

# **Gaining a dynamical understanding of hydroclimatic extremes over the past millennium from proxies and climate models**

**C.C. Ummenhofer<sup>1</sup>**

<sup>1</sup>Woods Hole Oceanographic Institution, Woods Hole, USA

Proxy-model synthesis provides a useful tool for understanding variability and change in hydroclimatic extremes over the last millennium. An overview is provided on how to combine a diverse set of proxies with annual to (multi-)decadal resolution from the terrestrial and marine realms (e.g., speleothems, tree-rings, corals, bivalves, lacustrine and marine sediments) with state-of-the-art climate model simulations to investigate the relative contributions of internal and external climate drivers to (sub)tropical hydroclimate variations across a range of timescales. The focus is on the Austral-Asian monsoon systems, key climate modes in the Indian and Pacific Oceans such as the El Niño-Southern Oscillation, Indian Ocean Dipole, Interdecadal Pacific Oscillation, as well as their interactions as mediated through variations in the zonal and meridional overturning circulations (i.e., Walker and Hadley circulation) and their hydroclimatic impacts in surrounding regions as mediated by atmospheric teleconnections.