



Abstract Details

[AOGS 1st Annual Meeting](#) > [Ocean and Atmospheres](#) > [Impact of Climate Change to Dry Land Water Budget in Indonesia: Observation during 1980-2002 and Simulation for 2010-2039](#) >

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Title: Impact of Climate Change to Dry Land Water Budget in Indonesia: Observation during 1980-2002 and Simulation for 2010-2039

Abstract: In the tropic region as Indonesia, rainfall is the most sensitive meteorological parameter for climate changes, and particularly irregularities and changes of distribution of rainfall give a serious impact such as drought and flooding. Changes of climate such as temperature and rainfall in various spatial and temporal scales are increasing and will induce surplus and deficit period of water availability. In agricultural sector, they are the most important factors for determining growing period, planting period, type of crops and production. Moreover, they are main factors behind food security. Daily rainfall, maximum and minimum temperature from 1980 to 2002 at 13 selected stations of agro-meteorology type A were collected and divided in the previous (1980-1992) and the recent (1993-2002) decades. Those stations are located in the central areas of agriculture production in west Sumatra (Gunungmedan and Bandarbatu), Lampung (Tamanbogo), west (Cimanggu, Muara, Pacet and Margahayu) and east Java (Mojosari, Genteng, Ngale, and Jambegede) and south Sulawesi (Maros and Bontobili). Those data were used for anomaly frequency analysis, linear regression of decadal rainfall and temperature, and tendency of annual rainfall. Dry land water budget at Tamanbogo and Maros, were analyzed by using Thornthwaite and Mather (1957) method. In order to predict future climate condition for a period 2010-2039, ARPEGE climate version 3.0 model incorporating an increase of CO₂ was used. The rainfall increase appeared significantly at Genteng in Banyuwangi region. The frequency analysis showed that the amount of daily rainfall 25-150 mm/day increased 15% till 3000% in recent decade. Other regions with positive anomalies are Pacet in Bogor region and Maros and Bontobili in Makassar and Gowa regions. Tamanbogo, Margahayu, Mojosari and Ngale stations do not show clear tendencies. The maximum temperature frequency analysis shows that most stations have increase of days with temperature higher than 38°C such as about 4.38% in Jambegede and 1627.4% in Pacet, except for Gunungmedan and Bandarbatu. The frequencies of minimum temperature of 16-20°C and 26-30°C in the recent decade at the most stations are higher than in the previous decade. The result of ARPEGE model showed that in the future rainfall zone will change. Positive rainfall anomaly around 220-439 mm/year for average from April to September is indicated in South Sulawesi, East Java, and North of Kalimantan. From March to October positive anomaly between 73 and more than 293 mm/year is distributed from Karimata strait, Banda to Arafura Sea. The maximum and minimum temperature anomaly zones may also appear in the same region. The long growing period in Tamanbogo for the previous period is about 80-243 days (III Oct/III Dec to I Mar/II Jun), whereas in the recent period it is about 79-191 days (I Nov/I Jan to II Mar/II May). The difference of total surplus water between the both periods is around 77.7 – 310.1 mm. On the other hand, for Maros station, a difference of total surplus water between both period around 151.0 – 731.4 mm is found.

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