Abstracts of Papers on SEACLID/CORDEX Southeast Asia findings presented at the recently concluded Asia Oceania Geosciences Society (AOGS) 2014, Sapporo, Japan, 28 Jul – 1 Aug 2014.
[http://www.asiaoceania.org/aogs2014/public.asp?page=home.htm]

Oral Presentations:

The Southeast Asia Regional Climate Downscaling (SEACLID) / CORDEX Southeast Asia Project

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The Southeast Asia Regional Climate Downscaling (SEACLID) project aims to develop multiple downscaled Climate Change Scenarios for the Southeast Asia region based on the latest IPCC Representative Concentration Pathway (RCP) Emissions. These downscaled data products are crucially important for climate change impact assessments at the local and regional scales. Due to requirements of multiple General Circulation Models (GCMs) and RCPs for such assessments, regional climate downscaling can be a very time consuming and resource-expensive exercise. In the spirit of regional collaboration, scientists from seven countries within the Southeast Asia region (i.e. Indonesia, Malaysia, Vietnam, Thailand, the Philippines, Cambodia and Lao PDR) have agreed to team up and implement this project on a sharing-task basis. The project secured its funding from the Asia Pacific Network (APN) for a during of three years commencing October 2013. Subsequently, SEACLID was incorporated into the regional CORDEX and the project has been renamed as SEACLID / CORDEX Southeast Asia (or CORDEX SEA). In addition to the original SEACLID country members, a number of countries have joined the project as collaborators. These include Australia, UK, South Korea, and Hong Kong SAR. The inception workshop was held from 18-19 November 2013 in Jakarta and hosted the Indonesian Agency for Meteorology, Climatology and Geophysics (BMKG). Currently the group is completing the RegCM4 sensitivity experiments for the best physics options. The results of these experiments are presented in this AOGS session and at the second workshop scheduled in June 2014 in Bangkok. Actual climate downscaling works will commence after the second workshop.

Model Temperature Dependence on Physical Parameterization Schemes of RegCM4 Over CORDEX- SEA Region

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Southeast Asia (SEA) has been identified as one of the more vulnerable regions to the impacts of climate change because of the high population mostly living in countries with high exposure to climate-related hazards and with low adaptive capabilities. It is therefore crucial for high-resolution climate projections to be available for this region for vulnerability studies and adaptation options. The Southeast Asia Regional Climate Downscaling/CORDEX Southeast Asia (SEACLID/CORDEX-SEA) project aims to provide these projections through a collaborative effort in regional climate downscaling. Model simulations with the 4th version of Regional Climate Model system (RegCM4) developed by International Centre for Theoretical Physics (ICTP) were performed for SEA domain (80°E-145°E; 15°S-40°N) for the period of 1989-2008 at 36 km spatial resolution. Using the ECMWF ERA Interim data as boundary condition, a total of 18 sensitivity experiments were done with different cumulus parameterization and ocean flux schemes. In this study, the model's performance in simulating mean temperature is evaluated against observed APHRODITE temperature gridded dataset. Initial results showed that spatial distribution of seasonal mean temperature showed a consistent cold bias among all simulations over the Tibetan plateau and Indochina, especially during the boreal winter. Consequently, simulations had the smallest biases during boreal summer. The seasonal cycle of regional means was well captured, except for the Grell - Fritsch Chappell scheme in some regions. The distribution of monthly regional mean temperature in the Emanuel, Grell over land and Emanuel over ocean, and Kuo schemes closely resembled the APHRODITE distributions. For some sub-regions, modeled temperature anomalies showed opposite signs to the observed in all schemes. In addition, the choice of the ocean scheme can also affect the model's temperature bias. These results thereby highlight the need to choose the appropriate configuration for RegCM4, particularly for the SEA region, before downscaling climate projections.

