Date: **September 29th**

Time: **11:00 AM**

Location: **Maryland Hall 110**

Speaker: **Dr. Christian Rodehacke**
Columbia University

Title: **"Water Mass Transformation in the Southern Ocean: Tracer Studies with the regional Ocean Model BRIOS"**

Abstract

The Weddell Sea is one of the major source regions of AABW, the water mass which provides much of the ventilation of the deep world ocean. Tracer (CFCs, Helium, Tritium) simulations have been carried out as a part of the BRIOS (Bremerhaven Regional Ice-Ocean Simulations) project to analyze the contribution of the marginal seas around Antarctica to obtain a better understanding of the relevant processes. The CFC simulation shows that deep and bottom water is primarily formed in the Weddell Sea, in front of the Ross and Amery Ice Shelf and spread mainly with the boundary currents: (i) the boundary current from Ross Ice Shelf develops two branches: one ventilates the Ross Gyre and the other Antarctic Coastal Current; (ii) the area in front of the Amery Ice Shelf ventilates the Antarctic Coastal Current; (iii) Deep and Bottom Water formed in front of the Filchner Ronne Ice Shelf flows along the Antarctic Peninsula and partly leaves the Weddell Gyre through topographical gaps to ventilated the Southern Scotia Sea. Based on the common assumption that the tracer content/ inventory in the deep sea is equal to the formation rate, when it is normalized by the tracer input history, we analyzing the formation rate of the Southern Ocean. For this we inspecting the simulated transient tracers CFC11, CFC12 and Tritium. Since the model's vertical overturning is constant in time the detected artificial temporal evolution of the deduced "formation rate" depends on the history of the used tracer. So the widely-accepted relationship is wrong and doesn't allow the detection of changes in the meridional overturning circulation. For the first time an explicitly formulated interaction between ocean and ice shelf is used to describe the input of Helium and Neon. The good agreement between simulated and observed values confirms the approach. Increase of measurement accuracy to 0.2% would improve the detection of Ice Shelf Water (ISW) from the Ross and Amery Ice Shelf. The ISW outflow

from the Ross Ice Shelf would be detectable as far as to the Prydz Bay and the ISW fraction of the Amery Ice Shelf could be traced all the way to the Greenwich Meridian. Since observations are taken routinely along the Greenwich Meridian this will open an unique test if the Amery Ice Shelf is a source of the fresh ventilated water masses that enters the Weddell Sea from the east.