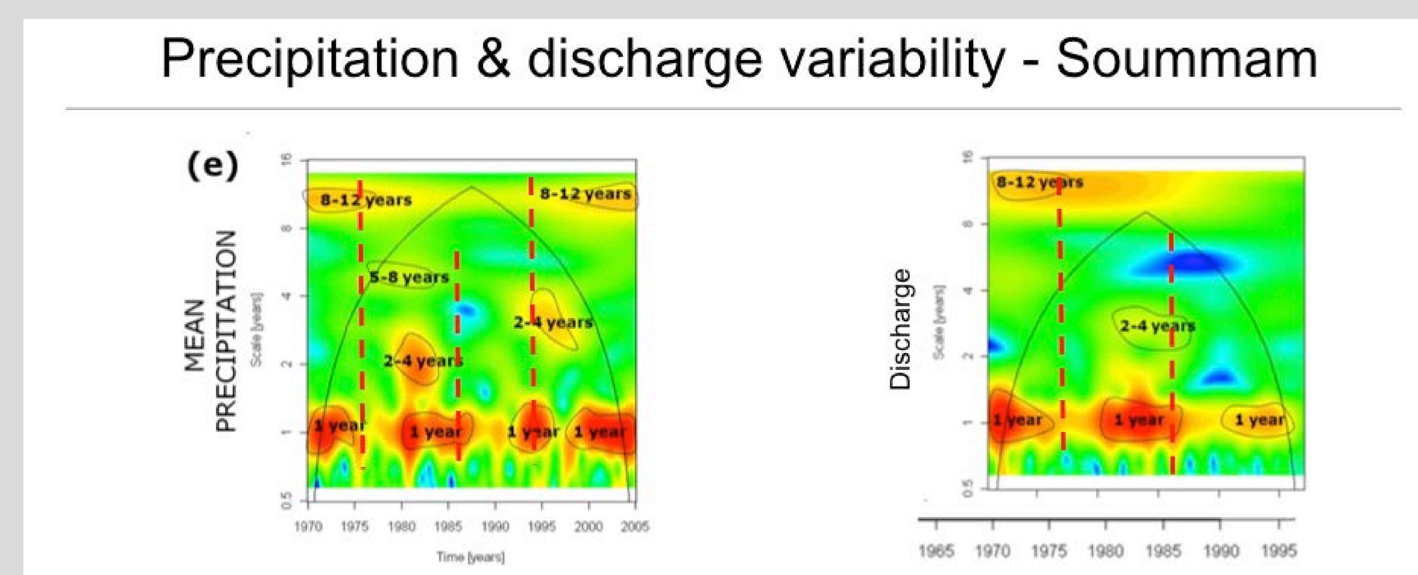
Data
The longest discharge, piezometric & rainfall time series : daily data, range from 1970 to 2010 (Tensift), to 2005 (Soummam)

Approach & Methods
Characterisation of the hydrological variability (Discharge, Piezometry) & comparison between the hydrological variability & the fluctuations of the rainfall & the NAO & SOI indices by using the signal processing methods (wavelet analysis…)