Sensitivity of Rainfall Climatology Over the CORDEX-SEA Regions to Different Physical Parameterizations in RegCM4

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CORDEX Southeast Asia (CORDEX-SEA) is a new component of World Climate Research Programme's (WCRP) Coordinated Regional Climate Downscaling Experiments (CORDEX). The proposed downscaling region covers 82E-144E; 15S - 40N. This study examined the sensitivity of the rainfall climatology simulations over this CORDEX domain to different combinations of cumulus parameterizations and ocean fluxes treatment in the 4th version of Regional Climate Model system (RegCM4) developed by International Centre for Theoretical Physics (ICTP). A total of eighteen 21-years (1989-2009) simulations were conducted using the ECMWF Interim product as lateral boudnary conditions. The quality of the simulated rainfall climatology of each of the experiments were compared to gridded observation datasets. For the comparison, multiple observational gridded datasets which include the Asian Precipitation - Highly-Resolved Observational Data Integration Towards Evaluation of Water Resources (APHRODITE), Climate Research Unit (CRU), Global Precipitation Climatological Centre (GPCC) and Tropical Rainfall Measuring Mission (TRMM) were used in order to account for the uncertainties in the observation. The inter observational product variations are generally larger over the east coast of IndoChina Peninsular and the equatorial regions due to small rainfall amount in the APHRODITE dataset over the regions. The simulation of rainfall is more sensitive to the cumulus parameterization but less so to the ocean flux treatment. Mixing of cumulus treatment with Grell scheme over the land and Emanuel scheme over the ocean appears to produce the best rainfall climatology simulation. Nevertheless, regions over the northern IndoChina generally showing larger rainfall biases with higher sensitivity to different physical options. On the other hand, the equatorial regions, where simulation biases are generally smaller, is less sensitivity to physical parameterization options.

Performance Evaluation of RegCM4 in Simulating Extreme Rainfall Events Over the CORDEX-SEA Regions

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In this study, the Regional Climate Model version 4.2 (RegCM4.2) with 18 different parameterization options was forced by the ERA-Interim product under the framework of the Southeast Asia Regional Climate Downscaling (SEACLID)/ CORDEX Southeast Asia (or SEACLID/CORDEX-SEA) activities. The model outputs for the period 1989-2008 covers a common domain of 15oS-40oN, 80oE-145oE at 36km resolution. The Asian Precipitation - Highly-Resolved Observational Data Integration Towards Evaluation of Water Resources (APHRODITE's Water Resources) daily data version V1003R1 were used to evaluate simulated extreme rainfall indices. Results show high correlations between simulated maximum 1-day precipitation (RX1day), maximum 5-day precipitation (RX5day), maximum length of consecutive dry spell (CDD), maximum length of consecutive wet spell (CWD) and those of APHRODITE over the mainland Asia continent. However, the correlations are smaller over the Maritime Continent, suggesting an inappropriate quality of the rainfall simulated by RegCM4.2 or/and the APHRODITE data over the region. Other statistical estimations further indicate different performances of the experiments versus the observed-based data. Our analysis will also point out the regions within SEA at which simulated extreme rainfall are more sensible to cumulus parameterizations and ocean fluxes treatment.

Keywords: CORDEX, Southeast Asia, RegCM4, climate downscaling, extreme rainfall event B. Poster Presentations

Poster Presentation:

Evaluation of RegCM4 Performance with Different Physics Options in Simulating Circulation Fields Over the CORDEX-SEA Regions

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Addressing climate change impacts at regional scales requires high resolution climate data which can be achieved from dynamical downscaling using regional climate model. Under the framework of the Southeast Asia Regional Climate Downscaling (SEACLID)/CORDEX Southeast Asia (or SEACLID/CORDEX-SEA), the Regional Climate Model version 4.2 (RegCM4) is applied for the Southeast Asia (SEA) domain of 15oS– 40oN, 80oE–145oE to generate the regional climate downscaling at 36 km resolution. The first stage of the activities is to evaluate the performance of RegCM4 with different physics schemes to come up with the best options for downscaling with future climate projection. In all, 18 sensitivity experiments with different cumulus parameterization and ocean flux schemes were carried out by using reanalysis data from ECMWF ERA Interim during 1989–2008 as lateral boundary conditions. The model's performance in simulating atmospheric circulation fields was evaluated against ERA Interim upper- and lower-tropospheric winds, mid- tropospheric geopotential height and mean sea level pressure. It was found that, over all, the RegCM4 can adequately reproduce the major features of the circulation fields over Southeast Asia. However, minor differences in circulation fields existed among different physics options.