National Report Germany 2012/2013 for CLIVAR SSG

There are several research activities in Germany that are closely related to CLIVAR. Germany funded programs/projects are for example:

BMBF SACUS (Southwest African Coastal Upwelling System and Benguela Niños), focus on the SW African upwelling system studying the connectivity of the equatorial current system, and tropical Atlantic climate and predictability with observations in the southeastern tropical Atlantic, high-resolution ocean modeling and coupled climate modelling.

Goal of the newly established **BMBF RACE** (Regional Atlantic Circulation and Global Change, http://race.zmaw.de) programme (2012-2015) is an improved understanding of the regional response of the Atlantic circulation and climate modes to global warming and of expected impacts. This is a coordinate effort including high-resolution ocean and coupled modeling as well as contributions to the Atlantic observing system. The latter includes western boundary current arrays off Brazil at 11°S and in the subpolar gyre at 53°N, an observation network of the NAC and measurements of the Denmark Strait Overflow.

The large initiative **BMBF MIKLIP** (http://www.fona-miklip.de/en/) Decadal Predictions aims to create a model system that can provide reliable decadal forecasts on climate and weather, including extreme weather events. The model system to be developed will be novel in several aspects, with great challenges for the methodology development. This concerns especially the determination of the initial conditions, the inclusion into the model of processes relevant to decadal predictions (e.g. modelling of the cryosphere and the biosphere), the increase of the spatial resolution through regionalisation, the improvement or adjustment of statistical post-processing, and finally the synthesis and validation of the entire model system. MIKLIP is composed of five modules: Initial Conditions / Initialisation, Processes and Modelling, Regionalisation, Synthesis, and Validation.

Another project funded by the German government under the DFG Collaborative Research Center **SFB 754** (Climate-Biogeochemistry Interaction in the Tropical Oceans, http://www.sfb754.de/) focuses on the oxygen minimum zones of the tropical North Atlantic and South Pacific. This project is at its phase 2 (2012-2015) at the moment. This subject is of a close relation with the biogeochemistry (BGC) community and interaction with them needs to be further developed. There is some emphasis on the modeling component on BGC, with interaction with coupled climate models, coupled BGC and regional models.

The response of the Weddell Gyre to climate change is studied by the **HGF** large investment **HAFOS,** extending an already existing 30-year time series into the foreseeable future. The HAFOS oceanographic observatory (Link Webpage) comprises an array of 17 oceanographic moorings and some 50 ice-resilient Argo floats to detect changes in the hydrographic properties of the interior watermasses of

the Weddell Sea. RAFOS navigational signals are provided by this array once daily, and are accessible to the oceanography community for navigational purposes. Current planning aims to uphold this system at least until 2017, with the intention to extend it into the next decade.

A French-German-West African Initiative, **AWA** (Ecosystem Approach to the management of fisheries and the marine environment in West African waters, http://www.awa-project.org/) was funded focusing on the eastern boundary upwelling system of NW Africa including fishery and socio-economic impact studies.

German scientists/institutes also strongly contribute to several EU FP7 projects. EU funded programs/projects are:

EU PREFACE (Enhancing PREdiction oF Tropical Atlantic ClimatE and its impacts) was submitted, with the objective of enhancing prediction of tropical Atlantic climate and its impacts. This project is based on high-resolution ocean and atmosphere and coupled modelling. It includes observational programme in the eastern tropical Atlantic of both hemispheres. Within this proposal, there is funding request for PIRATA Southeast extension at 6°S, 8°E, which would be beneficial to studies related to model SST biases.

The **NACLIM** project (http://www.naclim.eu, EU FP 7) aims at investigating and quantifying the predictability of the climate in the North Atlantic/European sector related to North Atlantic/Arctic sea surface temperature and sea ice variability on seasonal to decadal time scales. SST and sea-ice forcing have a crucial impact on weather and climate in Europe. NACLIM will analyze the multi-model decadal prediction experiments currently performed as part of the CMIP5 Project and assess the quality of predictions of the near-future state of key oceanic and atmospheric quantities relevant to the SST and sea-ice distribution and the related climate. Long-term observations of relevant ocean parameters will be carried out, for assessing the forecast skill of the model-based prediction results. NACLIM will identify observations that are key to the quality of the prediction and optimize the present observing system. NACLIM will quantify the impact of North Atlantic/European climate change on oceanic ecosystems and urban societies.