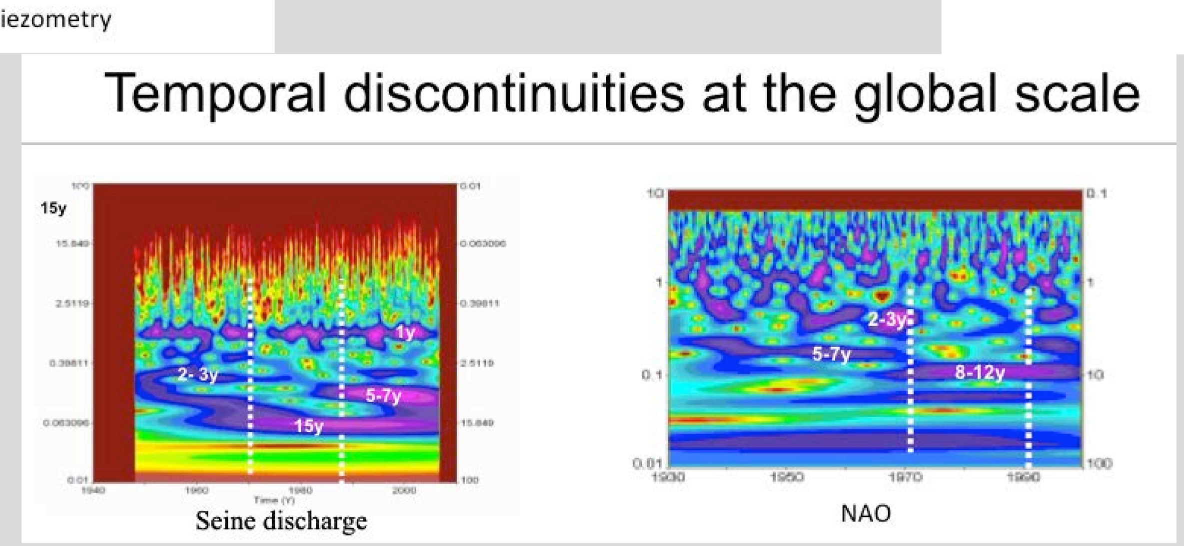
CHARACTERIZATION OF THE HYDROLOGICAL VARIABILTY



3 or 4 Components = EB (Energy Bands) or Variability modes
1-2y, 2-4y, (4-7y only piezometry), 7-12y
4 different periods & 3 discontinuities around :
1975, 1985, 1995

