



Applying data assimilation to understand the signal recorded by natural archives over the past millennia

Hugues Goosse (1), François Klein (1), and Hans Renssen (2)

(1) Université Catholique de Louvain, Earth and Life Institute, Centre de recherches sur la terre et le climat G. lemaître, Louvain-la-Neuve, Belgium (hugues.goosse@uclouvain.be), (2) Department of Natural Sciences and Environmental Health, University College of Southeast Norway, Bø i Telemark, Norway

A primary goal of data assimilation is to reconstruct the state of the system by combining observations and model results. This is also a way to test hypotheses about the mechanisms ruling past changes or the compatibility of the interpretation of observations coming from different sources. We are reviewing here several successful applications belonging to this second type, illustrating its wide interest in paleoclimatology. A first example shows how data assimilation can be used to estimate the contribution of the forcing and internal variability over the past millennium and to confirm that the anthropogenic forcing is required to explain the warming over the 20 century. In the second example, the technique is used to determine the best scenario to explain observed fluctuations during the Younger Dryas as a combination of a reduced meridional overturning circulation in the North Atlantic, a moderate negative radiative forcing and the alteration of the atmospheric circulation in the North Atlantic sector. Finally, data assimilation can also underline fundamental incompatibilities between the interpretation of some records, as for instance between some marine and terrestrial ones for the mid-Holocene or between the interpretation of some records and model results in Antarctica over the past millennium.