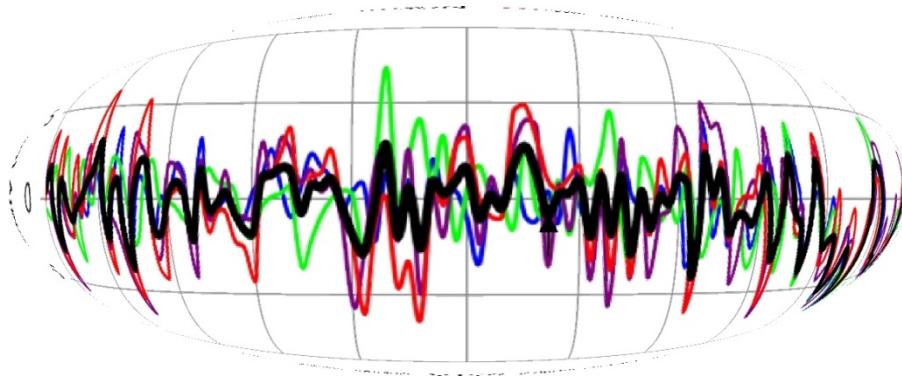


Investigation of Rainfall Variability and Trends in the Indonesian Region (1900 – 2008)



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A thesis submitted in fulfilment for the degree of
Master of Science



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Abstract

Characteristics of rainfall variability and trends in Indonesian region are investigated for the period 1900-2008 based on monthly gridded rainfall data. Standard statistical methods and multivariate statistical methods are used to examine rainfall variability and its trends. This study identified a significant decline in annual-mean rainfall in the entire region of more than 20% commencing in the late 1980s. There are only two dominant rainfall modes calculated from Empirical Orthogonal Function (EOF) that accounts for about 38% of variance occurring in the centre of the region. A smaller variance of about 9% appeared in the second EOF mode with the negative spatial loading concentrated in the southern part of the region.

Previous analyses of Indonesian rainfall data indicated a tight seasonal coupling between ENSO anomalies and rainfall anomalies during the dry season peaking in August. Nevertheless, rainfall anomalies tended not to persist from the dry season into the wet season. Indonesian rainfall variability has dramatically changed from the early 1970s onwards. Instead of being seasonally confined, ENSO events have switched into a mode in which they also control Indonesian rainfall anomalies outside the dry season.

This prolongation of ENSO influences and extended El-Nino episodes the early 1990s onwards explains the observed decline in annual-mean rainfall by ~20% in most of the Indonesian region and why this decline occurred spatially coherent and during most seasons of the year. Given the widespread impacts of ENSO events, we anticipate these findings to be an important clue in the understanding of climate-change impacts on changes in modes of climate variability. For instance, the sudden onset and persistence of intensified ENSO influences over the last 40 years, revealed here via an analysis of Indonesian rainfall anomalies, could point to a dramatic and permanent shift in ENSO-related climate variability influencing most areas across the tropical Pacific Ocean.

Declaration of Authenticity

‘I certify that this thesis does not incorporate, without acknowledgement, any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text’.

Muhammad Yusuf Awaluddin, Adelaide, 4th July 2011

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