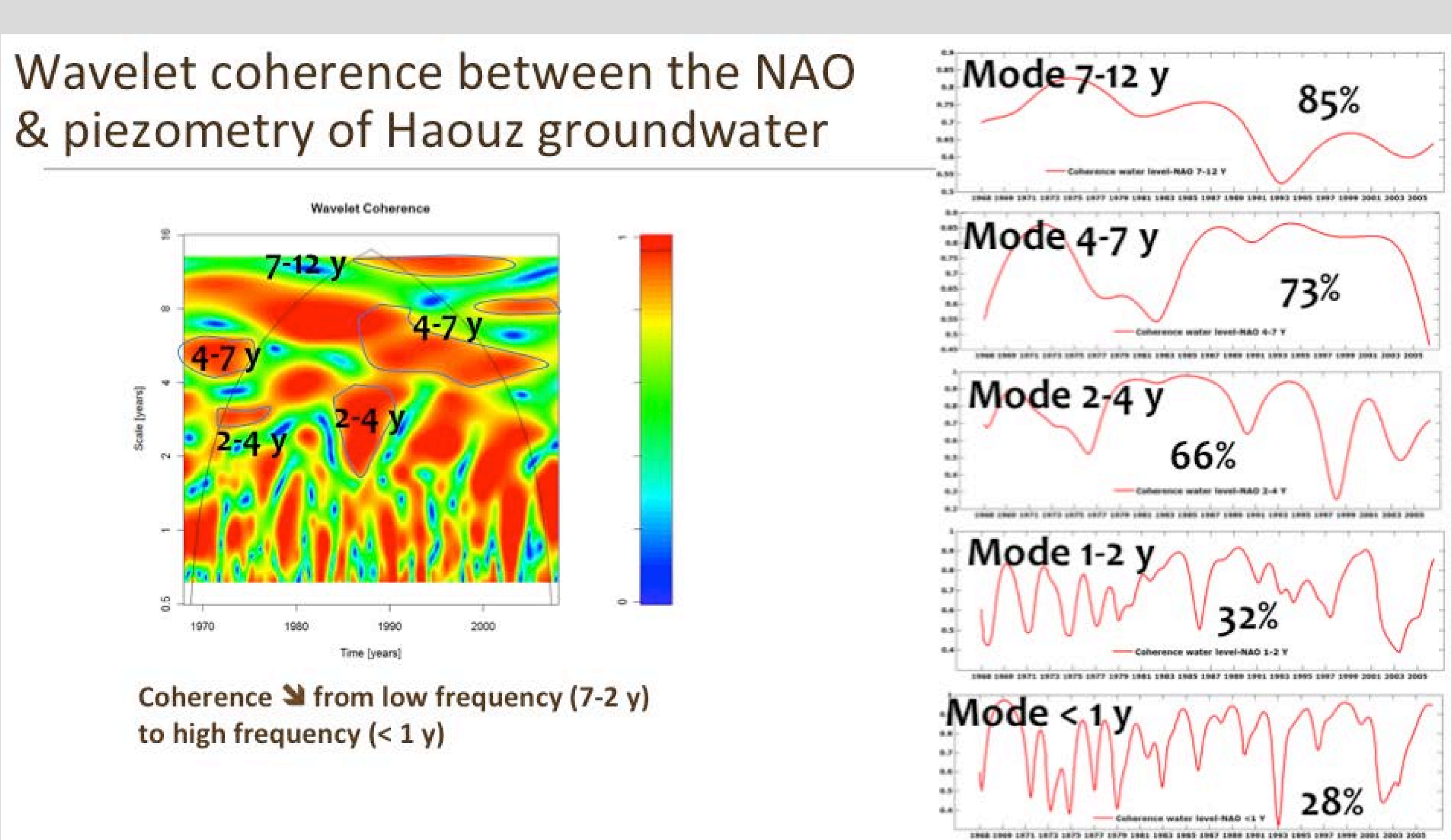


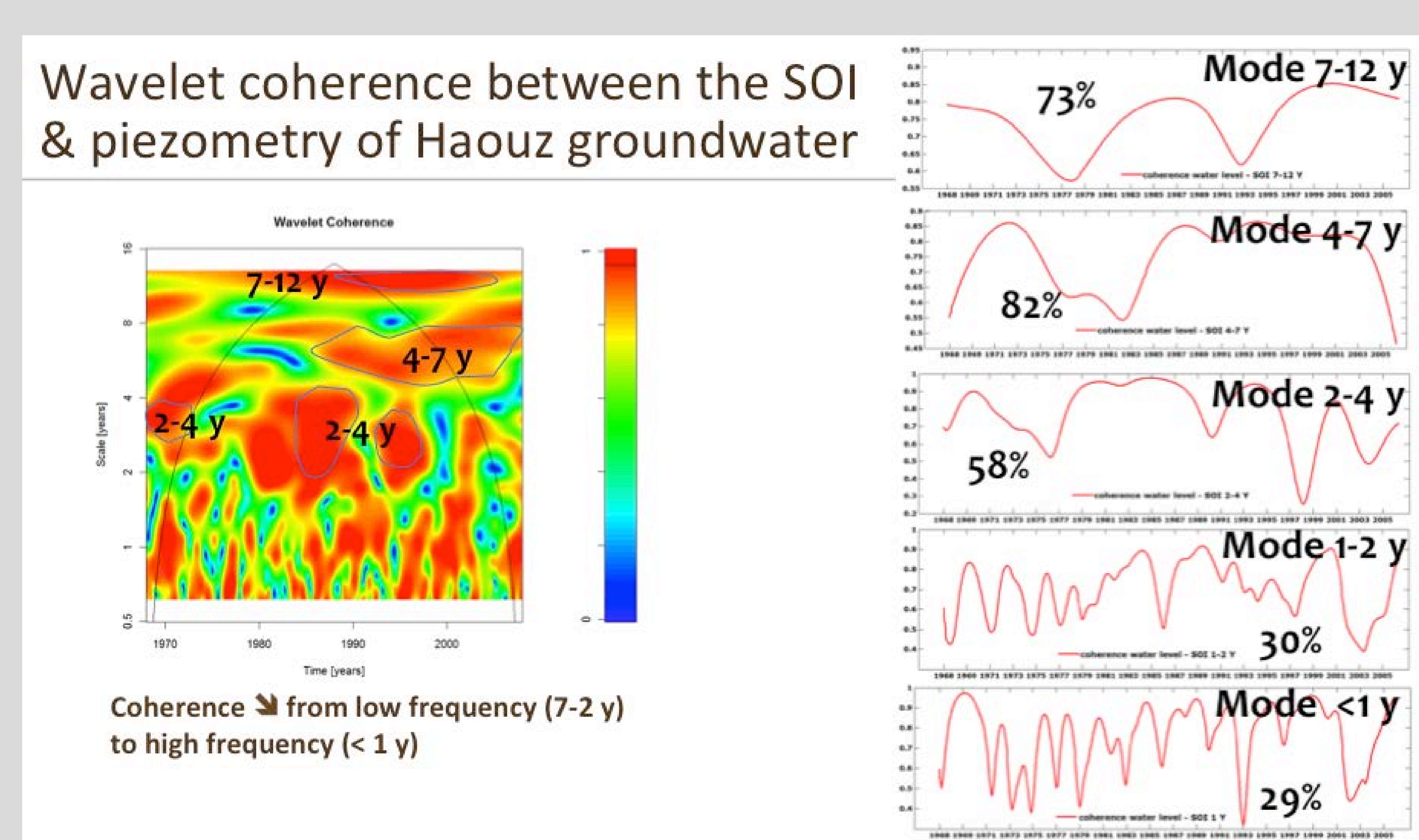
3 Components = EB (Energy Bands) or Variability modes
1y, 2-4y, 8-12y
4 different periods & 3 discontinuities around :
1975, 1985, 1995

