

Cryosphere-related amplification of climate variations over the past millennium

Hugues Goosse[†]; Elisabeth Crespin; Svetlana Dubinkina; Yoann Sallaz-Damaz

[†] Université catholique de Louvain, Belgium

Leading author: hugues.goosse@uclouvain.be

The temperature reconstructions covering the past millennium display relatively mild conditions around 1000 AD, followed by a colder period roughly between 1450-1850, and finally end with a large warming over the 20th century. This transition from relatively warm to relatively cold conditions during the pre-industrial era is partly due to a simple thermodynamic response to changes in the radiative forcing. Changes in atmospheric and oceanic circulations, caused by the external forcings or related to internal variability, have also contributed to this long-term cooling. As illustrated by various simulations performed with a coupled climate model of intermediate complexity, both the thermodynamical and the dynamical changes are strongly amplified at high latitudes because they imply snow and sea ice melting. This modifies the surface albedo and thus the net solar radiation at surface, amplifying the initial radiative forcing at high latitudes up to a factor of 10.