Projekt: Technologien zum nachhaltigen Gewässer- und Umweltschutz von Küstenlandschaften in Vietnam (EWATEC-COAST)

Projekttitel: EWATEC-COAST (BMBF)

Förderkennzeichen: 02WCL1217C

Andreas H. Fink, Joaquim G. Pinto, Sven Ulbrich, Robert Schuster, Roderick von der Linden

(fink@meteo.uni-koeln.de, jpinto@meteo.uni-koeln.de)

The overall goal of the cooperative project EWATEC-COAST, funded under the BMBF CLIENT program, is the development and implementation of management tools and environmental technologies for the strongly polluted Thi Vai river estuary in southern Vietnam. The core of the management tool is a hydrologic-hydraulic model system to simulate river discharge, coastal tides, and mass transport in the river. The hydrological model requires high-resolution gridded (at least 1°x1° degree lat./lon.) meteorological data as the upper boundary condition. The meteorological subproject lead by the Institute of Geophysics and Meteorology will provide such boundary conditions both from atmospheric analyses, as well as from regional climate model (RCM) integrations for present and future climates.

To achieve the latter goal, a statistic-dynamical downscaling approach, using COSMO-CLM or WRF (Weather Research and Forecasting) self-nested simulations for altogether several hundred, four-day long episodes of distinct weather states, will be carried out. The cluster analyses to determine the weather states will be either based on wind, humidity, and stability data from radiosondes launched at the upper-air station Ho Chi Minh (Saigon) or ERA-Interim data. Due to the location of the study region in the Southeast Asian monsoon region, not more than about half a dozen clusters (weather states) are expected. The boundary conditions for the COSMO-CLM/WRF episode simulations will stem from the CORDEX East Asia RCM ensemble integrations for the 20th century (20C), as well as RCP (Representative Concentration Pathway) 4.5 and 8 runs. The CORDEX runs have a grid resolution of 50 km or finer. The episode simulations will iteratively refine the resolution for smaller domains centered on southern Vietnam.

Model temperature and precipitation will then be bias-corrected and the present and future climates will be reconstructed by a linear combination of the frequency of occurrence of the CORDEX RCM-simulated weather states, respectively. A further probabilistic regionalization, based on a multiple regression analyses and applied to the reconstructed climates, will permit an even higher resolution of 1x1 km (or finer) to enable forcing of the hydrological model. Finally, since the infrequent occurrence of landfalling tropical cyclones will likely not be captured in any cluster type, such important extreme events will be simulated for historical cases in convection permitting spatial resolution (less than 3x3 km grid resolution) with COSMO CLM and (Hurricane-)WRF.

In 2013, sensitivity studies with the two above-mentioned RCMs for different weather situations and tropical cyclone landfall cases will be carried out and validated against atmospheric reanalyses,

gridded temperature and precipitation data, and station observations. Foci will be on appropriate spatial nesting steps (e.g. 50 km –> 7 km -> 2.8 km) and on the gain in skill of precipitation processes/fields when using explicit convection (2.8 km), as well as on performance of simulating tropical cyclones in the South China Sea. These runs will be forced with ERA-Interim reanalysis. At the end of 2013, a decision regarding the better performing RCM, as well as the appropriate and necessary (is 2.8 km really rewarding) nesting steps shall be made based on the simulation experiments.