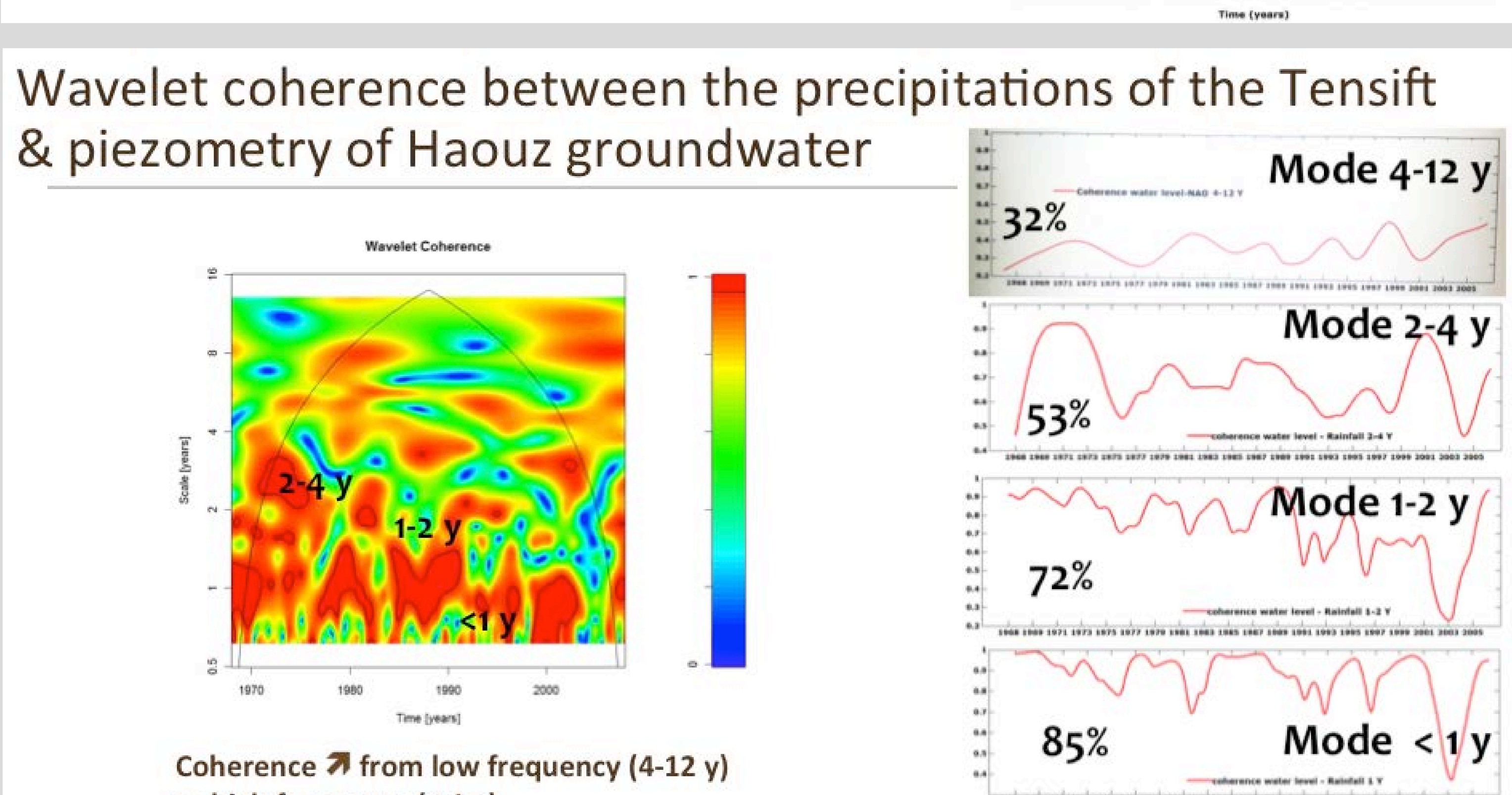


The 2 temporal discontinuities around 1970-1975 and 1990-1995 were also found in other studies in different climate and geomorphology context (NW France, N Africa, USA),
whatever the spatial scale (small or big watershed : Seine, Normandy watersheds, Mississippi, Colorado, Texas watersheds)
and whatever the hydrological compartment (surface, groundwater)
These 2 discontinuities were recovered also in the climate indices (NAO, SOI) (Laignel et al., 2010, …)
These 2 discontinuities could be climatic discontinuities at the global scale

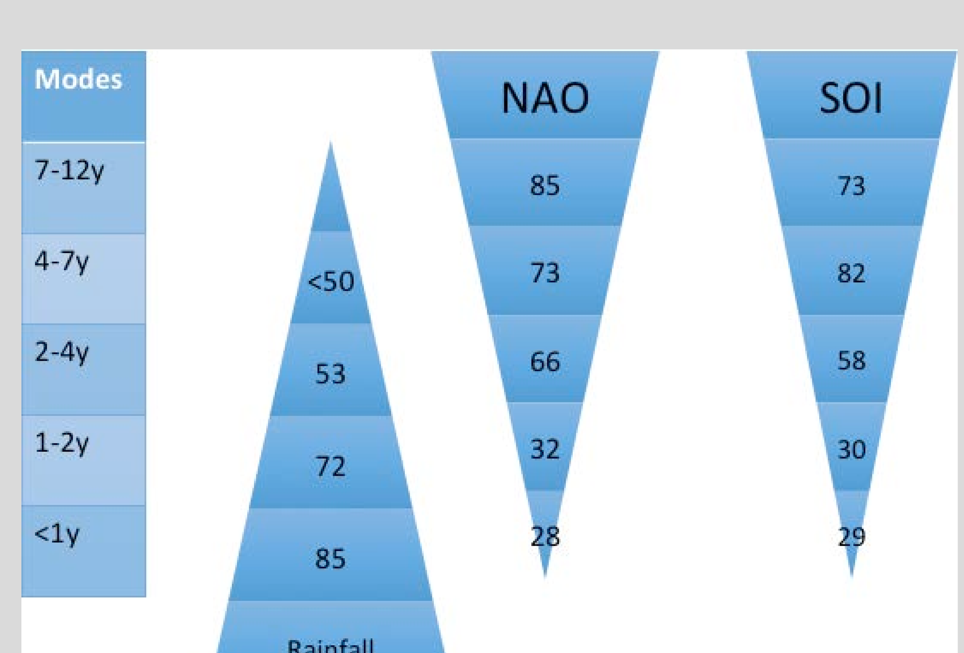
RELATIONS BETWEEN THE CLIMATIC FLUCTUATIONS AND THE HYDROLOGICAL VARIABILTY







CONCLUSION



Respective roles of the global climate & local climate on the hydrological variability

- Low-frequency hydrological variability (> 1-2 years) is mainly controlled by the fluctuations of the NAO and SOI and thus by the global climatic fluctuations,
- High frequency hydrological variability (> 1-2 years) is mainly controlled by rainfall and by the local climatic fluctuations in the rainfall