Another project funded within EU FP7 with strong German contribution is **ice2sea** (http://www.ice2sea.eu/), a scientific programme that was developed in response to the Fourth Assessment Report (AR4, 2007) of the Intergovernmental Panel on Climate Change (IPCC). Ice2sea has made fundamental progress in measuring ongoing changes in ice sheets and glaciers, and in understanding the processes responsible for rapid ice-loss, and both global and regional sea-level rise. Combining expertise across a wide range of scientific disciplines has enabled ice2sea to develop projections of continental ice-loss using computer models that are based exclusively on representations of the physics at work in glaciers and ice sheets. Several important processes, that were previously not included due to insufficient understanding, have been incorporated in these models. These advances achieved by ice2sea directly address issues that were of concern to the IPCC AR4. Ice2sea

projections have been presented to the IPCC, to contribute to the development of a consensus of sea-level projections that will be published by Working Group I in the Fifth Assessment Report in autumn 2013 (AR5, 2013).

Workshops/Conferences in Germany:

In September 2012 the **international conference "North Atlantic Climate Variability"** was held in Hamburg (http://www.eu-thor.eu/Closing-event.2060.0.html). The conference was a joint initiative between the EU funded THOR and the German BMBF-funded "North Atlantic" programmes, to explore the scientific understanding of Atlantic variability on a range of time scales, with a main focus of the role of the AMOC. The EU THOR "Thermohaline overturning - at risk?" project was launched in December 2008 and has brought together 20 higher educational and research institutions of 9 European countries under the coordination of the University of Hamburg (Detlef Quadfasel). The project investigates the impact of the Oceans on the climate change with focus on the short-term stability of the thermohaline overturning. The goal of the project is to provide reliable forecasts for the next 15-25 years, in order to estimate the impacts on the ecosystem and on the population in Europe. The BMBF North Atlantic project is a consortium effort of leading oceanographic institutions of Northern Germany, acting under the coordination of the University of Hamburg (Detlef Stammer). The research focus of the consortium is on detection of changes in the circulation and on the understanding of the role of the North Atlantic in relation to the transport of energy, CO_2 emissions in the global change and the coupling and exchange mechanisms between Atlantic and North Sea.

In September 2012 the **Tropical Atlantic Variability Meeting / PIRATA-17 Meeting** representing the final meeting of the CLIVAR TACE programme was held in Kiel (https://conferences.geomar.de/conferenceDisplay.py?ovw=True&confId=0). One of the main goals of TACE was to improve the observational database and to carry out dedicated process studies enhancing our understanding of the tropical Atlantic climate system. The regional focus of TACE was on the central and eastern equatorial Atlantic characterized by the development of the Atlantic cold tongue (ACT) during boreal summer. The year-to-year variability of the ACT sea surface temperature (SST) is linked to climate variations including the strength and onset date of the West African Monsoon; however, its prediction is strongly limited by large biases in coupled climate models. The 2012 Tropical Atlantic Variability (TAV) meeting that was held jointly with the PIRATA-17 meeting focused on advances in observing, simulating, understanding and predicting TAV and provided an opportunity to assess progress toward achieving TACE's goals. The meeting was organized around five themed sessions: 1) Climate Variability and Change in the Tropical Atlantic; 2) Tropical Atlantic Teleconnections; 3) Predictability, Coupled and Uncoupled Model Biases; 4) Oceanic and Atmospheric Processes Affecting Climate Variability; 5) Physical-Biogeochemical Interaction

The **European Climate Change Adaptation Conference 2013** (http://eccaconf.eu/, March, Hamburg) brought together scientists and practitioners working on adaptation to the impacts of climate change. The conference created a European forum bringing together world-class science, with the aim of fostering a creative dialogue with climate adaptation policy makers and practitioners. The theme of the conference was integrating climate into action.

National Committee Structure in Germany:

NKGCF (German National Committee on Global Change Research) has ended its activities in March 2013 and initiated the "**German Committee Future Earth**" (Deutsches Komitee für Nachhaltigkeitsforschung in Future Earth, www.dkn-future-earth.org). The "German Committee Future Earth" (chairman Martin Visbeck) will act as a research advisory board and national partner on questions regarding international developments and activities within the framework of Future Earth. The German Committee Future Earth will act also as the national contact point for WCRP and its core projects such as CLIVAR. After a successful initial meeting of the German Committee Future Earth the member decided to start first initiatives. In preparation is an expert discussion in collaboration with the DKK (Deutsches Klimakonsortium) on the Belmont CRA topic "Decadal Analysis".