OCEAN CIRCULATION, SEA LEVEL AND CLIMATIC CHANGES

Nils-Axel MörnerPaleogeophysics & Geodynamics, S-10691 Stockholm, Sweden,
email: morner@pog.su.se

There is a strong linkage between Earth's rate of rotation – total as well as differential – and the changes in ocean surface circulation. The ocean circulation changes are, in their turn, strongly linked to the paleoclimatic evolution of the boardering land masses. This is due to the high heat-storing capacity of the oceans, the ocean/atmosphere heat flux, and the ocean/land interaction via heat transport by the winds. The ocean circulation is not only driven by thermo-haline forces. The interchange of angular momentum between the hydrosphere and the solid Earth is another fundamental factor. This can be demonstrated (1) for the ENSO-events, (2) for the last centuries' instrumental data, (3) for decadal-to-century changes during the Holocene, (4) for the high-amplitude climatic-eustatic changes some 13-10 ka ago, and (5) for the main glacial/ /interglacial cycles. The high heat-storing capacity of the oceans implies that any change in the ditribution of the water masses will have strong effects on the global climatic temperature distribution. The oceans contain huges masses of water of a reasonably high density that are constantly circulating both horizontally and vertically over the globe. Any irregilarity in this circulation leads to a redistribution in total mass which affects the sea level and has to be compensated by an interchange of angular momentum between the hydrosphere and the solid Earth. This means that we in the recorded changes in climate and in sea level can obtain information about possible past changes in ocean circulation, too. And this is exactly what our paleo-records seem to indicate. During sunspot minima, the solar wind intensity decreased (read by increased in-fall of cosmic ray increrasing the 14C production and 10Be content) which led to a speeding-up of the Earth’s rate of rotation affecting the ocean circulation so that the a major current like the Gulf Stream sent less warm equatorial water along its northern branch towards NW Europe at the same time as Arctic water penetrated further south giving rise to severe cold periods in NW Europe and warm periond in S. Europe and N. Africa.