



Abrupt depletion of sea-ice in the Arctic over the 21st century

C. Dubois (1) and D. Salas Melia

Meteo-France/CNRM, France (clotilde.dubois@cnrm.meteo.fr)

Recent observation and model studies have highlighted large changes in Arctic sea ice extent. Current observed sea-ice extent has declined sharply and suggests that a threshold has been crossed. Most models participating in the Intergovernmental Panel on Climate Change, Fourth Assessment Report (IPCC AR4) project an ice free Arctic Ocean during the summer by 2100 but underestimate the current rapid decline. However, some of those models simulate sudden drops in sea ice extent during the 21st century.

An SRESA1B projection by the CNRM-CM3 model (Centre National de Recherches Meteorologiques) simulates an abrupt decline in sea ice thickness for the period 2034-2042, which never recovers afterwards. This threshold occurs when ice melt during the summer is never compensated by the ice growth during the winter. The reduced ice growth is correlated to strong winter anomalies in the downward longwave flux emitted by the atmosphere over the North Siberian coast and the East Siberian Sea. This flux anomaly lags the strong sea ice extent reduction by 1-2 years and is linked with a positive cloud water content anomaly. The spatial distribution of different atmospheric modes (characterised by EOFs on sea level pressure) over the Arctic reveals that the third mode has a strong positive phase during this abrupt event. The spatial distribution of this mode is similar to the cloud anomaly and only appears during the 21st century.